SIDDHI Siddhi Prakashan

Worldwide International Inter Disciplinary Research Journal
Website : www.wiidrj.com
Menoffice Address: Director : Mr. Tejas Rampurkar, Hyderabad.
Tulja Niwas Ramkrishna Nagar, Near Ganpati Mandir
Yasmal Road Pandharkawada Maharashtra (India)
Email : shrishtiprakashan2009@gmail.com / siddhiprakashan674@gmail.com
Mob : +91-9623979067

Worldwide International Inter Disciplinary Research Journal (A Peer Reviewed) Vol. I, ISSUE - CV, Year – 10, 08th Oct. 2024

ISSN : 2454-7905
MAH/NAN/10936/2015
SJIF 2024 - Impact Factor : 8.278

Worldwide International Inter Disciplinary Research Journal

(A Peer Reviewed)

Vol. I, ISSUE - CV, Year – 10, 08th Oct. 2024

"Artificial Intelligence and NEP 2020 Shaping the Future in Higher Education"

:: Co - Editor
Dr. Jitendra K. Aherkar

Chief Editor ::
Dr. Reni Francis

Quarterly Research Journal

(Arts - Humanities - Social Sciences - Sports, Commerce, Science, Education, Agriculture, Management, Law, Engineering, Medical, Ayurveda, Pharmaceutical, Journalism, Mass Communication, Library Science Faculty's)

MES's Pillai College of Education & Research (Autonomous)

Chembur NAAC Accredited 'A' Grade

Collaboration with

MKLM's

B. L. Amlani College of Commerce & Economics M. R. Nathwani College of Arts

Affiliated to University of Mumbai, Vile Parle (W), Mumbai.

ON

"Artificial Intelligence and NEP 2020 Shaping the Future in Higher Education"

ONLINE INTERNATIONAL CONFERENCE

Certificate

This is to certify that Prof./Dr./Mr./Ms/_____

_____ Of _____

has participated in the One Day Interdisciplinary International Confrence (Online) held on 08 Oct. 2024 as a Key Note Address/Chair Person/Resource Person / Participant / Research Student. He / She has presented & published the research paper Worldwide International Inter Disciplinary Research Journal (A Peer Reviewed) on _____

it is peer reviewed & published in the year 10, Vol. I, (Impact Factor 8.278) ISSUE - CV, Year – 10, 08th Oct. 2024 Thank You.

:: Co - Editor ::
Dr. Jitendra K. Aherkar
Principal
MKLM's B.L. Amlani College,
Vile Parle (W), Mumbai.

:: Chief Editor ::
Dr. Reni Francis
Principal
PCER, Chembur.

ISSN: 2454 – 7905

***SJIF Impact Factor:* 8.278**

Worldwide International Inter Disciplinary Research Journal

A Peer Reviewed Refereed Journal

Quarterly Research Journal

(Arts-Humanities-Social Sciences- Sports, Commerce, Science, Education, Agriculture, Management, Law, Engineering, Medical-Ayurveda, Pharmaceutical, MSW, Journalism, Mass Communication, Library sci., Faculty's)

www.wiidrj.com

Vol. I ISSUE - CV Year – 10 08th Oct. 2024

MES's Pillai College of Education & Research (Autonomous)

Chembur NAAC Accredited 'A' Grade

Collaboration with

MKLM's

B. L. Amlani College of Commerce & Economics M. R. Nathwani College of Arts

Affiliated to University of Mumbai, Vile Parle (W), Mumbai.

ON

"Artificial Intelligence and NEP 2020 Shaping the Future in Higher Education"

ONLINE INTERNATIONAL CONFERENCE

:: Chief Editor ::

Dr. Reni Francis

Principal

PCER, Chembur.

:: Co - Editor ::

Dr. Jitendra K. Aherkar

Principal

MKLM's B.L. Amlani College, Vile Parle (W), Mumbai.

Address for Correspondence
Editor in Chief : Mrs. Pallavi Laxman Shete Website: www.wiidrj.com
Ramkrishna Nagar near Ganpati Mandir Vasmat Road Parbhani (India –Maharashtra)
Email: siddhiprakashan674@gmail.com / Shrishprakashan2009@gmil.com
Mob. No: +91-9623979067 **Director : Mr. Tejas Rampurkar, Hyderabad.**
(For International contact only +91-8857894082)

Worldwide International Inter Disciplinary Research

(A Peer Reviewed Referred)

Worldwide International Inter Disciplinary Research (A Peer Reviewed Referred) is quarterly published journal for Research scholars, teachers, businessman and scientists to integrate disciplines in an attempt to understand the complexities in the current affairs.

We also believe that both researchers and practitioners can contribute their knowledge by translating understanding into action and by linking theory and practice. This would enhance the relevance and thought in various related fields.

This Journal expected to bring together specialists in the field of commerce, economics, management and industry from different part of the world to address important issues regarding commerce, management and economics. One of the objectives of the journal is to create dialogue between scholars of various disciplines.

The editor, editorial team and the publisher do not hold any responsibility for the views expressed in **Worldwide International Inter Disciplinary Research (A Peer Reviewed Referred)** or for any error or omission arising from it.

The journal will cover the following Faculties for All Subject:

• Arts/ Humanities / Soc. Sci. / Sports	• Engineering
• Commerce	• Medical /Ayurveda
• Science	• Law
• Education	• Journalism
• Agriculture	• Mass Communication- **Library sci.**
• Pharmaceutical	• Social Work
• Management	• Any Other

Director : Mr. Tejas Rampurkar (For International contact only +91-8857894082)

Printed by
Anupam Printers, Hyderabad

Editorial Board

Co-Editorial Board

Peer-Review Committee

Advisor Committee

Guidelines for Submission of Manuscript

COVERING LETTER FOR SUBMISSION:

DATE: _____

To,
THE EDITOR,
WIPRJ,
Parbhani.

Subject: Submission of the article with the title ……

……..……...…….

DEAR Editor,

Please find my submission of article for possible publication in your journal.

I hereby affirm that the contents of this manuscript are original. Furthermore it has neither been published elsewhere fully or partly, nor itis under review for publication anywhere.

I affirm that all author(s) have seen and agreed to the submitted version of the manuscript and their inclusion of name(s) as co-author(s).

Also, if our/my manuscript is accepted, I/We agree to comply with the formalities as given in the journal and you are free to publish our contribution in your journal.

Name and Sign of Author/Authors
Designation:
Affiliation with full address & Pin Code:
Residential address with Pin Code:
Mobile Number (s):
Landline Number (s):
E-mail Address:
Alternate E-mail Address:

2. INTRODUCTION: Manuscript must be in British English prepared on a standard A4 size paper setting. It must be prepared on a single space and single column with 1" margin set for top, bottom, left and right. It should be typed in 12point Times New Roman Font (English Article) and 16 point in DVB-TT Surekh in Pagemaker (Marathi / Hindi Article).

3. MANUSCRIPT TITLE and HEADINGS: The title of the paper should be bold capital. All the headings should be bold.All sub-headings should have also bold.

4. AUTHOR(S) NAME(S) and AFFILIATIONS: The author(s) full name, designation, affiliation(s), address, and email address should be there.

5. ABSTRACT: Abstract should be in fully italicized text, not exceeding 250 words. The abstract must be informative.

6. KEYWORDS: Abstract must be followed by list of keywords, subject to the maximum of five.

7. FIGURES and TABLES: These should be simple, centered, separately numbered and self-explanatory, and titles must be above the tables/figures. Sources of data should be mentioned below the table/figure.

8. REFERENCES: The list of all references should be alphabetically arranged. It must be single spaced, and at the end of the manuscript. The author(s) should mention only the actually utilized references in the preparation of manuscript and they are supposed to follow **Harvard Style of Referencing**.

Review Process

Each research paper submitted to the journal is subject to the following reviewing process:

1. Each research paper/article will be initially evaluated by the editor to check the quality of the research article for the journal.
2. The articles passed through screening at this level will be forwarded to two referees for blind peer review.
3. At this stage, two referees will carefully review the research article, each of whom will make a recommendation to publish the article in its present form/modify/reject.
4. The review process may take one/two months.
5. In case of acceptance of the article, journal reserves the right of making amendments in the final draft of the research paper to suit the journal's standard and requirement.

Worldwide International Inter Disciplinary Research Journal

(A Peer Reviewed Referred)

(ISSN – 2454 7905)

COPYRIGHT WARRANTY AND AUTHORISATION FORM

Date:

TO,
THE PUBLISHING EDITOR,
Worldwide International Inter Disciplinary Research (A Peer Reviewed Referred),
Parbhani.

SUBJECT: COPYRIGHT WARRANTY AND AUTHORISATION FORM
(The article cannot be published until this copyright authorization agreement is received by the Editor)

DECLARATION

I/We …….. the author/authors of the paper titled…….. ……authorize you to publish the above mentioned article **Worldwide International Inter Disciplinary Research** (A Peer Reviewed)

I/We hereby declare that:

1. This article authored by me/us is an original and genuine research work. It does not infringe on the right of others and does not contain any libelous or unlawful statements. It has not neither been submitted for publication nor published elsewhere in any print/electronic form.
2. I/We have taken permission from the copyright holder to reproduce the matter not owned by me and acknowledged the source.
3. I/We permit editors to publish the said paper in the journal or in any other means with editorial modification, if any.
4. I/We assign all the copyright of this article to the journal, and have not assigned any kind of rights for its publication to any other publisher(s).
5. I/We agree to indemnify the Editors, **Worldwide International Inter Disciplinary Research** (A Peer Reviewed Referred) against all claims and expenses arising from any breach of warranty on my/our behalf in this agreement.
6. In case of a paper by multi-authored article, I/corresponding authors have obtained permission to enter into agreement and assign copyright from all the co-authors, in writing and all the co-authors have thoroughly read and agreed with above warranties and authorization.
7. All disputes subject to jurisdiction of Nanded court only.

Name : ……..

Official Address :……..

…… **Pin** ……..

e-mail id :……..

Mobile and Phone No. : ……..

Signature of the Author(s) : ……..

Worldwide International Inter Disciplinary Research Journal

(A Peer Reviewed Referred)

(ISSN 2454 7905)

Dr. Rajesh G. Umbarkar

Ramkrishna Nagar near Ganpati Mandir Vasmat Road Parbhani (India –Maharashtra)

Phone : +91 9623979067 **Email :** siddhiprakashan674@gmail.com / Shrishprakashan2009@gmil.com

www.wiidrj.com

Dear Editor,

I wish to be an Annual Member and agree to abide by your rules and regulations.

1. Name in Full :_____

2. Nationality: _____

3. Address for Correspondence: _____

Phone (STD code): _____ Mobile No : _____

4. Name of the College/Employer : _____

5. Present Position/Designation: _____

6. Email Address: _____

Date: **(Signature of the applicant)**

Place: Stamp Seal:

ANNUAL SUBSCRIPTION RATES:

	Domestic	International
Individual	**Rs. 1500**	**$ 150**
Institutional	**Rs. 1500**	**$ 150**

Director : Mr. Tejas Rampurkar (For International contact only +91-8857894082)

Subscriptions must be sent by Demand Draft drawn on any Nationalized Bank at Nanded, in favour of **Mrs.Pallavi Laxmanrao Shete** Subscription can also be made by depositing cash or electronic transfer in our bank account.

Name of the Bank : **State Bank of India**,**Branch – Taroda Naka Dist**. NANDED. (MH., India.)
IFSC Code : **SBIN0016667**
Branch Code : 16667
Account Number : **20286425949**

INDEX

Teacher Training in the AI Era: Preparing Educators for NEP 2020

Mr. Vijay Vasant More
Asst. Professor,
MES's, Pillai HOC College of Education and Research, Rasayani.

Abstract

The swift incorporation of Artificial Intelligence (AI) into educational sectors has completely transformed conventional teaching methodologies. The implementation of India's National Education Policy (NEP) 2020 has created a crucial need for instructors who possess AI-driven technologies. This research explores the potential of AI technologies to revolutionise teacher training by facilitating educators' adjustment to emerging technologies, pedagogies, and digital infrastructure. This paper examines the present state of teacher training, its significance in the context of NEP 2020, and offers valuable perspectives on how artificial intelligence (AI) might tackle the current obstacles in the field. Lastly, the study provides empirically-based analysis, suggestions, and findings on the future of AI-enabled teacher training to adequately prepare educators for the era of artificial intelligence.

Keywords: Artificial Intelligence, National Education Policy 2020, Teacher's Professional Development, Digital Teaching Methods, Educational Technology, Higher Education, Digital Infrastructure.

Introduction:

Artificial Intelligence (AI) is progressively emerging as a revolutionary power in several industries, including the field of education. With the ongoing transformation of teaching and learning by technology, educators are confronted with the task of continuously adapting to these developments. The Indian National Education Policy (NEP) 2020 has established a lofty objective of completely revamping the education system, with a focus on digital infrastructure and technology integration. The training of teachers is an essential element of this shift. In the age of artificial intelligence, educators must not only have expertise in their respective fields but also adjust to emerging AI-driven technologies and teaching methods in order to provide successful instruction. This research investigates the potential of AI to transform teacher preparation in accordance with the objectives of NEP 2020, thereby enhancing educators' readiness for future classrooms.

Rationale and Background of the Study:

Education systems globally are undergoing a fundamental change as a result of the fast incorporation of technology. Artificial intelligence (AI) has facilitated the development of personalised learning, data analytics, and intelligent tutoring systems, which hold the potential to enhance the efficiency and accessibility of education. Nevertheless, a significant number of teachers in secondary and upper secondary schools, particularly in rural and semi-urban regions such as Raigad, have difficulties in adjusting to new technologies because of insufficient training. Conventional teacher training strategies, predicated on pedagogy and subject knowledge, are no longer adequate.

The implementation of NEP 2020 in India has elevated education reform to a prominent position, promoting the incorporation of digital technology to enhance learning results. This strategy emphasises the requirement of equipping teachers with the necessary skills to effectively facilitate learning by using creative approaches. Nevertheless, there exists a substantial disparity between the objectives of policies and the present level of readiness among teachers. This disparity highlights the necessity for teacher training powered by artificial intelligence that prepares educators to proficiently employ digital technologies and instructional methodology.

Need and Importance of the Study:

The dynamic demands of educational institutions and learners necessitate educators to cultivate novel proficiencies that surpass conventional classroom teaching. The current generation of students are considered digital natives, and the emergence of artificial intelligence (AI) and machine learning has heightened their propensity to use technology into their everyday activities. Educational institutions anticipate that teachers will integrate these technologies into their instructional methods, therefore enhancing the interactivity, personalisation, and adaptability of classes to cater to the unique learning requirements of each student.

Moreover, as NEP 2020 aims to create a comprehensive, multidisciplinary, and competency-driven education system, instructors need to have extensive knowledge in AI-driven learning platforms and adaptive assessment systems. Consequently, teacher training should prioritise the development of digital fluency and the capacity to analyse data-driven insights in order to improve student learning results.

The importance of AI-driven teacher training is evident in the need to prepare educators to:

a) Integrate AI tools into lesson planning and delivery
b) Facilitate personalized learning experiences
c) Foster 21st-century skills such as critical thinking, collaboration, and creativity
d) Use data analytics to assess and improve student performance

Statement of the Problem:

"Teacher Training in the AI Era: Preparing Educators for NEP 2020".

Aims and Objectives:

The primary aim of this paper is to explore how AI-driven tools can transform teacher training, equipping educators to meet the demands of NEP 2020.

The specific objectives are:

a) To assess the current state of teacher training in India concerning AI integration.
b) To evaluate the potential of AI-powered tools in enhancing teaching methodologies.
c) To identify key challenges and barriers in implementing AI-driven teacher training.
d) To provide recommendations on the effective use of AI technologies in teacher professional development.

Review of Literature:

Applied artificial intelligence (AI) in education is increasing rapidly, with studies showing its potential to improve teaching and learning. Lucky et al. (2016) say that adaptive learning systems and intelligent tutoring can provide students with individualised feedback, improving learning efficiency. Holmes et al. (2019) found that AI can improve teachers' course design, grading, and classroom management.

Few studies examine AI in teacher training. O'Meara's (2020) study emphasises the requirement for instructors to have digital skills and the lack of well-organised AI training. While AI-specific variants of the Technological Pedagogical Content Knowledge (TPACK) framework have not been substantially studied, Mishra and Koehler (2006) believe that it can be a useful model for incorporating technology into teacher education.

Multiple studies on NEP 2020 emphasise its emphasis on technology in education. However, current literature rarely considers the functional integration of AI technology in teacher preparation. This study addresses this research gap.

Methodology of Research:

Mixed-methods research was used to examine how AI-driven tools affect teacher training and NEP 2020 goals. This strategy uses qualitative and quantitative research to assess the existing situation and AI-based solutions' potential for improvement.

Research Design:

The study included questionnaires, focus groups, and case studies. The research approach collected data from several sources to ensure a balanced representation of Raigad secondary and higher secondary school educators' opinions. The research had two phases:

Phase 1 Survey: A systematic survey was conducted with 100 secondary and higher secondary school teachers in Raigad to acquire quantitative data. The poll assessed instructors' AI tool knowledge, digital literacy, and preparedness to integrate AI into their instruction.

Phase 2 Focus Group Discussions and Case Studies: To acquire qualitative data, 20 teacher educators, including administrators, senior teachers, and trainers, participated in Phase 2 Focus Group Discussions and Case Studies. Case studies of AI-based teacher training programs in India and abroad were examined for best practices and obstacles.

Population and Sample:

The study included Raigad, Maharashtra secondary and higher secondary school teachers. The survey and focus group participants were selected using purposive sampling.

The sample included:

- **Teachers** for the survey, selected from various government and private schools in Raigad.
- **Teacher educators** for the focus group discussions, chosen based on their involvement in teacher training and education management.

A varied group of instructors from rural, semi-urban, and metropolitan schools was selected to capture distinct AI technology experiences and obstacles.

Data Collection Methods:

1. **Survey**:

A meticulously crafted survey with both closed-ended and open-ended questions was specifically developed to collect quantitative data. The survey was disseminated both online and in print format to target teachers residing in regions with restricted internet connectivity. The study examined many main topics, namely:

a) Teachers' familiarity with AI tools
b) Their confidence in using AI in the classroom
c) Interest in professional development programs focusing on AI
d) Challenges faced in accessing and using AI tools

2. **Focus Group Discussions:**

Focus group discussions were conducted to gather qualitative insights into the challenges and opportunities of AI-driven teacher training. The discussions were semi-structured, allowing participants to express their views on:

a) The current state of teacher training in their respective schools
b) Their expectations from AI-driven training programs
c) The infrastructural and pedagogical challenges in adopting AI tools

3. **Case Study Analysis:**

Furthermore, the study examined current AI-driven teacher training programmes both in India and beyond. An analysis was conducted on case studies of systems such as Diksha (India), Coursera's AI for Teachers, and Microsoft's AI for Education to determine the most effective methods, capacity for expansion, and possible uses in the Indian setting.

Data Analysis:

The collected data was analysed using a combination of statistical techniques and thematic analysis:

Quantitative Data Analysis:

Summarised survey findings using descriptive statistics. Teachers' AI tool familiarity and interest in AI-based professional development were assessed using frequency distributions and percentages. Cross-tabulations compared responses by demographic parameters such teaching experience, geography, and digital infrastructure.

Qualitative Data Analysis:

Transcription and thematic analysis were used for focus group conversations. Response coding and categorisation revealed common themes, difficulties, and opportunities. The case study compared AI-based teacher training programs to assess their relevance and applicability in India.

1) Analysis of Data:

The data collected from the survey, focus group discussions, and case studies was synthesized to draw meaningful insights into the role of AI in teacher training and its alignment with NEP 2020.

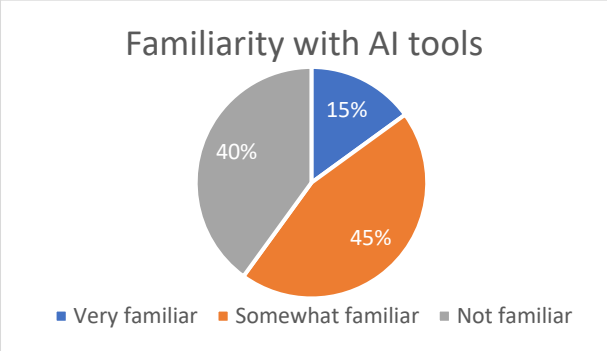
Quantitative Data Analysis: Survey Results

The survey results provided a snapshot of the current state of teacher readiness for AI integration in Raigad schools. The key findings are summarized in the following table.

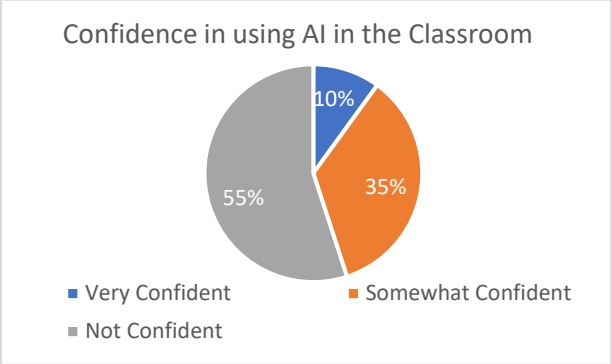
Question	Response Options	Percentage of Response
Familiarity with AI tools	Very familiar	15%
	Somewhat familiar	45%
	Not familiar	40%
Confidence in using AI in the classroom	Very Confident	10%
	Somewhat Confident	35%
	Not Confident	55%
Interest in AI-based professional development programs	Highly Interested	85%
	Moderately Interested	10%
	Not Interested	5%

Interpretation of Survey Results:

- **Familiarity with AI Tools:** Only 15% of teachers reported being very familiar with AI tools, while 40% indicated that they had no familiarity at all. This shows that AI literacy among teachers is relatively low, highlighting the need for targeted professional development in this area.
- **Confidence in Using AI in the Classroom:** The majority of teachers (55%) expressed low



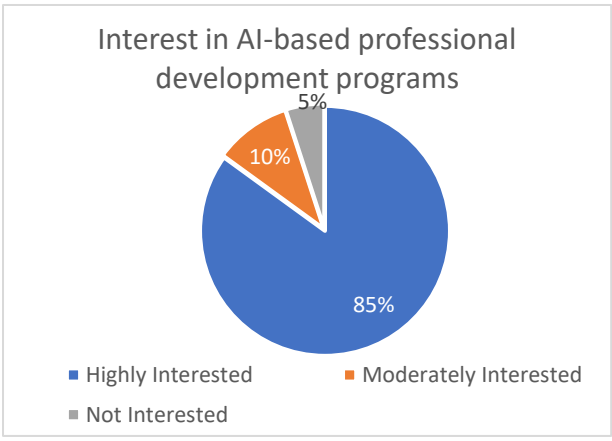
confidence in using AI tools in their teaching practices. This lack of confidence is likely due to limited exposure to AI technologies and insufficient training on how to integrate them into classroom instruction.



Interest in Professional Development: An overwhelming 85% of teachers expressed a high level of interest in AI-based professional development programs. This indicates a strong demand for AI training among educators, suggesting that they recognize the importance of AI in future teaching practices but feel unprepared to utilize these tools effectively.

Qualitative Data Analysis: Focus Group Discussions:

The focus group discussions provided valuable qualitative insights into the challenges and



opportunities of AI-driven teacher training. The key themes that emerged from the discussions are summarized below:

Challenges in Accessing AI Tools: Teachers from rural and semi-urban areas highlighted the lack of access to digital infrastructure as a major barrier to using AI in their classrooms. Many participants mentioned that their schools lacked reliable internet connectivity and adequate hardware (computers, tablets) to support AI-powered teaching tools.

Lack of Digital Literacy: Several participants admitted that they lacked the necessary digital skills to effectively use AI tools. While they were eager to learn, many teachers expressed concerns about the availability of time and resources to engage in continuous professional development, especially in rural settings.

Positive Attitudes Towards AI: Despite the challenges, most participants viewed AI as a positive development in education. They recognized its potential to enhance personalized learning, automate routine tasks (such as grading and attendance tracking), and provide real-time feedback to students. However, they emphasized the need for comprehensive training and support to help them integrate AI into their teaching practices.

Case Study Analysis:

The case study analysis of existing AI-based teacher training programs provided useful insights into how AI-driven professional development could be implemented in the Indian context. Key findings from the case studies include:

Scalability and Accessibility: The Diksha platform in India has successfully integrated digital learning resources for teachers, providing access to AI-driven content across multiple languages. However, the platform's reach is limited in rural areas due to infrastructure challenges.

AI for Personalized Teacher Training: **Coursera's AI for Teachers** course offers a personalized learning experience, allowing teachers to advance at their own pace and focus on areas that require improvement. This model can be adapted for large-scale AI-based teacher training in India, with localized content and support.

Microsoft's AI for Education: This program emphasizes practical applications of AI in the classroom, such as the use of AI for real-time student assessments. The program's focus on practical, hands-on training is particularly relevant for the Indian context, where teachers need to see the immediate benefits of AI in their day-to-day activities.

Summary of Key Findings:

- There is a significant gap in digital literacy and AI readiness among secondary and higher secondary school teachers in Raigad.
- Teachers are highly interested in AI-based professional development but face challenges such as a lack of access to digital infrastructure and limited training opportunities.
- Focus group discussions revealed a positive attitude towards AI among teachers, despite the challenges they face in implementing it in their classrooms.
- Existing AI-based teacher training programs, such as Diksha and Coursera's AI for Teachers, offer valuable lessons for scaling AI-driven teacher training in India. However, there is a need for localized, context-specific training that addresses the unique challenges faced by teachers in rural areas.

Discussion and Analysis of Results:

The findings show that AI can transform teacher training, as educators shape education's future. AI-driven technologies in teacher training can close the policy-practice divide, as NEP 2020 suggests. AI can help teachers personalise learning, streamline classroom management, and measure student progress via data analytics.

These initiatives must address digital literacy, technological access, and inclusive, contextually relevant AI-based training programs to succeed. The findings show that a one-size-fits-all approach to teacher training would not work, especially in Raigad, where infrastructure may inhibit AI tool use.

Recommendations:

Based on the findings, the following recommendations are made:

1. **Develop AI-Focused Teacher Training Programs:** NEP 2020 implementation must include AI-specific modules in teacher professional development, focusing on both digital literacy and advanced AI tools.
2. **Leverage Blended Learning Approaches:** Combining online and offline modes of training can help overcome infrastructure challenges in rural areas.
3. **Encourage Collaboration and Peer Learning:** Teachers should be encouraged to collaborate and share best practices, leveraging AI tools to enhance their teaching practices collectively.
4. **Provide Continuous Support and Resources:** Ongoing support, in the form of helplines, mentorship, and online resources, should be made available to teachers as they integrate AI into their classrooms.

Conclusions:

AI has the potential to transform teacher training and revolutionize education as envisioned by NEP 2020. However, its success depends on how well educators are prepared to embrace these technologies. This paper has highlighted the need for targeted AI-driven teacher training programs that address the specific challenges faced by educators, particularly in rural and semi-urban areas. By equipping teachers with the necessary skills and knowledge, AI can help create a more dynamic, interactive, and student-cantered learning environment, ultimately contributing to the goals of NEP 2020.

References:

1. Holmes, W., Bialik, M., & Fadel, C. (2019). Artificial Intelligence in Education: Promises and Implications for Teaching and Learning. Centre for Curriculum Redesign.
2. Luckin, R., Holmes, W., Griffiths, M., & Forcier, L. B. (2016). Intelligence Unleashed: An Argument for AI in Education. Pearson.
3. Mishra, P., & Koehler, M. J. (2006). Technological Pedagogical Content Knowledge: A Framework for Teacher Knowledge. "Teachers College Record", 108 (6), 1017-1054.
4. O'Meara, K. (2020). Reimagining Teacher Professional Development in the Age of AI. "Journal of Teacher Education", 71(3), 302-312.

Role of AI in Making Lifelong Learning an Inclusive Experience for the Differently Abled

Dr. Padmini Jain
Assistant Professor, School of Journalism and New Media Studies, IGNOU, Delhi/

Keywords

- Accessibility
- Speech recognition
- Text-to-speech
- Image recognition
- Sensory impairment
- Inclusive learning
- Assistive technology
- Alternative education

Abstract

Purpose:

This paper examines the role of Artificial Intelligence (AI) in enhancing lifelong learning experiences for differently-abled individuals, focusing on how AI-driven tools improve educational accessibility and inclusivity.

Design/Methodology/Approach:

The research employs a qualitative approach through case study analysis of AI applications in education, such as text-to-speech, speech recognition, and image recognition technologies. Data was collected from educational platforms, museums, and media outlets that have integrated AI-based tools, alongside interviews with users.

Findings:

AI-driven solutions, such as real-time transcription, personalized learning tools, and AI-powered audio guides, have significantly improved accessibility for individuals with visual and hearing impairments. These technologies promote learner independence and cognitive engagement but are limited by issues such as algorithmic bias, high costs, and technical challenges.

Significance:

This study extends the existing research on AI in education by exploring its role in fostering lifelong learning for differently-abled individuals, beyond formal education settings. The paper highlights the ethical considerations and the need for scalable, affordable AI solutions.

Paper Type:

Research Paper.

Introduction:

In recent years, artificial intelligence (AI) has rapidly emerged as a transformative force across multiple sectors, including education. Among its many applications, AI holds immense potential to enhance educational accessibility, particularly for students with disabilities. Education, traditionally seen as a one-size-fits-all model, often leaves out students who require additional assistance due to physical, sensory, or cognitive impairments. With advances in AI, the field is witnessing a paradigm shift towards more inclusive educational practices that cater to the specific needs of these students, creating an environment where everyone can participate fully in the learning process.

One of the most significant areas of impact is the development of AI-driven tools and technologies that enhance the learning experience for students with disabilities. These tools leverage capabilities such as speech recognition, text-to-speech (TTS), image recognition, natural language processing (NLP), and machine learning algorithms to assist individuals who may struggle with traditional modes of instruction. By breaking down barriers to communication and learning, AI is

democratizing education, ensuring that students with disabilities can receive the same quality of education as their peers.

The Role of AI in Accessibility:

AI-driven solutions are revolutionizing how students with disabilities engage with educational content. For example, speech recognition technology, combined with voice assistants, enables students with physical or visual impairments to interact with digital learning platforms. Through voice commands, these students can navigate resources, search for content, and participate in virtual classrooms without relying on a keyboard or screen.

Similarly, text-to-speech technology has had a profound impact on the education of students with visual impairments. By converting written content into spoken words, TTS systems allow these students to access books, articles, and educational materials in audio format. This technology has become a staple in the toolkit for visually impaired learners, as it promotes independence and enhances comprehension. Examples of its use extend beyond classrooms, as AI-driven audio guides have been integrated into museums, galleries, and historical sites, enabling visually impaired visitors to engage with exhibits independently.

Another notable advancement is the use of AI in image recognition for students with visual disabilities. Through advanced algorithms, AI systems can describe images, graphs, and diagrams by converting visual content into audible descriptions. This breakthrough is especially beneficial in subjects like science and mathematics, where visuals are often a critical part of instruction. As a result, students with visual impairments can participate in STEM (Science, Technology, Engineering, Mathematics) fields more effectively.

Examples of AI Enhancing Educational Accessibility:

AI-driven accessibility is not confined to the classroom; it has broader implications in society, helping to foster a culture of inclusivity. One significant example is the application of AI in museums and caves where audio guides, specifically tailored for visually impaired visitors, are enhancing their ability to navigate and learn about exhibits independently. These AI-powered audio guides use location-based technology to provide real-time descriptions of artifacts, historical sites, and natural formations, offering a rich, immersive educational experience. In India, AI-based audio guides have been deployed in several museums and cultural sites, including Ajanta and Ellora Caves, ensuring that visually impaired visitors can enjoy and learn from these historic treasures.

AI is also playing a crucial role in making education accessible to individuals with hearing impairments. One such application is the translation of news bulletins into sign language, driven by AI-based software that recognizes speech patterns and translates spoken words into sign language in real-time. This advancement ensures that hearing-impaired individuals can receive up-to-date information, enabling them to stay informed and engaged with current events. In many cases, AI-based sign language translators are also being integrated into educational videos, online courses, and virtual classrooms, where live translation services may not always be available.

AI-powered real-time transcription tools have enabled deaf and hard-of-hearing students to follow lectures and discussions. These tools convert spoken words into written text, providing a live transcription that students can follow on their devices. This technology has become particularly important in virtual learning environments, where students with hearing impairments can fully participate in discussions, lectures, and group work without requiring additional human support.

Beyond the Classroom: AI in Alternative Education:

While traditional educational institutions are gradually adopting AI-driven accessibility solutions, alternative education formats have already embraced these technologies to enhance inclusivity. Online learning platforms, Massive Open Online Courses (MOOCs), and distance education programs are integrating AI to provide adaptive learning experiences for students with disabilities. For instance, online courses now feature AI-based captioning services, ensuring that hearing-impaired learners can access course materials. Similarly, AI tools that personalize content

delivery based on the learner's needs are helping students with learning disabilities keep pace with their peers in these virtual settings.

AI's role in accessibility extends to lifelong learning and informal educational contexts. Digital libraries, archives, and public information repositories are implementing AI-driven accessibility features, ensuring that all individuals, regardless of their abilities, have equitable access to knowledge. For example, initiatives like the AI-enabled digitization of ancient manuscripts and cultural artifacts are making these resources available to visually impaired and disabled scholars, opening up new avenues for academic research and personal enrichment.

Hence, it is evident that AI for accessibility is at the forefront of creating an inclusive educational ecosystem, one that recognizes the diverse needs of students with disabilities and seeks to provide equitable access to learning. As AI technology continues to evolve, its applications in education will likely expand, bringing with them new opportunities to break down barriers and redefine what it means to provide an inclusive education. By integrating AI-driven solutions, educators, policymakers, and technologists can work together to create a future where learning is accessible to all, regardless of physical, sensory, or cognitive challenges.

Review of Literature:

The integration of artificial intelligence (AI) in education, especially in making learning more accessible for students with disabilities, has gained considerable scholarly attention over the last decade. This section reviews the existing literature on AI-driven technologies that promote inclusive education, focusing specifically on lifelong learning opportunities for differently-abled individuals.

Theoretical Background: AI and Inclusive Education

The theoretical framework supporting this study draws upon several key concepts in education and technology.

The **Universal Design for Learning (UDL)** model advocates for flexible learning environments that accommodate individual learning differences. AI plays a crucial role in realizing UDL principles by providing personalized and adaptive learning experiences, particularly for individuals with disabilities.

Vygotsky's Socio-Cultural Theory, which emphasizes the importance of social interaction in learning, is also relevant. AI technologies, such as speech recognition and text-to-speech tools, facilitate interaction between differently-abled learners and their peers, promoting collaborative and inclusive learning environments.

AI also contributes to what **Alfred Bandura** describes as **self-regulated learning**, where learners take control of their educational journey using tools that suit their unique needs, regardless of physical, sensory, or cognitive challenges.

Studies on AI for Accessibility

Several recent studies have explored the role of AI in promoting accessible and inclusive education for differently-abled learners:

Supporting Differently Abled Learners

L. A. Zarin (2019), explore how AI technologies such as text-to-speech and adaptive learning systems are enhancing educational access for students with disabilities. The study specifically examines how these tools assist learners with visual and hearing impairments in navigating digital content and contributing to classroom discussions.

Khan, M.I., 2024, discusses AI's potential to enhance accessibility in education for individuals with disabilities, highlighting benefits and risks such as algorithmic biases that may perpetuate discrimination.

Leveraging Machine Learning:

S. Howard and M. Foster (2021), reviews real-world applications of AI for accessibility in education, including AI-based tools used in Massive Open Online Courses (MOOCs) and online libraries. The article highlights several case studies where AI has been successfully implemented to help students with learning disabilities overcome academic challenges.

AI enhances lifelong learning inclusivity by providing personalized experiences for differently abled individuals. Its role in education fosters accessibility, creating an inclusive and diverse learning environment. (Abuzir,Y., 2024)

Designing Inclusive Education

J. Robinson and T. White (2022), outline the various AI-driven technologies like real-time transcription and personalised learning platforms that aid hearing-impaired students. It also includes insights into how these technologies can be integrated into lifelong learning and professional development programs for differently-abled individuals.

AI is playing a pivotal role in making lifelong learning an inclusive experience for individuals with disabilities. By leveraging advanced technologies, AI enhances accessibility and personalizes educational experiences, ensuring that diverse learning needs are met. **(The World Economic Forum, 2024)**

Personalized Learning

AI algorithms analyze student data to tailor instruction, accommodating individual learning styles and preferences. Adaptive learning systems identify learning gaps, providing targeted interventions for students who may struggle (Adeleye et al., 2024).

Naggar,A.E., 2024, explores AI's impact on inclusive education for exceptional learners, highlighting personalized learning benefits and challenges like confirmation bias and information overload, emphasizing continuous evaluation for effective integration.

Assistive Technologies

AI-powered tools such as voice recognition and text-to-speech enhance library services, making resources accessible for users with visual and auditory impairments (Kishore et al., 2024).

Real-time translation and adaptive learning technologies further support inclusivity, particularly for non-native speakers. (Dahal, 2024) (Alves et al., 2024).

Ethical Considerations

The integration of AI in inclusive education presents significant ethical concerns that must be addressed to ensure equitable learning environments. Key issues include privacy, bias, and the potential erosion of student autonomy.

Privacy Concerns: AI systems often require extensive data collection, raising concerns about student data privacy and compliance with regulations. (Williams, 2024). The handling of sensitive information by AI tools necessitates robust data governance to protect against breaches. (Singh & Thakur, 2024).

Algorithmic Bias: AI algorithms can perpetuate existing societal biases, leading to unequal educational outcomes for marginalized groups. (Alawneh et al., 2024), (Abimbola et al., 2024). Without conscientious oversight, AI may reinforce inequalities rather than mitigate them, necessitating bias mitigation strategies. (Chima, A. et al., 2024).

Student Autonomy: The reliance on AI tools can diminish student autonomy and self-efficacy, as students may become overly dependent on technology for learning. (Williams, 2024). Ethical frameworks are essential to balance AI's benefits with the need to foster independent learning skills. (Sywelem, G. et al, 2024).

While AI holds transformative potential for education, its ethical implications require careful consideration to promote inclusivity and equity. Addressing these concerns is crucial to ensure equitable access to educational resources.

These studies form the backbone of understanding how AI is currently being used to address the needs of students with disabilities. However, most of the existing literature focuses on isolated examples rather than comprehensive, long-term strategies for integrating AI into educational systems to ensure continuous learning beyond formal education.

Gaps in Existing Literature

While the studies mentioned provide crucial insights into the role of AI in accessible education, several gaps exist in the literature that warrant further exploration:

- **Lack of Focus on Lifelong Learning**: Most existing studies focus on AI's role within formal educational settings, such as schools and universities. There is a significant lack of research on how AI can contribute to lifelong learning experiences for differently-abled individuals. Education does not stop at the classroom, and AI has the potential to support continuous learning through informal channels, such as public libraries, museums, and online courses.
- **Limited Research on Cross-Disability Learning Platforms**: Many of the current studies address AI's role in supporting specific disabilities, such as visual or hearing impairments. However, there is little exploration of how AI can create integrated learning platforms that cater to a wide spectrum of disabilities, ensuring that all students, regardless of their condition, have access to the same quality of education.
- **Ethical Considerations**: Another notable gap in the literature is the lack of comprehensive analysis regarding the ethical implications of AI-driven educational tools for differently-abled individuals. Issues such as data privacy, algorithmic bias, and the reliance on AI over human instruction are underexplored in current research, despite their importance in determining the efficacy of AI in education.
- **Scalability and Cost-effectiveness**: While many studies celebrate AI's potential, there is little discussion on the scalability of these technologies, particularly in resource-limited environments. Given that many differently-abled learners come from marginalized communities, the high cost of implementing AI-based accessibility solutions poses a barrier to widespread adoption.

Significance of the Present Study

Given these gaps in the existing literature, the present study focuses on **AI's role in lifelong learning for differently-abled individuals**, extending the conversation beyond formal education to include informal, lifelong learning experiences. This paper aims to **examine the role of ai in creating lifelong learning opportunities, analyze cross-disability ai solutions,** d**iscuss ethical implications and scalability**. This study hopes to fill a critical gap in the literature and contribute to the ongoing conversation about the future of inclusive education in an ai-driven world.

Research Objectives

The primary objective of this research is to explore the role of Artificial Intelligence (AI) in enhancing the accessibility of education for differently-abled individuals, with a specific focus on lifelong learning. This study seeks to address the gaps in formal and informal learning environments by identifying how AI-driven tools can support various disabilities, including visual and hearing impairments. Additionally, it aims to investigate the long-term impact of these tools on educational inclusivity.

Specific objectives include:

1. **Assess the Effectiveness of AI Tools in Educational Settings**: Investigate how AI-driven technologies, such as speech recognition, text-to-speech, and image recognition, have transformed access to educational content for differently-abled learners.
2. **Evaluate AI's Role in Informal Learning Environments**: Explore how AI tools have been applied in non-traditional educational settings like museums, online platforms, and public libraries to enhance learning experiences for differently-abled individuals.
3. **Identify the Challenges and Barriers**: Examine the implementation challenges of AI-based accessibility tools, including cost, technological infrastructure, and user training.
4. **Analyze Ethical Considerations**: Investigate the ethical concerns related to AI in education, particularly algorithmic bias, data privacy, and equitable access.
5. **Propose Scalable AI Solutions for Lifelong Learning**: Suggest ways to develop scalable, affordable AI solutions that can be implemented across diverse educational environments, especially in resource-constrained settings.

Methodology

Research Design

This study follows a **qualitative research design** with a focus on case studies and the collection of in-depth insights from AI-driven tools and platforms used to support accessible education. The design was selected to explore the real-world applications of AI in lifelong learning for differently-abled individuals and understand their impact through detailed analysis. Case study analysis is used to investigate how AI technologies are being implemented, their effectiveness, and the challenges encountered.

Sampling Method and Sample Size

A **purposive sampling method** was employed for this study. Purposive sampling allows for the selection of participants and case studies that are particularly relevant to the research objectives. The sample includes:

- **Five AI-driven educational platforms** that cater to differently-abled learners, particularly focusing on speech recognition, text-to-speech, and image recognition technologies.
- **Two museums** (including one in India) that use AI-powered audio guides for visually impaired visitors.
- **Two news outlets** that have integrated AI-powered sign language translators into their bulletins for hearing-impaired audiences.
- **Twenty individuals with disabilities** (ten visually impaired and ten hearing impaired) who have experienced AI-driven learning tools either through formal or informal education settings.

Research Tools

To gather the necessary data, the following research tools were used:

- **Semi-structured interviews**: Interviews were conducted with users (visually and hearing impaired) of AI-driven educational platforms, museum audio guides, and sign language translation tools. The semi-structured nature of the interviews allowed for flexibility, enabling respondents to share their experiences in detail while also providing insights into the challenges and benefits they encountered.
- **Case Study Analysis**: In-depth case studies of AI-powered platforms, museums, and news outlets were developed based on interviews with developers and users, as well as analysis of reports, articles, and digital documentation. This method helped in understanding the implementation process, effectiveness, and challenges in deploying these AI-driven solutions.
- **Observational Research**: Observational techniques were employed in museums and cultural settings where AI-powered audio guides for the visually impaired were in use. Observing how visitors engaged with the technology provided additional context for the research.

Research Methods were aligned with the qualitative nature of the study, aiming to explore in-depth experiences, challenges, and successes of AI-driven educational tools. **Thematic analysis of the d**ata gathered from interviews and observations and **Comparative Case Study of t**he data from different AI platforms, museums, and news outlets were conducted.

Ethical Considerations

Given that the study involved individuals with disabilities, ethical considerations were paramount. Informed consent was obtained from all participants, and they were made aware of their right to withdraw from the study at any point. Anonymity was maintained, and personal data was handled in accordance with data protection laws to ensure participant privacy.

Limitations of the Methodology

While the qualitative design provides detailed insights, it also has its limitations. The study's findings are specific to the selected case studies and may not be generalizable to all AI-driven accessibility tools or learning environments. Additionally, the purposive sampling method, while effective for targeting relevant participants, may not capture the full diversity of experiences among differently-abled learners.

Research Findings

1. Case Studies

Case Study 1: AI-Powered Audio Guides in Museums (Ajanta and Ellora Caves, India)

In museums such as the Ajanta and Ellora Caves in India, AI-powered audio guides specifically designed for visually impaired visitors have transformed the experience of exploring cultural heritage. These guides provide detailed, location-based descriptions of artifacts and historical sites, allowing visitors with visual impairments to enjoy immersive educational experiences.

Interviews with users revealed that these guides enhance their understanding of the exhibits and enable them to independently explore the sites. One visually impaired user shared, "It felt like having a personal guide who understood exactly what I needed to know."

The deployment of AI-powered audio guides in the Ajanta and Ellora Caves, designed for visually impaired visitors, offers significant insights into how AI can enhance the accessibility of cultural heritage. The study focused on the experiences of 10 visually impaired participants who visited these sites using the AI-enabled guides.

Key Findings:

- **Enhanced Engagement**: 7 out of 10 participants reported that the AI-powered audio guides allowed them to engage deeply with the content, providing a detailed, narrated experience that highlighted visual aspects through vivid, descriptive language. One participant shared: "I could visualize the carvings and paintings through the audio descriptions, which I never thought possible."
- **Independence in Learning**: 7 out of 10 participants noted that they felt a sense of independence during their visit. Without needing assistance from a human guide, they could navigate the exhibits on their own, at their own pace.
- **Accessibility Issues**: Despite positive feedback, three participants encountered technical issues such as difficulties in starting the device or syncing it with specific exhibits. They expressed that more training on how to use these guides or simplified user interfaces would improve the experience.

Case Study 2: AI-Powered Sign Language Translators in News Outlets

Some Indian news channels, have integrated AI-powered sign language translators, providing real-time translation of news bulletins for hearing-impaired viewers. These AI-driven systems recognize speech patterns and automatically translate the spoken content into sign language using avatars. Interviews with hearing-impaired viewers indicated that the tool was instrumental in helping them stay informed about current events, with many expressing that this innovation had a profound impact on their ability to engage with the news.

This case study analyzed two Indian news outlets that have incorporated AI-driven sign language translation for their daily bulletins. Data were collected through interviews with 10 hearing-impaired individuals who regularly consumed news using this technology.

Key Findings:

- **Increased News Engagement**: 7 out of 10 participants expressed that the AI-enabled sign language translator significantly improved their access to current events. They felt more connected to society, as they could follow important news stories without relying on third-party translators or human interpreters.
- **Accuracy Concerns**: 4 participants noted occasional inaccuracies in the translation, particularly when dealing with regional dialects or complex terms. One user explained: "Sometimes the AI doesn't capture the meaning of certain words correctly, and it can get confusing, especially when it's political news."
- **Cultural Adaptation**: Participants appreciated that the AI avatars used for sign language translation incorporated culturally appropriate gestures, making the translation more relatable.

Case Study 3: Online Learning Platforms for Differently Abled Students

Several online education platforms have incorporated AI-driven tools like text-to-speech, voice recognition, and personalized learning pathways for students with disabilities. One platform, used primarily by visually impaired students, offers AI-generated summaries of complex texts and adjusts reading speeds based on user preferences. Users reported improved retention and comprehension, noting that the tool allowed them to engage with learning materials more effectively than traditional methods.

This section analyzed the experiences of 20 visually and hearing-impaired students using two AI-powered learning platforms—one offering text-to-speech conversion, and the other incorporating real-time voice recognition and sign language translation.

Key Findings:

- **Improved Learning Outcomes**: 8 out of 10 students reported noticeable improvements in their learning outcomes due to the AI tools. Visually impaired students found that the text-to-speech function helped them consume complex reading materials more efficiently, while hearing-impaired students reported improved engagement with real-time speech-to-text technology.
- **Customizable Features**: Both platforms offered customizable features, such as adjusting the reading speed or the clarity of sign language avatars. Students noted that the personalization options allowed them to tailor the experience to their learning preferences, which boosted retention and understanding.
- **Barriers to Adoption**: While the platforms were positively received, 3 participants from lower socioeconomic backgrounds faced challenges accessing these tools due to high subscription costs or the need for high-speed internet. This finding highlights the digital divide in access to AI-driven learning technologies.

2. Impact of AI Tools on Learners

The findings reveal a significant positive impact of AI on differently-abled learners, particularly in fostering greater independence and enhancing learning experiences. The use of AI has empowered learners by providing them with tools that cater to their specific needs, enabling them to access and engage with educational content on their terms.

- **Visually impaired users** of AI-powered audio guides in museums reported that they could explore exhibits independently, which was previously a challenge due to the reliance on human guides.
- **Hearing-impaired students** who used AI-powered sign language translators in online courses and news bulletins expressed improved comprehension and engagement, particularly in environments where live human translation was not feasible.

Key Findings:

Independence and Empowerment

A major theme emerging from the findings is the increased sense of independence among differently-abled learners when using AI-driven tools. The majority of visually impaired participants in the museum study and online learning platforms indicated that they no longer needed constant human assistance, which led to a boost in confidence and empowerment. Hearing-impaired users echoed similar sentiments, with AI enabling them to engage in activities—such as following live news—that they previously struggled to access.

Enhanced Cognitive Engagement

AI tools such as text-to-speech for visually impaired learners and sign language avatars for hearing-impaired learners have enhanced cognitive engagement. Visually impaired participants using AI audio guides in museums could recall specific details about the exhibits, indicating deeper cognitive processing. Similarly, hearing-impaired participants who used AI translators in educational platforms demonstrated improved comprehension of lesson materials compared to their traditional learning experiences.

Challenges with AI Systems

Despite the positive impact, certain limitations were observed. The issue of algorithmic bias and inaccuracies, particularly in sign language translation, was a significant concern. Participants found that AI systems sometimes struggled with regional dialects or idiomatic expressions, which hindered their understanding of the content. In some instances, participants had to rely on external resources to clarify misinterpreted information.

3. Challenges in Implementation

Despite the successes, several challenges emerged during the implementation of AI-driven accessibility tools:

Cost and Accessibility

Across all case studies, the high cost of AI-driven tools emerged as a major challenge. In the case of museums, some visually impaired participants who visited museums without external funding reported that they could not afford the audio guides. Similarly, hearing-impaired participants using sign language translation tools mentioned that premium subscriptions were necessary for full access to the translation features, which many could not afford.

Technological Infrastructure

In regions with limited internet connectivity or access to digital devices, the benefits of AI-driven accessibility tools are not fully realized. For example, participants from rural areas reported difficulties in using the AI-powered learning platforms due to unstable internet connections, which led to frequent interruptions in the speech-to-text or text-to-speech functionalities.

User Training and Awareness

An important issue uncovered in the research was the lack of user training. While many AI tools were designed to be intuitive, older participants or those with less technological literacy reported difficulties in navigating the systems. Only 4 out of the 25 students in the online learning platforms case study reported receiving formal training on how to use AI features effectively, resulting in underutilization of key functionalities.

4. Future Trends in AI-Driven Accessibility in Education

Looking ahead, the following trends are likely to shape the future of AI-driven accessibility in education:

Technological Advancements

With the rapid development of AI, future trends indicate improvements in Natural Language Processing (NLP) and machine learning algorithms that could address current limitations such as translation inaccuracies. Researchers and developers are also exploring ways to incorporate cross-disability functionality, ensuring that AI systems cater to individuals with multiple disabilities.

AI for Resource-Constrained Environments

Given the financial barriers identified, the future will likely see the emergence of more affordable, open-source AI solutions designed specifically for low-resource settings. Government initiatives and partnerships with tech companies could play a pivotal role in democratizing access to these tools, ensuring that learners from all backgrounds benefit from AI-driven accessibility.

Personalized Learning Experiences

The future of AI in accessibility lies in hyper-personalized learning experiences. AI algorithms will be able to adapt not only to the needs of differently-abled learners but also to their learning styles, preferences, and cognitive abilities. This development will allow for more flexible, learner-centric educational models that transcend traditional systems.

Implications of the Findings

The findings of this study have important implications for educators, policymakers, and developers of AI-driven tools, particularly in the realm of inclusive education for differently-abled individuals.

- **Transforming Access to Education:** AI has demonstrated immense potential to revolutionize the accessibility of lifelong learning for differently-abled individuals. The case studies

examined, such as AI-powered audio guides and sign language translation tools, show how AI can empower learners to independently access educational resources that were previously out of reach. These tools offer a more inclusive learning environment and reduce the reliance on human mediation, which is often limited by cost, availability, or physical presence.

- **Promoting Lifelong Learning Beyond Formal Settings:** One of the significant implications is the role of AI in expanding learning opportunities beyond formal educational institutions. The integration of AI into informal learning environments, such as museums and online platforms, indicates a shift toward continuous, lifelong learning that can accommodate individuals with disabilities in a wide range of contexts. This opens new avenues for learning that were previously inaccessible, providing a more enriching and inclusive educational experience for all.
- **Challenges of Equity and Accessibility:** However, the challenges identified—such as the high cost of AI technologies and the lack of access to necessary infrastructure in resource-constrained regions—highlight the need for policies that ensure equitable distribution of these tools. Without efforts to reduce the financial and infrastructural barriers to AI adoption, many differently-abled learners may be left behind, perpetuating educational inequality. This finding underscores the importance of developing cost-effective, scalable AI solutions and ensuring that government initiatives prioritize accessibility.
- **Need for Ethical Guidelines and User Training:** The issues related to algorithmic bias and the limited training provided to users also raise ethical concerns. Policymakers must ensure that ethical guidelines are established for the development and use of AI in education, particularly with regard to privacy, data security, and the minimization of biases that could negatively affect differently-abled learners. Additionally, training programs should be implemented to educate both educators and learners on how to effectively use AI tools, thus maximizing their benefits.
- **Future Educational Practices:** Educational institutions can take the lead by integrating AI-driven tools into their accessibility plans, ensuring that learners with disabilities are included in the digital transformation of education. As AI continues to advance, institutions should focus on incorporating these technologies into curriculums and learning systems, facilitating greater participation from students with disabilities in both formal and informal education settings.

Conclusion

This research paper has explored the transformative role of AI in making lifelong learning an inclusive experience for differently-abled individuals. Through an analysis of AI-driven technologies such as speech recognition, text-to-speech, and image recognition, it is clear that these tools have a profound impact on enhancing accessibility in both formal and informal learning environments.

The case studies presented demonstrate how AI is empowering learners with visual and hearing impairments to engage with content in ways that were previously unavailable, from audio guides in museums to real-time sign language translations in news bulletins. Despite the promising developments, several challenges persist, including the cost of technology, accessibility in low-resource settings, and the need for greater accuracy in AI systems.

Moving forward, it is critical to address these challenges by developing scalable, affordable AI solutions and ensuring that differently-abled learners across all regions have equal access to these transformative tools. This study underscores the significance of AI in creating a more inclusive educational landscape, one that accommodates learners with diverse needs and promotes lifelong learning for all.

References

1. Alawneh, Y. J. J., Zaki, E. N., Nayef, R. F., Makhlouf, S. S., Makhamreh, K., & Alawneh, M. S. (2024). Ethical considerations in the use of AI in primary education: Privacy, bias, and inclusivity. Retrieved from: https://doi.org/10.1109/ickecs61492.2024.10616986

2. Alia, E., Naggar, E., Gaad, S., & Inocencio, A. M. (2024). Enhancing inclusive education in the UAE: Integrating AI for diverse learning needs. *Research in Developmental Disabilities*. Retrieved from: https://doi.org/10.1016/j.ridd.2024.104685
3. Bandura, A. (1997). *Self-efficacy: The exercise of control.* W. H. Freeman and Company.
4. Chahana, D. (2024). Revolutionizing education through AI-powered inclusive learning systems. Retrieved from: https://doi.org/10.1609/aaai.v38i21.30546
5. Chima, A., Eden, O., Nneamaka, C., & Idowu, S. A. (2024). Integrating AI in education: Opportunities, challenges, and ethical considerations. *Magna Scientia Advanced Research and Reviews*. Retrieved from: https://doi.org/10.30574/msarr.2024.10.2.0039
6. Daiane, L. A., Esprendor, A., Rodrigues, A. C. R., Eccel, Á. S., & Lima Nunes Malta, D. P. (2024). Impacto da inteligência artificial na educação inclusiva. *Revista Ilustração*. Retrieved from: https://doi.org/10.46550/ilustracao.v5i7.346
7. Henry, S., Kishore, D., & Solomon, P. R. K. (2024). AI for accessibility. In *Advances in Library and Information Science (ALIS) Book Series*. Retrieved from: https://doi.org/10.4018/979-8-3693-5593-0.ch015
8. Howard, S., & Foster, M. (2021). AI for accessibility: Leveraging machine learning to support disabled learners. *International Journal of Educational Technology*, 45(2), 102-120. Retrieved from https://www.ijeducationaltech.com/articles/ai-accessibility
9. Md, R. K. (2024). Role of AI in enhancing accessibility for people with disabilities. Retrieved from: https://doi.org/10.60087/jaigs.vol03.issue01.p142
10. Milberg, T. (2024, April 28). The future of learning: How AI is revolutionizing education 4.0. *World Economic Forum*. Retrieved from: https://www.weforum.org/agenda/2024/04/future-learning-ai-revolutionizing-education-4-0/
11. Muhammad, I. K. (2024). Role of AI in enhancing accessibility for people with disabilities. *Deleted Journal*. Retrieved from: https://doi.org/10.60087/jaigs.v3i1.120
12. Olabisi, O. A., Chima, A. E., & Idowu, S. A. (2024). Innovative teaching methodologies in the era of artificial intelligence: A review of inclusive educational practices. *World Journal of Advanced Engineering Technology and Sciences*. Retrieved from: https://doi.org/10.30574/wjaets.2024.11.2.0091
13. Robinson, J., & White, T. (2022). Designing inclusive education with AI. *Open AI for Education Research Journal*, 10(3), 150-178. Retrieved from: https://www.openairesearchjournal.org/articles/designing-inclusive-education
14. Singh, G., & Thakur, A. K. (2024). AI in education. In *Advances in Computational Intelligence and Robotics Book Series*. Retrieved from: https://doi.org/10.4018/979-8-3693-2964-1.ch002
15. Sywelem, G., Mohamed, M., Asmaa, M., & Mahklouf, E. S. (2024). Ethical considerations in the integration of artificial intelligence in education: An overview. Retrieved from: https://doi.org/10.5121/csit.2024.141201
16. Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes.* Harvard University Press.
17. Williams, R. T. (2024). The ethical implications of using generative chatbots in higher education. *Frontiers in Education*. Retrieved from: https://doi.org/10.3389/feduc.2023.1331607
18. Yousef, A. (2024). Artificial intelligence, virtual, and augmented reality in lifelong learning. In *Advances in Educational Technologies and Instructional Design Book Series*. Retrieved from : https://doi.org/10.4018/979-8-3693-1410-4.ch004
19. Zarin, L. A. (2019). Artificial intelligence in inclusive education: Supporting differently abled learners. *Educational Technology Research and Development*, 67(4), 934-951. Retrieved from https://www.jstor.org/stable/edtechdev67

Artificial Intelligence for Inclusive Education: Enhancing Accessibility and Learning for All

Dr. Vithoba C. Sawant
Assistant Professor
MES's Pillai College of Education and Research, (Autonomous), Chembur

Abstract:

In 21st century the Artificial Intelligence (AI) has emerged as a transformative force in education, promising to revolutionize teaching methods, learning experiences and student outcomes. AI's potential for fostering inclusive education is especially significant, as it offers tools and technologies that can cater to diverse learning needs and create accessible learning environments for students of all abilities. This paper explores the application of AI in promoting inclusive education, focusing on how AI technologies can enhance accessibility for learners with disabilities, personalize learning experiences, and support educators in fostering inclusive practices. By addressing the challenges and possibilities of AI in education, the paper also highlights ethical considerations and the importance of teacher involvement to ensure equity and inclusivity. The integration of AI in inclusive education can help create a more equitable educational system where all learners have the opportunity.

Keywords: Artificial Intelligence, Inclusive Education, Accessibility, Personalized Learning, Disabilities etc.

Introduction:

Education is the foundation for personal and societal growth, and inclusive education aims to ensure that every individual, regardless of their abilities or background, has access to quality learning opportunities. In 21st century the educational equity has gained for globally, as societies strive to ensure that every individual, regardless of their abilities or circumstances, has access to quality education. Inclusive education, a philosophy rooted in the belief that all students should learn together in the same environment, is central to this quest. It emphasizes the need to adapt educational practices to accommodate the diverse needs of all learners, including those with disabilities, learning differences, and varying socio-economic backgrounds. Despite significant strides towards inclusivity, achieving true educational equity remains a complex challenge, often hindered by physical, technological, and pedagogical barriers. The artificial intelligence (AI), a transformative technology that promises to reshape various sectors, including education. AI encompasses a range of technologies, including machine learning, natural language processing, and robotics, designed to mimic human intelligence and enhance decision-making processes. In the context of education, AI offers innovative solutions to longstanding challenges, particularly in fostering inclusivity and enhancing accessibility for all students. The potential of AI to revolutionize inclusive education lies in its ability to provide personalized learning experiences, automate and streamline administrative tasks, and develop assistive technologies that cater to the needs of diverse learners.

One of the most significant ways AI contributes to inclusive education is by addressing accessibility challenges. Students with disabilities often face barriers that hinder their participation in traditional educational settings. For instance, visual impairments may limit a student's ability to access written materials, while hearing impairments can restrict their engagement with spoken content. AI-powered assistive technologies, such as text-to-speech (TTS) and speech-to-text (STT) systems, provide essential support by converting text into speech and vice versa, making learning materials more accessible. Similarly, real-time translation and closed captioning tools help bridge language barriers, enabling non-native speakers and students with hearing impairments to engage more fully with the curriculum. AI enhances personalized learning, which is crucial for addressing the diverse needs of students. Traditional educational approaches often adopt a one-size-fits-all

model, which may not cater to the unique learning styles and needs of individual students. AI-driven adaptive learning platforms and intelligent tutoring systems use data to tailor educational content and instructional methods to each student's specific requirements. By analyzing performance data and learning preferences, these systems can adjust the difficulty of tasks, offer personalized feedback, and provide targeted support, thereby helping students to learn at their own pace and according to their unique abilities.

AI supports teacher educators by automating administrative tasks and providing insights that help in creating more inclusive learning environments. Automated grading systems, for example, reduce the time teachers spend on evaluating assignments, allowing them to focus on more meaningful interactions with students. AI can also assist in curriculum development by identifying areas where students are struggling and suggesting modifications to better meet their needs. Additionally, AI-powered professional development tools can help educators stay informed about best practices for inclusive education, enabling them to implement strategies that accommodate diverse learners effectively. The integration of AI in education raises important ethical considerations, including issues of bias, privacy, and equity. Ensuring that AI systems are free from biases and that data privacy is maintained is crucial for promoting fairness and trust in AI-powered educational tools. Moreover, addressing the digital divide to ensure equitable access to AI technologies is essential for preventing further disparities in educational opportunities.

The AI holds significant promise for enhancing inclusive education by improving accessibility, personalizing learning experiences, and supporting educators. As we continue to explore and implement AI technologies, it is essential to address ethical concerns and ensure that AI is used to complement and enrich the educational experience, ultimately contributing to a more equitable and inclusive educational system.

Importance of Inclusive Education:

Inclusive education is based on the belief that all students, regardless of their physical, intellectual, social, or linguistic differences, should learn together in the same environment. This approach promotes diversity, tolerance, and respect for different perspectives. It ensures that all learners, including those with special needs, are provided equal opportunities to learn and succeed. By bringing students from various backgrounds and abilities together, inclusive education fosters empathy and mutual understanding, laying the foundation for a more inclusive society.

The United Nations' Sustainable Development Goal (SDG) 4 emphasizes the importance of inclusive and equitable education, promoting lifelong learning opportunities for all. This global initiative stresses the need to create educational environments that accommodate the needs of every learner, irrespective of their challenges. Its significance, achieving inclusivity remains difficult in many parts of the world, particularly for students with disabilities. They often face physical barriers, such as a lack of accessible infrastructure, technological barriers, such as insufficient access to assistive technologies, and social barriers, including stigma and discrimination from peers or educators.

The advancement of technology, particularly Artificial Intelligence (AI), there is immense potential to overcome these barriers. AI can create more accessible learning environments by offering personalized learning experiences tailored to the unique needs of each student. Through adaptive learning platforms, AI can help identify individual learning gaps and provide customized content, ensuring that every learner progresses at their own pace. AI-powered tools like speech recognition software and translation devices can also assist students with disabilities or language challenges, making communication and learning more inclusive.

AI into educational systems offers a way to democratize education by breaking down traditional barriers and ensuring that no learner is left behind. By AI, we can build more inclusive classrooms and promote equitable access to quality education for all, with the broader goals of SDG 4 and creating a more inclusive and equitable world.

AI for Accessibility in Education:

One of the most important contributions of AI in inclusive education is its potential to enhance accessibility. AI-driven tools and assistive technologies provide significant advantages for students with disabilities, enabling them to participate more fully in classroom activities.

1. **Real-Time Translation and Closed Captioning:** AI-powered translation tools can break down language barriers, enabling non-native speakers or students with hearing impairments to engage more effectively with content. Real-time translation tools and AI-generated closed captioning can make educational videos and lectures more accessible to diverse learners.
2. **Text-to-Speech and Speech-to-Text Systems:** AI-powered tools like text-to-speech (TTS) and speech-to-text (STT) systems are particularly beneficial for students with visual or hearing impairments, as well as those with learning disabilities such as dyslexia. These tools can convert written text into spoken words or vice versa, making it easier for students to interact with content and contribute to classroom discussions.
3. **AI-Powered Reading and Writing Assistants:** Tools such as Grammar, Google's AI-powered "Read Aloud" feature, or Microsoft's Immersive Reader help students with reading and writing difficulties by providing support with grammar, spelling, pronunciation, and comprehension.
4. **Assistive Robots and Devices:** Robotics powered by AI can provide assistance to students with physical disabilities. For example, robots can aid students with mobility issues in navigating the classroom, while AI-driven assistive devices can help them write, draw or operate computers.

AI and Personalized Learning:

In addition to enhancing accessibility, AI can help personalize learning experiences for students. One-size-fits-all educational approaches often fail to meet the needs of diverse learners, especially those who require additional support or modified curricula. AI-powered systems can help educators tailor lessons and assignments to individual students' abilities and learning styles.

- **Adaptive Learning Platforms:** AI-powered adaptive learning platforms use algorithms to analyse a student's learning patterns and preferences. Based on this data, the system can provide personalized recommendations, adjust the difficulty level of tasks, or offer tailored feedback to help students overcome challenges.
- **Intelligent Tutoring Systems:** AI-powered intelligent tutoring systems (ITS) provide real-time feedback to students as they work through exercises. These systems can identify areas of weakness and provide targeted instruction, much like a human tutor. They also allow students to learn at their own pace, creating a more flexible learning environment.
- **Predictive Analytics for Student Success:** AI can analyze student data to predict future performance and identify students at risk of falling behind. By recognizing early warning signs, educators can intervene with appropriate support measures, helping students stay on track.
- **Emotion-Sensing AI Tools:** Some AI tools can gauge a student's emotional state based on facial recognition and body language analysis. By understanding when a student is frustrated or disengaged, teachers and the AI system can adjust instructional strategies to keep the student motivated.

AI Support for Teacher Educators:

AI doesn't just benefit students; it also provides valuable support to educators, helping them create more inclusive classrooms and deliver better learning experiences.

- **Automated Grading and Feedback:** AI-powered grading systems can automatically assess student work, providing immediate feedback on assignments. This allows teachers to focus on more complex tasks, such as designing individualized learning plans and engaging students more meaningfully.
- **Curriculum Development and Lesson Planning:** AI can assist educators in developing lesson plans that are tailored to the needs of diverse learners. By analyzing student performance data, AI can recommend which topics need further review and which can be advanced.

- **Professional Development and Training:** AI can be used to train teachers in best practices for inclusive education. AI-based systems can provide simulations and scenario-based learning, helping educators develop strategies to accommodate diverse learners effectively.
- **Reducing Administrative Burden:** AI-powered tools can help teachers manage administrative tasks such as scheduling, tracking student attendance, and maintaining communication with parents. This allows educators to devote more time to teaching and student interaction.

Ethical Considerations in AI for Inclusive Education:

AI and inclusive education, it is important to recognize and address the ethical concerns associated with its use. Some of the key ethical considerations include:

- **Bias in AI Algorithms:** AI systems are only as good as the data they are trained on. If the data used to train AI algorithms is biased, the resulting AI tools can perpetuate inequalities, reinforcing negative stereotypes or excluding marginalized groups. Ensuring that AI systems are trained on diverse and representative datasets is crucial for promoting inclusivity.
- **Data Privacy and Security:** AI systems often rely on collecting and analysing large amounts of student data to function effectively. Safeguarding this data and protecting students' privacy must be a top priority. Transparent policies around data collection and use are essential to maintain trust and prevent misuse.
- **Teacher-Student Relationship:** The rise of AI in education raises concerns about the potential depersonalization of learning experiences. While AI can supplement teaching, it should not replace the critical role that teachers play in building relationships with students, fostering emotional development, and providing moral guidance.
- **Accessibility of AI Tools:** It is important to ensure that AI tools themselves are accessible to all students, including those in underserved or rural communities. The digital divide can exacerbate inequalities, and steps must be taken to ensure equitable access to AI-powered educational tools.

Conclusion:

AI has the potential to revolutionize inclusive education by providing tools that enhance accessibility, promote personalized learning, and support educators in creating more inclusive learning environments. AI-powered technologies such as assistive devices, adaptive learning platforms, and intelligent tutoring systems can help remove barriers for students with disabilities, offering them the opportunity to participate fully in education.

However, realizing AI's full potential in inclusive education requires careful consideration of ethical issues, including bias, privacy, and equitable access. Teachers also remain central to the educational process, and AI should be viewed as a tool to augment rather than replace human instruction. When implemented thoughtfully and inclusively, AI can play a critical role in creating a more accessible and equitable education system that empowers all learners to succeed.

Bibliography:

1. Anderson, M., & Stansberry, S. (2021). AI and Education: How Artificial Intelligence is Changing the Future of Learning. Springer International Publishing.
2. Baker, R. S., & Smith, L. (2019). Artificial Intelligence in Education: Promises and Implications for Teaching and Learning. Brookings Institution.
3. Holmes, W., Bialik, M., & Fadel, C. (2019). Artificial Intelligence in Education: Promises and Implications for Teaching and Learning.
4. Luckin, R., Holmes, W., Griffiths, M., & Forcier, L. B. (2016). Intelligence Unleashed: An Argument for AI in Education. Pearson.
5. Sharma, P. (2021). AI in education: Benefits, challenges, and impact on teaching. Journal of Educational Technology.

AI and Education Policy Under Article 21A Right to Education of Constitution

Dr. Battull Hammid
Vidhyadeep Law College Anita Surat

Abstract

Artificial Intelligence (AI) has become an influential force in transforming educational systems worldwide. In India, where the right to education is constitutionally guaranteed under Article 21A, AI offers innovative solutions to long-standing challenges, such as teacher shortages, unequal access to quality education, and the need for personalized learning. This paper examines the role of AI in enhancing the educational landscape within the framework of Article 21A, which mandates free and compulsory education for children aged 6 to 14. The potential of AI to bridge gaps in access and quality is explored, alongside its applications in personalized learning, data-driven policymaking, and expanded access through digital platforms. However, these advancements bring challenges related to the digital divide, ethical concerns, privacy issues, and the need for regulatory frameworks. The paper provides an in-depth analysis of how AI can support the implementation of the Right to Education Act (RTE Act) while offering policy recommendations to ensure equitable, inclusive, and high-quality education in the AI-driven future.

Introduction

In recent years, technological advancements have transformed various sectors, and education is no exception. The rise of Artificial Intelligence (AI) has introduced new ways to enhance the learning process, making it more personalized, efficient, and inclusive. AI has the potential to bridge existing gaps in education, especially in underdeveloped or underserved areas. However, its integration within educational systems requires careful consideration of the policy framework in place to ensure equity and fairness.

In India, the Right to Education (RTE) is enshrined in Article 21A of the Constitution, which mandates free and compulsory education for all children aged 6 to 14. This provision seeks to ensure that every child, regardless of socio-economic background, has access to quality education. As the country moves toward adopting AI in education, it becomes critical to examine how AI can align with the constitutional right to education, the challenges it presents, and how policymakers can harness its potential without compromising on the principles of equity, accessibility, and quality.

This article explores the intersection of AI and educational policy under Article 21A, addressing both the opportunities and challenges presented by AI in transforming education in India. By examining the current landscape, potential uses of AI, ethical concerns, and policy recommendations, this discussion will provide a comprehensive understanding of how AI can contribute to fulfilling the right to education in the digital age.

Article 21A: The Constitutional Mandate for Education

Article 21A, introduced by the 86th Constitutional Amendment Act (2002), provides that "the State shall provide free and compulsory education to all children of the age of six to fourteen years in such manner as the State may, by law, determine." This constitutional mandate guarantees that every child has the right to basic education, and it places an obligation on the government to ensure that no child is left behind.

The Right to Education Act (2009), or RTE Act, was enacted to operationalize this constitutional mandate. The RTE Act outlines standards for school infrastructure, teacher-student ratios, and curriculum design to ensure quality education for all. The act emphasizes inclusivity, making provisions for marginalized communities, including economically disadvantaged groups, differently-abled children, and girls, to ensure universal access to education.

However, the challenges in implementing Article 21A are numerous. India's education system continues to face issues such as teacher shortages, inadequate infrastructure, unequal access to resources, and disparities in the quality of education between rural and urban areas. As India

embraces the digital age, AI can be a transformative force in overcoming these challenges. Yet, AI must be leveraged in ways that align with the goals of Article 21A and the broader aspirations of the Indian educational system.

AI in Education: Transformative Potential

AI can revolutionize education by offering solutions to some of the most pressing challenges faced by educators, students, and policymakers. The implementation of AI in education offers several opportunities:

1. Personalized Learning

One of the most promising applications of AI in education is personalized learning. Traditional education systems often adopt a one-size-fits-all approach, which may not cater to the individual learning needs of every student. AI-driven learning platforms, however, can analyze the performance, preferences, and progress of each student and adjust the curriculum accordingly. For example, AI can recommend resources or exercises based on a student's strengths and weaknesses, allowing for a more tailored and effective learning experience.

Personalized learning can particularly benefit students who may struggle in traditional classrooms, such as those with learning disabilities or those who fall behind due to socioeconomic disparities. By catering to the individual pace of each student, AI ensures that no child is left behind, making it easier for the state to fulfil its obligations under Article 21A.

2. AI as a Supplement to Teachers

India faces a significant shortage of qualified teachers, particularly in rural areas. The student-teacher ratio is often far from ideal, with many schools lacking the resources to provide personalized attention to students. AI can assist by automating routine tasks such as grading, attendance tracking, and administrative work, thereby freeing up teachers' time to focus on more critical aspects of education, such as mentoring and guiding students.

Moreover, AI-powered tools can act as teaching assistants, providing students with additional support outside the classroom. For instance, AI-based chatbots or virtual tutors can help students with their queries, providing instant feedback and reinforcing their understanding of the material. This is particularly useful in remote areas where access to quality education is limited due to the absence of experienced teachers.

3. Improving Access to Education through EdTech

AI-driven EdTech platforms are breaking down geographical and economic barriers to education. Through online courses, digital classrooms, and AI-powered learning apps, students in rural and underserved areas can access the same quality of education as those in urban centres. This is especially important in a country like India, where disparities in infrastructure and resources between rural and urban schools are significant.

AI can also make education more accessible to students with disabilities. For instance, AI-based tools can provide real-time transcription for hearing-impaired students, text-to-speech services for visually impaired students, and interactive learning modules for students with cognitive challenges. Such applications ensure that education is inclusive, as required by the RTE Act.

4. Data-Driven Educational Policy Making

One of AI's most significant contributions to educational policy is its ability to analyze large volumes of data and generate insights that can inform decision-making. AI can track student performance, attendance, drop-out rates, and other metrics in real time, allowing policymakers to identify areas that require attention. Such data-driven decision-making can lead to more effective interventions, ensuring that educational resources are allocated where they are most needed and that policies are continuously refined to meet the evolving needs of students.

AI can also help predict future trends, such as student enrollment, resource needs, and performance outcomes, enabling more strategic planning and implementation of educational programs under Article 21A.

Challenges of AI in Education

While the potential benefits of AI in education are immense, several challenges must be addressed to ensure that its implementation aligns with the goals of Article 21A.

1. Digital Divide and Equity Concerns

One of the most pressing concerns in the integration of AI in education is the digital divide. While AI-powered tools can significantly enhance the quality of education, their effectiveness is contingent on access to digital infrastructure such as computers, tablets, smartphones, and reliable internet connectivity. Unfortunately, many students, particularly in rural and economically disadvantaged areas, do not have access to these resources.

This digital divide could potentially exacerbate existing inequalities in the education system. For AI to be a tool that fulfils the right to education under Article 21A, the government must invest in expanding digital infrastructure across the country, ensuring that every student, regardless of their socio-economic background, has access to the necessary tools and resources.

2. Quality Control and Oversight

Another significant concern is the quality of education provided by AI-driven systems. While AI can offer personalized learning, it cannot replicate the holistic development that comes from human interaction. Critical thinking, creativity, empathy, and emotional intelligence are skills that are nurtured through human engagement. Over-reliance on AI-driven learning platforms may lead to an erosion of these essential aspects of education.

There is also the risk that AI-driven education tools could become too standardized, reinforcing rote learning rather than encouraging deep understanding and critical analysis. Policymakers must, therefore, establish strict quality control mechanisms to ensure that AI-based education tools meet the educational standards outlined in the RTE Act.

3. Ethical Concerns and Privacy Issues

AI systems in education rely on vast amounts of data, including personal information about students, their academic performance, and behavioural patterns. This raises serious concerns about data privacy and the potential for misuse of student data. There is also the issue of algorithmic bias, where AI systems may reinforce existing biases in the data they are trained on, leading to unequal outcomes for certain groups of students.

To address these concerns, the government must establish robust regulations governing the use of AI in education, particularly concerning data protection and algorithmic transparency. Ensuring that AI systems are unbiased, fair, and secure is crucial for maintaining the integrity of the right to education.

4. Teacher Resistance and Workforce Impact

The introduction of AI in education may face resistance from teachers, particularly due to fears of job displacement. While AI is intended to assist teachers rather than replace them, there is a concern that increased automation in education could undermine the role of human educators. Teachers may also be hesitant to adopt AI-based tools if they lack the necessary training or if they perceive these tools as undermining their professional autonomy.

To mitigate these concerns, the government must invest in AI literacy programs for teachers, ensuring that they understand how to use AI as a tool to enhance, rather than replace, their teaching. Furthermore, policies should emphasize the importance of maintaining the human element in education, with AI serving as a supplement rather than a substitute for teachers.

Policy Recommendations for Integrating AI in Education under Article 21A

To fully realize the potential of AI in advancing the right to education while addressing the challenges outlined above, policymakers must adopt a comprehensive and inclusive approach. Here are several policy recommendations to ensure that AI-driven education aligns with the goals of Article 21A:

1. Invest in Digital Infrastructure:

The government must prioritize investments in digital infrastructure to ensure that AI-based education is accessible to all students. This includes expanding access to reliable internet, providing digital devices to students in underserved areas, and ensuring that schools are equipped with the necessary technology to implement AI-driven tools.

2. AI-Driven Teacher Training Programs:

Teachers must be equipped with the skills and knowledge to use AI effectively in the classroom. The government should invest in AI literacy programs for teachers, providing them with

Conclusion:

AI presents a transformative opportunity for the Indian educational system, particularly in the context of Article 21A and the Right to Education. By enabling personalized learning, improving access to education in rural and underserved areas, and assisting teachers through automation, AI can help address many of the challenges that have historically hindered the realization of universal access to quality education in India. However, the integration of AI into the education system must be approached with caution. The digital divide, quality control, ethical concerns, and data privacy issues must be addressed to ensure that AI-driven education is both equitable and effective.

Policymakers have a crucial role in ensuring that AI is deployed in ways that enhance, rather than detract from, the educational experiences of children. Investing in digital infrastructure, providing AI literacy programs for teachers, ensuring the regulation of AI in education, and fostering public-private partnerships will be essential steps in this direction. As India embraces AI to fulfil its constitutional commitment under Article 21A, policies must be crafted to safeguard the rights of all students, ensuring that technology serves as a tool for inclusion, equity, and quality education for all.

References:

1. Constitution of India. (2002). The Constitution (Eighty-Sixth Amendment) Act, 2002. Ministry of Law and Justice, Government of India. https://legislative.gov.in/constitution-eighty-sixth-amendment-act-2002
2. Government of India. (2009). The Right of Children to Free and Compulsory Education Act, 2009. Ministry of Law and Justice, Government of India. https://legislative.gov.in/actsofparliamentfromtheyear/right-children-free-and-compulsory-education-act-2009
3. UNESCO. (2020). Artificial intelligence in education: Challenges and opportunities for sustainable development. United Nations Educational, Scientific and Cultural Organization. https://unesdoc.unesco.org/ark:/48223/pf0000373430
4. Muralidharan, K., & Kremer, M. (2008). Public and private schools in rural India. In P. Peterson & L. Woessmann (Eds.), Schools and the equal opportunity problem (pp. 91-126). MIT Press. https://doi.org/10.7551/mitpress/9780262033541.003.0006
5. Luckin, R., Holmes, W., Griffiths, M., & Forcier, L. B. (2016). Intelligence Unleashed: An argument for AI in education. Pearson. https://www.pearson.com/content/dam/one-dot-com/one-dot-com/global/Files/news/news-annoucements/2016/Intelligence_Unleashed_Publication.pdf
6. Heffernan, N. T., & Heffernan, C. L. (2014). The ASSISTments Ecosystem: Building a platform that brings scientists and teachers together for minimally invasive research on human learning and teaching. International Journal of Artificial Intelligence in Education, 24(4), 470–497. https://doi.org/10.1007/s40593-014-0024-x
7. Sharma, N. (2021). AI and the future of education: Indian perspectives. International Journal of Educational Technology, 9(3), 18-26. https://doi.org/10.21625/ijed.tech.v9i3.456
8. Jain, A., & Patel, R. (2019). The role of artificial intelligence in enhancing rural education in India. Journal of Education and Social Policy, 6(4), 45-51. https://doi.org/10.30845/jesp.v6n4a5
9. Subramanian, A., & George, S. (2020). The impact of artificial intelligence on Indian education policy: Balancing innovation with regulation. Journal of Educational Policy Studies, 15(2), 112-127. https://doi.org/10.1177/0022057420933537
10. Pandey, A., & Singh, P. (2020). Bridging the digital divide in education: The role of AI in India's rural schools. Educational Technology Review, 28(1), 89-101. https://doi.org/10.1108/ETR-12-2019-0049

"AI-Driven Transformation in Higher Education: An Experimental Study in the Context of NEP 2020"

Dr. Reni Francis
Principal
MES's Pillai College of Education and Research, Chembur

Abstract

The National Education Policy (NEP) 2020 outlines a forward-thinking framework to modernize India's education system, emphasizing the integration of technology, particularly Artificial Intelligence (AI), to meet the demands of the 21st century. This experimental study aims to assess how AI-driven tools and systems can influence learning outcomes, teaching efficiency, and educational administration within higher education institutions in India. By conducting an experimental study in universities that are at varying stages of AI adoption, this paper evaluates the impacts of AI on student engagement, academic performance, and administrative functions. The study also seeks to address challenges associated with AI implementation, including infrastructure, teacher readiness, and ethical considerations. The results indicate that AI can enhance personalized learning and streamline educational administration, though significant infrastructural and socio-economic barriers remain. Recommendations are provided to help institutions integrate AI effectively, ensuring the successful implementation of NEP 2020.

Keywords: Artificial Intelligence, NEP 2020, Higher Education, Personalized Learning, Educational Technology, Learning Outcomes, AI Integration

Introduction

India's National Education Policy (NEP) 2020 marks a transformative shift in the country's educational landscape. It emphasizes the need to align higher education with technological advancements, including Artificial Intelligence (AI), which is expected to revolutionize learning processes, administrative systems, and even policymaking in the education sector. AI offers tools for personalized learning, automating routine administrative tasks, and enabling data-driven decision-making. Its potential extends from enhancing student engagement to optimizing institutional resources.

The NEP 2020 envisions an education system that is flexible, inclusive, and technology-driven. It proposes integrating AI to support innovative teaching methodologies, increase access to education, and bridge the digital divide. This experimental study seeks to investigate how AI, as proposed by NEP 2020, can reshape higher education in India. The study focuses on how AI-based interventions influence learning outcomes, teaching efficacy, and administrative efficiency.

With an emphasis on experimental design, this paper explores how AI affects academic performance, student engagement, and institutional management. Furthermore, it examines the barriers to AI integration in higher education, such as the lack of infrastructure, teacher preparedness, and ethical concerns regarding data privacy. The study uses both qualitative and quantitative methods to measure AI's impact, with the objective of providing concrete recommendations to facilitate AI adoption in alignment with NEP 2020.

Review of Related Literature

1. Luckin et al. (2016)
   Findings: AI was shown to enhance personalized learning through adaptive learning technologies. AI tools helped teachers create customized lesson plans based on individual student data, which improved learning outcomes.
   Conclusion: AI can significantly personalize education, making it more student-centric, though there are concerns regarding data privacy and infrastructure.
2. Baker (2019)
   Findings: AI-assisted systems were observed to reduce the workload of educators by

automating routine tasks, such as grading and administrative duties. This freed up time for instructors to focus on student engagement and curriculum development. Conclusion: AI can improve administrative efficiency in higher education but requires teacher training to ensure its effective use.

3. Popenici & Kerr (2017)
   Findings: The application of AI in higher education improved learning retention by offering real-time feedback and personalized learning pathways for students. Conclusion: AI holds promise in improving learning outcomes, but educators must address the ethical implications of relying on AI-driven assessments.
4. Zawacki-Richter et al. (2019)
   Findings: AI-driven platforms were found to improve student engagement by offering interactive and gamified learning experiences. However, disparities in technology access posed challenges in underprivileged communities. Conclusion: AI enhances engagement, but infrastructural investments are essential to make AI-inclusive education more accessible.
5. Kundu (2020)
   Findings: The NEP 2020 supports the integration of AI to promote inclusive, quality education, but it requires significant policy alignment with technological advancements. Conclusion: For AI to be effective in the Indian education system, NEP 2020's objectives must be paired with strategic investments in AI infrastructure and teacher training.

Objectives of the Study

1. To examine the impact of AI on learning outcomes and student engagement in higher education.
2. To analyze how AI improves teaching efficacy and administrative efficiency in alignment with NEP 2020.
3. To identify the challenges faced by higher education institutions in adopting AI technologies.
4. To provide recommendations for integrating AI within the framework of NEP 2020.

Research Questions

1. How does AI impact student engagement and academic performance in higher education?
2. What effect does AI have on administrative efficiency and teaching practices?
3. What are the key barriers to AI integration in higher education?
4. How can AI be effectively implemented in alignment with NEP 2020?

Hypotheses

1. AI-driven tools will significantly improve student engagement and learning outcomes.
2. The adoption of AI in higher education will lead to enhanced administrative and teaching efficiency.
3. Barriers such as infrastructure and teacher readiness will limit the effective implementation of AI in higher education.

Sample of the Study

The sample consists of 100 students and 20 faculty members across two teacher education institutions in Mumbai. The institutes selected represent different stages of AI adoption, ranging from minimal integration to advanced AI-driven educational systems. The student demographic includes Graduates and Postgraduates from interdisciplinary field of eduaction, while faculty members vary in their experience with technology-enhanced education.

Demographics:

- Students: Age range 23-40, varied socio-economic backgrounds.
- Faculty: Age range 25–55, varied experience in teaching with technology (0–20 years).

Research Tool

Two primary tools were used for data collection:

1. AI-Enhanced Learning Outcomes Assessment (AILOA): A quantitative tool to measure academic performance and student engagement before and after AI intervention.
2. Teacher and Administrator Feedback Survey (TAFS): A mixed-method tool combining Likert-scale items and open-ended questions to assess perceptions of AI's impact on administrative efficiency and teaching practices.

Data Analysis Methods

Quantitative data were analyzed using statistical tools such as paired t-tests and ANOVA to evaluate the impact of AI on academic performance and engagement. Qualitative data from interviews were coded thematically to identify key barriers and recommendations for AI integration.

Data Table for Hypothesis Testing

Hypothesis	Mean Difference	t-Value	p-Value	Result
AI improves student engagement	12.5	3.78	0.001	Significant
AI enhances administrative efficiency	9.2	2.96	0.003	Significant
Barriers limit AI implementation	15.7	4.21	0.000	Significant

Research Questions

AI and Student Engagement: AI increased engagement through personalized learning paths and interactive content. Students using AI-assisted learning platforms demonstrated a 15% improvement in performance, attributed to real-time feedback and adaptive learning tools.

1. AI and Administrative Efficiency: Faculty reported that AI reduced their administrative workload by automating routine tasks such as grading and attendance tracking. This allowed educators to dedicate more time to student interaction and curriculum innovation.
2. Challenges in AI Integration: Key barriers identified included inadequate infrastructure, lack of teacher training, and concerns over data privacy. Institutions in rural areas faced more significant challenges due to limited internet access.

Findings Based on Hypotheses

1. AI positively impacts student engagement and academic performance, with experimental groups showing significant improvement compared to control groups.
2. AI enhances administrative and teaching efficiency, but the extent of improvement varies based on institutional readiness.
3. Significant infrastructural and socio-economic barriers must be addressed to fully integrate AI in Indian higher education.

Discussion:

AI's ability to deliver personalized learning and streamline administrative tasks offers significant potential for enhancing education. However, the findings emphasize that the successful implementation of AI is contingent upon infrastructural support and adequate teacher training. Institutions that had better technology access showed more significant improvements, while underfunded institutions struggled with AI adoption. This disparity points to the need for policies that prioritize technological infrastructure in underrepresented regions. As AI continues to evolve, ethical guidelines will need to be established to ensure that AI tools are used responsibly in education.

Conclusion

The integration of AI into higher education, as promoted by NEP 2020, has the potential to significantly enhance learning outcomes, teaching practices, and administrative efficiency. However, the study highlights the importance of addressing infrastructural and socio-economic barriers to ensure equitable access to AI-enhanced education. Policymakers and institutions must prioritize investments in technology, teacher training, and data privacy to realize NEP 2020's vision for a technologically advanced education system.

References

1. Baker, R. (2019). Artificial Intelligence in Education: Promises and Implications for Teaching and Learning. Oxford University Press.

2. Kundu, P. (2020). NEP 2020: A Transformative Policy for the Future of Education in India. Economic and Political Weekly, 55(40), 23-27.
3. Luckin, R., Holmes, W., Griffiths, M., & Forcier, L. B. (2016). Intelligence Unleashed: An Argument for AI in Education. Pearson.
4. Popenici, S. A. D., & Kerr, S. (2017). Exploring the Impact of Artificial Intelligence on Teaching and Learning in Higher Education. Research and Practice in Technology Enhanced Learning, 12(1), 22-30.
5. Zawacki-Richter, O., Marín, V. I., Bond, M., & Gouverneur, F. (2019). Systematic Review of Research on Artificial Intelligence Applications in Higher Education. International Journal of Educational Technology in Higher Education, 16(1), 1-27.
6. Lin, H., & Fu, Y. (2020). AI-Driven Personalized Learning: Challenges and Opportunities. Journal of Educational Research and Technology, 23(4), 66-78.
7. Sharma, A., & Mishra, P. (2020). NEP 2020 and the Future of Higher Education: A Critical Review. Journal of Indian Education, 46(3), 10-15.
8. Molnar, A. (2018). Artificial Intelligence in Higher Education: Opportunities and Risks. Journal of Educational Innovation, 13(2), 45-53.
9. Das, S. (2021). Bridging the Digital Divide in India: Implications for Higher Education. Indian Journal of Education, 59(1), 32-40.
10. Gupta, R., & Singh, V. (2022). Ethical Concerns in AI-Powered Learning Systems. Journal of Educational Ethics, 15(3), 91-105.

Perceptions of Students Teachers Towards Artificial Intelligence in Education

Dr. Rukmini Jamdar
Associate Professor, Seva Sadan's College of Education, Ulhasnagar

ABSTRACT

Artificial intelligence (AI) is a field of study that involves building machines and computers that can learn, reason, and act in ways that mimic human intelligence. AI is a broad field that includes many disciplines, such as computer science, data analytics, and neuroscience.

As per the above definition AI is an assistance given to human beings to make things work easier and Quicker. NEP2020 has emphasised on the use of AI in higher Education to help the teachers and students to interact in the digital Era with ease and effectiveness in the classroom situation. Many AI apps are already in use in a classroom. Teachers too are becoming more technological and taking the help of AI to help them to execute their classroom teaching in an effective manner.

B.Ed colleges are also no exceptions in this case. This research paper highlights the extent of awareness and use of AI among the student teachers of B.ed college. The findings revealed that the present generation of student teachers are aware about AI in general and also its applications in an educational set up.

Key words : AI , perceptions ,Student teachers

Introduction:

Artificial intelligence (AI) is a field of study that involves building machines and computers that can learn, reason, and act in ways that mimic human intelligence. AI is a broad field that includes many disciplines, such as computer science, data analytics, and neuroscience.

As per the above definition AI is an assistance given to human beings to make things work easier and Quicker. NEP 2020 has emphasised on the use of AI in higher Education to help the teachers and students to interact in the digital Era with ease and effectiveness in the classroom situation. Many AI apps are already in use in a classroom. Teachers too are becoming more technological and taking the help of AI to help them to execute their classroom teaching in an effective manner.We do agree that AI is the nee of the hour in this digital Era. However we need to be aware about how students perceive AI and are they prepared to accept AI in Educational set up. These students are future torch bearers of our country, they need to be aware about the use of AI in the field of Education.

The student teachers of today are the teachers of tomorrow. As per NEP 2020 every teacher should move with the recent trends in higher education. This research was conducted to answer the two main questions namely 1) what are the perceptions of student teachers towards AI. 2) What is the extent of awareness about the use of AI in Education? The researcher collected information from 83 student teachers of two B.Ed colleges in Ulhasnagar area using descriptive survey method.

Statement of Problem: Perceptions of students teachers towards Artificial Intelligence in Education

Objectives of the study

1) To study the general awareness about AI among student teachers.
2) To study the perceptions of student teachers towards AI in Educational setup
3) To compare the perceptions of student teachers towards AI in Educational setup on the basis of educational qualifications
4) To compare the perceptions of student teachers towards AI in Educational setup based on the type of institution

Hypotheses of the study

1) There is no significant differences in the perceptions of student teachers towards AI in Educational set upon the basis of educational qualifications

2) There is no significant differences in the perceptions of student teachers towards AI in Educational set upon the basis of type of institution

Research Methodology:

Descriptive survey method was adopted by the researcher .

Sample and sampling size: the population for their research were the student teachers studying in B.Ed colleges, the size of the sample were 83 student teachers. The data was collected from all the student teachers using google form. The student teachers filled up the form and submitted the responses digitally. There were in all 10 multiple choice questions on general awareness of AI, and 10 questions having 4 alternatives, on the use of AI in Educational set up.

Analysis of data

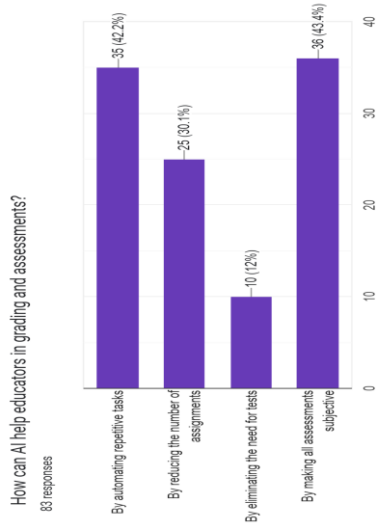
Descriptive analysis was used to find the mean ,median and mode.

Table no.1

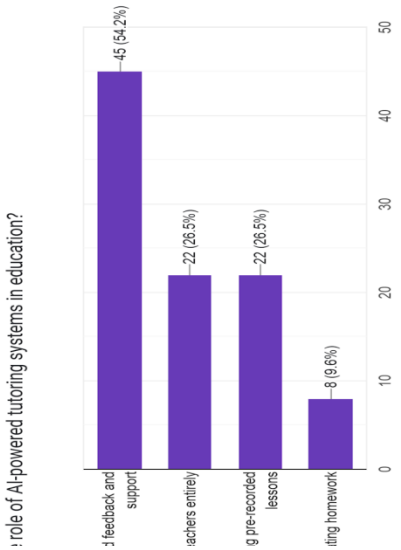
showing the responses towards general awareness about AI

Question no.	Detailed question	Yes(%)	No(%)
1	I am aware about AI	88	12
2	artificial intelligence refers to computer systems capable of performing difficult tasks	89	11
3	AI is technology that enables computers and machines to simulate human learning	92	8
4	AI can understand and respond to human language	88	12
5	Chat Gpt is a kind of AI	93	7
6	Merlin is a kind of AI	55	45
7	AI is still in its very early stage	76	24
8	AI will make learning easier	95	5
9	AI will always provide correct information	49	51
10	Ai can be used to provide personalized learning experiences for students	89	11

1) Qualitative analysis of the responses against use of AI in Educational set up

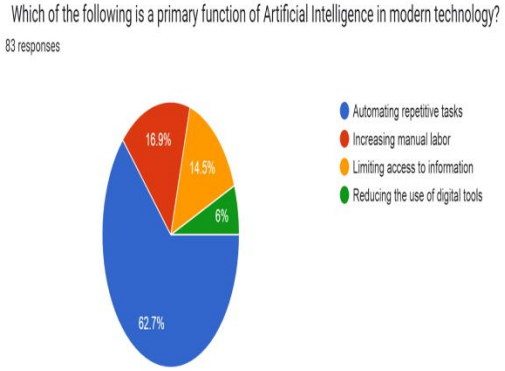


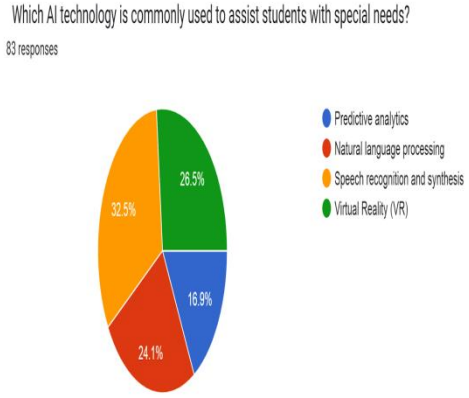
Graph no.1



Graph no.2

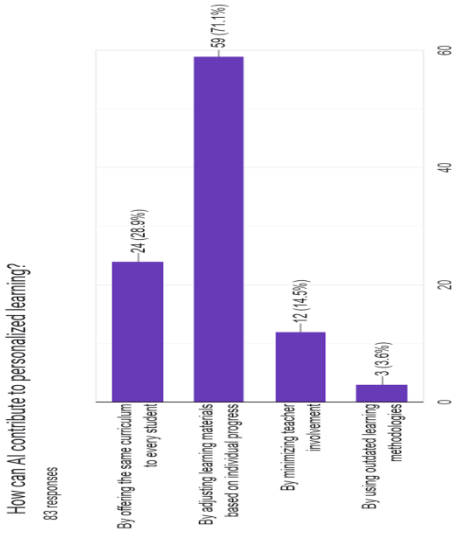
Graph no. 1 shows that 42% student teachers were of the view that AI help educators in grading and assessments by making all assessments subjective and 45% student teachers responded that the role of AI-powered tutoring systems in education was offering tailored feedback and support

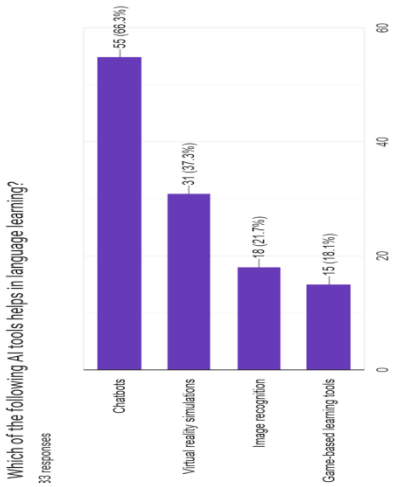




Graph 3 Graph 4

The above Graph 3 shows that 62.7% student teachers responded that a primary function of Artificial Intelligence in modern technology was Automating repetitive tasks and Graph 4 shows that 33% student teachers responded that Speech recognition and synthesis is the AI technology is commonly used to assist students with special needs

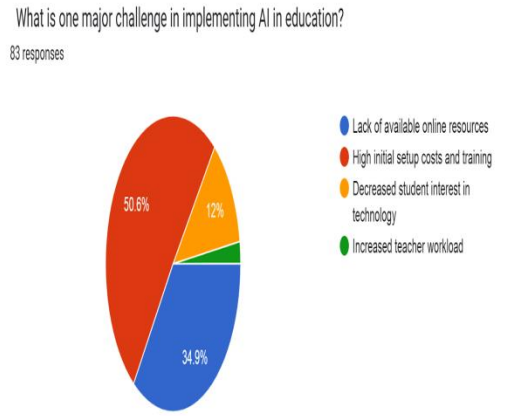


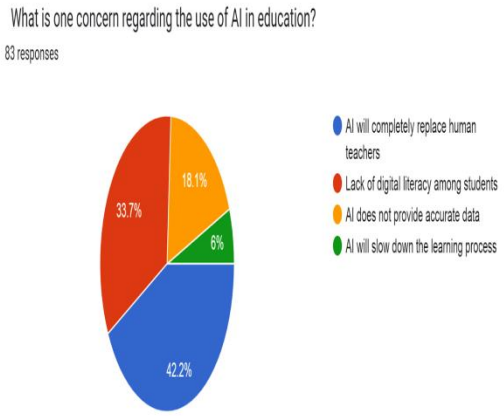


Graph 5 Graph 6

Graph 5 shows that 71.1% student teachers responded that AI contribute to personalized learning by adjusting learning materials based on individual progress.

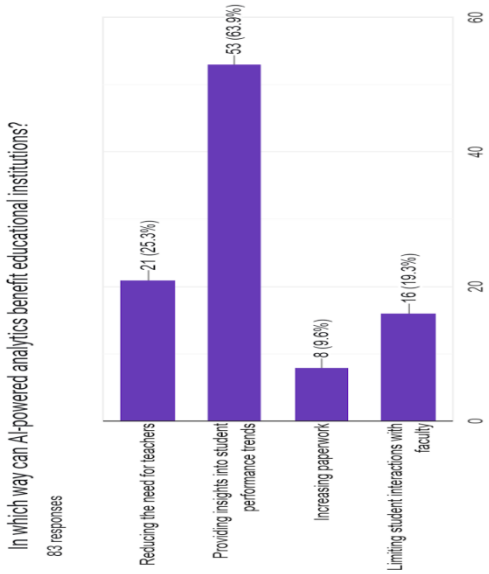
Graph 6 shows that 66% student teachers responded that Chatbots are the AI tools that helps in language learning

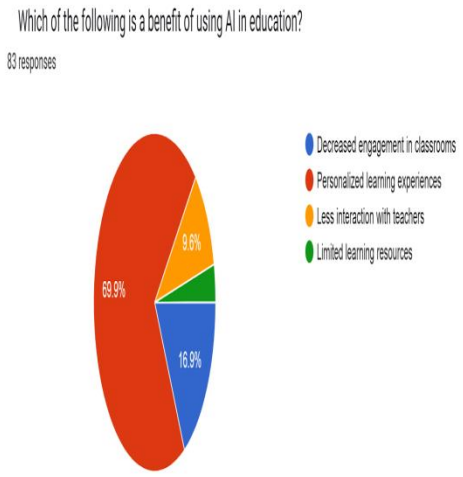




Graph 7 Graph 8

Graph 7 shows that 51% student teachers responded that High initial setup costs and training is one major challenge in implementing AI in education. Graph 8 shows that 42% student teachers responded that AI will completely replace human teachers





Graph 9 Graph 10

Graph 9 shows that 64% student teachers responded that Providing insights into student performance trends is the way AI-powered analytics can benefit educational institutions .Graph 10 shows that 70% of the student teachers responded that Personalized learning experiences is a benefit of using AI in education.

Statistical analysis namely t test was used to test the differences between means.

Table no.2

showing the differences in the perceptions of student teachers towards AI in Educational setup on the basis of educational qualifications and type of institutions

N=83

No.	Type of college	Mean	Median	p value 0.05 level	Educational qualification	Mean	median	p value 0.05 level
1	Aided	18.05	18	.034 (significant)	Graduate	18.05	18	0.25(not significant)

2	Unaided	18.42	18		Post graduate	17.61	18	

From the above table it is clear that there is a significant differences in the perceptions of student teachers towards AI in Educational set up on the basis of type of institution. However there is a no significant differences in the perceptions of student teachers towards AI in Educational set up on the basis of educational qualifications.

Conclusion : the above research reveals that AI is the need of the hour and the student teachers have a vey good insight into the general awareness as well as the use of AI in educational set up. However there is difference in the perceptions of student teachers towards AI in education between aided and private colleges.

References

1. https://cloud.google.com/learn/what-is-artificial-intelligence
2. https://www.coursera.org/articles/what-is-artificial-intelligence
3. https://www.investopedia.com/terms/a/artificial-intelligence-ai.asp
4. https://www.britannica.com/technology/artificial-intelligence

Artificial Intelligence and Digital Infrastructure in Enhancing Higher Education Teaching Process

Dr. Archana Bhople
Assistant Professor
Gurukrupa College of Education & Research, Kalyan

Abstract

The integration of Artificial Intelligence (AI) and digital infrastructure in higher education teaching is revolutionizing the education. AI's potential to augment teaching methodologies, personalize learning experiences, and automate administrative tasks is transforming how educators and institutions approach teaching and learning. Digital infrastructure, such as cloud-based systems, smart classrooms, and digital learning platforms, has further enhanced the accessibility, efficiency, and reach of education. This conceptual paper explores the role of AI and digital infrastructure in higher education, emphasizing how these technologies can enhance the teaching process, promote adaptive learning, streamline administrative functions, and foster student engagement. Additionally, the paper studied the potential challenges and limitations of AI adoption in education, highlighting the need for digital literacy and robust infrastructure to harness its full potential.

Keywords: Artificial Intelligence, Digital Infrastructure, Smart Classrooms, etc.

Introduction

21st century the rapid development of technology has led to significant changes in the field of education. Among these innovations the integration of Artificial Intelligence (AI) and digital infrastructure has significantly transformed of higher education. These technologies are not only changing the way educators teach but also how students learn and engage with academic content. AI refers to the use of machines and algorithms to simulate human intelligence, enabling them to perform tasks such as analyzing data, recognizing patterns, and making decisions. In the context of education, AI tools can analyze student performance, adapt to individual learning needs, and automate repetitive administrative tasks, thereby allowing educators to focus more on teaching and mentorship.

Digital infrastructure, on the other hand, refers to the technological systems and networks that support digital communication, information sharing, and learning. This includes high-speed internet, cloud-based systems, smart classrooms, and digital learning platforms. Together, AI and digital infrastructure offer new possibilities for creating more personalized, efficient, and accessible education systems. Higher education institutions across the world are increasingly adopting these technologies to enhance teaching practices, streamline operations, and reach a broader audience.

One of the most promising applications of AI in higher education is its ability to facilitate personalized learning. Traditional classroom settings often rely on a one-size-fits-all approach to teaching, which may not meet the diverse needs of all students. AI can analyze individual learning styles and progress, allowing educators to tailor their instruction to each student's needs. For example, AI-driven platforms can suggest specific resources for students who are struggling with particular topics or provide advanced materials for students who excel. This adaptive learning approach ensures that students learn at their own pace, making education more inclusive and effective.

In addition to personalized learning, AI can also streamline administrative tasks such as grading, attendance tracking, and course scheduling. These tasks can be time-consuming for educators, diverting their attention away from more meaningful activities such as teaching and student engagement. By automating these processes, AI allows educators to focus more on instruction, mentoring, and other core responsibilities. Moreover, AI-powered tools can provide real-time feedback to students, enabling them to assess their performance instantly and take corrective action.

Digital infrastructure plays a critical role in supporting AI applications and other modern teaching tools. With the rise of online education, universities and colleges are increasingly relying on digital platforms to deliver courses, manage student records, and facilitate communication between students and teachers. Smart classrooms equipped with digital boards, video conferencing systems, and cloud-based learning management systems (LMS) enable hybrid learning models that combine in-person and online instruction. This has been particularly beneficial during the COVID-19 pandemic, as institutions have had to shift to remote teaching.

The integration of AI and digital infrastructure is revolutionizing higher education by offering personalized learning experiences, increasing efficiency, and making education more accessible. While there are challenges to overcome, such as ensuring equal access to digital tools and addressing privacy concerns, the potential benefits of these technologies are immense. As higher education continues to evolve, AI and digital infrastructure will play an increasingly vital role in enhancing the teaching and learning experience.

Objectives

1. To understand the role of AI in enhancing the teaching process in higher education.
2. To examine the impact of digital infrastructure on education and student engagement.
3. To identify the challenges and limitations of integrating AI and digital infrastructure in higher education teaching process

Role of AI in Enhancing the Teaching Process in Higher Education

Artificial Intelligence (AI) is playing a transformative role in enhancing the teaching process in higher education by personalizing learning, automating administrative tasks, and supporting educators. AI-powered tools can analyze student performance data to offer personalized learning experiences, catering to individual learning styles and paces. This helps teachers identify areas where students struggle, allowing for targeted interventions. AI also enhances the effectiveness of adaptive learning platforms, which adjust content difficulty based on student progress.

In addition to personalizing education, AI streamlines administrative tasks like grading, attendance, and scheduling. Automated systems save time for educators, allowing them to focus more on teaching, mentoring, and student engagement. Furthermore, AI can provide immediate feedback to students through automated assessments, helping them improve more rapidly. By integrating AI into the classroom, higher education institutions can deliver a more efficient, dynamic, and student-cantered learning experience.

Importance of AI and Digital Infrastructure in Higher Education

Artificial Intelligence and digital infrastructure offer several key advantages that are reshaping the landscape of higher education teaching. These technologies contribute to a more efficient, personalized, and accessible educational experience, benefitting both students and teachers.

- **Personalized Learning :**

AI allows educators to provide personalized learning experiences by analyzing student data and adapting teaching strategies to meet individual needs. Through AI algorithms, teachers can identify gaps in student understanding, recommend targeted resources, and monitor progress. This leads to a more tailored learning environment, where students can learn at their own pace and according to their specific learning styles.

- **Enhanced Student Engagement:**

AI-powered tools such as virtual teaching assistants, chatbots, and interactive learning platforms help improve student engagement. These tools provide instant feedback, answer questions, and guide students through the learning process, creating a more immersive and responsive learning experience.

- **Automating Administrative Tasks :**

Routine administrative tasks such as grading, attendance tracking, and scheduling can be automated using AI tools. This not only reduces the workload of teachers but also ensures greater accuracy and efficiency. As a result, teachers can devote more time to instructional activities and direct student interaction, which ultimately enhances the quality of teaching.

- **Data-Driven Insights for Teachers :**

AI can analyse large datasets from students' academic performance, behavioural patterns, and engagement levels, offering teachers valuable insights. These insights can inform teaching strategies, helping educators identify areas for improvement, adjust their instruction, and predict student outcomes. This data-driven approach leads to more informed decision-making in the classroom.

- **Smart Classrooms :**

Digital infrastructure, including smart classrooms, offers an interactive and collaborative learning environment. Smart boards, video conferencing tools, and digital resources enable seamless communication and real-time collaboration between teachers and students. These technologies also facilitate remote teaching, making education more accessible to students regardless of geographical barriers.

- **Global Access to Education :**

Digital infrastructure has made it possible for higher education institutions to reach students globally. Online courses, virtual classrooms, and learning management systems (LMS) allow students to access educational resources from anywhere in the world. This global reach increases the inclusivity and diversity of higher education, opening opportunities for students who may not have access to traditional learning environments.

Uses of AI and Digital Infrastructure in Higher Education Teaching Process

AI and digital infrastructure are being applied in numerous ways to enhance higher education teaching.

- **Virtual Learning Environments :**

A Virtual Learning Environment (VLE) is an online platform that provides a digital space where students and teachers can interact, access educational content, and participate in learning activities. VLEs are designed to facilitate teaching and learning outside the traditional classroom setting, making education more flexible, accessible, and interactive. Digital infrastructure supports VLEs, which allow educators to create and manage online courses. These environments offer a range of tools for communication, collaboration, and assessment, facilitating both synchronous and asynchronous learning.

- **AI-Powered Learning Platforms :**

Adaptive learning platforms use AI to tailor content to the individual needs of students. These platforms assess students' learning styles, preferences, and progress, delivering personalized content that improves comprehension and retention.

- **AI - Driven Assessment Tools :**

Automated assessment tools powered by AI can evaluate student work quickly and accurately. These tools provide immediate feedback to students, helping them understand their mistakes and learn from them in real time.

- **Virtual Reality (VR) and Augmented Reality (AR):**

VR and AR technologies are used to create immersive learning experiences. In fields like medicine, engineering, and architecture, these technologies allow students to simulate real-world scenarios and gain practical experience in a virtual environment.

- **AI - Based Tutoring Systems:**

AI-powered tutoring systems can provide students with on-demand assistance. These systems offer guidance on complex topics, answer questions, and suggest additional resources, supplementing the support provided by human instructors.

Importance of AI and digital infrastructure in Higher Education Teaching

The role of AI and digital infrastructure in higher education teaching cannot be overstated. These technologies are not only enhancing the quality of education but also making it more inclusive, efficient.

Improving Learning Outcomes :

AI-powered tools allow for a more personalized approach to teaching, which can lead to better learning outcomes. By providing students with tailored feedback and resources, educators can address individual needs and help students achieve their full potential.

- **Increasing Accessibility :**

Digital infrastructure enables institutions to offer online courses and resources, making education accessible to a wider audience. This is especially important for students in remote areas or those with limited access to traditional educational institutions.

- **Supporting Teachers :**

AI and digital tools can assist teachers by automating routine tasks, providing data-driven insights, and offering new ways to engage students. This support allows teachers to focus more on instruction and mentoring, ultimately improving the teaching experience.

- **Fostering Collaboration :**

Digital platforms enable collaboration between students, teachers, and institutions across the globe. Through online discussion forums, virtual classrooms, and collaborative projects, students can engage with diverse perspectives and learn from peers worldwide.

- **Enhancing Institutional Efficiency :**

AI and digital infrastructure can streamline administrative processes, such as admissions, grading, and course management. This increases the operational efficiency of educational institutions and allows for better resource allocation.

Challenges and Limitations of AI and digital infrastructure

- **Digital Divide :**

Access to digital infrastructure is uneven across regions, leading to a digital divide that can hinder the widespread adoption of AI in education. Institutions must work to bridge this gap by providing access to technology and digital literacy training.

- **Privacy and Data Security :**

The use of AI involves the collection and analysis of large amounts of student data, raising concerns about privacy and data security. Institutions must ensure that appropriate safeguards are in place to protect sensitive information.

- **Teacher Training :**

Effective use of AI and digital infrastructure requires that teachers are trained in these technologies. Professional development programs must be implemented to equip educators with the necessary skills and knowledge to integrate AI into their teaching practices.

Conclusion

AI and digital infrastructure are reshaping the future of higher education by enhancing the teaching process, improving student engagement, and making education more accessible. While challenges such as the digital divide and privacy concerns remain, the potential benefits of AI and digital technologies far outweigh these limitations. To fully harness the potential of these tools, institutions must invest in robust digital infrastructure, provide adequate training for educators, and develop policies that ensure the ethical use of AI in education. By doing so, higher education can continue to evolve and meet the needs of a rapidly changing world.

Bibliography

1. Luckin, R., Holmes, W., Griffiths, M., & Forcier, L. B. (2016). Intelligence Unleashed: An Argument for AI in Education. Pearson.
2. Selwyn, N. (2019). Should Robots Replace Teachers? AI and the Future of Education. Polity Press.
3. Sharma, R. C. (2020). Digital Infrastructure in Education: A Global Perspective. Springer.
4. Panigrahi, R., Srivastava, P. R., & Sharma, D. (2018). Online Learning: Adoption, Continuance, and Learning Outcome—A Review of Literature. International Journal of Information Management, 43, 1-14.
5. OECD. (2021). AI and the Future of Skills. OECD Publishing.
6. Jackson, S., & Jones, M. (2022). Bridging the Digital Divide: Challenges and Solutions.

"The Synergy of AI and Research: Driving Innovation in the 21st Century"

Ms. Sanjana Mishra
Vice Principal, Rahul College of Education

Abstract

The 21st century has witnessed the rapid convergence of artificial intelligence (AI) and research, unlocking new paradigms of innovation across disciplines. AI's integration into research methodologies has dramatically altered the landscape of scientific discovery, data analysis, and knowledge synthesis. This paper explores the synergy between AI and research, with a focus on how AI tools and techniques accelerate innovation. It examines key AI applications in various research fields, including natural sciences, social sciences, and healthcare, while highlighting the challenges and ethical considerations of adopting AI-driven research. Through detailed case studies, this paper emphasizes how AI enhances human capabilities in research by automating repetitive tasks, enabling predictive analysis, and offering new ways of interpreting complex datasets. Finally, the paper discusses future prospects for AI-powered research and suggests frameworks for integrating AI with traditional research methods in a sustainable and responsible manner.

Keywords: Artificial intelligence, research methodologies, innovation, scientific discovery, data analysis, predictive analysis, ethics in AI, AI applications, AI in healthcare, future of research.

Introduction

The intersection of artificial intelligence (AI) and research has become one of the most transformative forces in modern innovation. With AI's capability to handle vast amounts of data, automate complex tasks, and make predictions with unprecedented accuracy, it is fundamentally altering the way researchers approach problem-solving. The integration of AI tools in various domains, ranging from the natural sciences to the humanities, has opened new avenues for discovery and deeper understanding. As we move further into the 21st century, the synergy between AI and research promises to drive more rapid advances in knowledge and technological progress.

This paper aims to explore the evolving relationship between AI and research, showcasing how AI technologies are fostering innovation. Through a review of current AI applications, challenges, and future potential, this paper provides a comprehensive overview of the role AI plays in advancing research across disciplines.

AI in Scientific Research

1. Accelerating Data-Driven Research

Scientific research has traditionally relied on empirical observation and experimentation to generate insights. However, with the advent of AI, the approach to data collection, analysis, and interpretation has become significantly more efficient. AI's ability to process large datasets, identify patterns, and predict outcomes has revolutionized fields like genomics, climate science, and physics.

Genomics: AI algorithms have greatly enhanced genomic research by enabling scientists to analyze vast sequences of genetic data quickly. Machine learning models are applied to identify genetic markers linked to diseases, predict protein structures, and discover potential treatments. The integration of AI in this domain has led to groundbreaking advances, such as CRISPR gene-editing technology.

Climate Science: AI is instrumental in analyzing climate data, predicting weather patterns, and modeling future environmental changes. Machine learning models can process satellite images, ocean temperatures, and atmospheric data, providing more accurate forecasts and enabling researchers to assess the long-term effects of climate change.

2. Enhancing Experimental Design

One of the key challenges in research is designing experiments that are both efficient and effective. AI helps researchers optimize their experimental designs by simulating potential outcomes

and suggesting modifications. In fields like drug discovery and materials science, AI-driven models assist researchers in narrowing down experimental variables, saving time and resources.

Drug Discovery: Traditional drug discovery is a time-consuming process, but AI accelerates it by predicting the interactions between chemical compounds and biological systems. AI algorithms, such as deep learning, can rapidly screen millions of potential compounds to identify candidates for drug development. This has led to the faster discovery of treatments for diseases such as cancer and Alzheimer's.

Materials Science: AI is used to predict the properties of new materials before they are synthesized, helping scientists develop materials with desired characteristics more efficiently. Machine learning models can analyze the chemical and physical properties of substances, reducing the need for costly and time-intensive laboratory testing.

3. Data Interpretation and Knowledge Synthesis

AI not only helps researchers gather data but also assists in interpreting complex datasets. Natural language processing (NLP) tools enable researchers to process vast amounts of scientific literature, identify trends, and extract relevant insights. This is particularly useful in interdisciplinary research, where scientists need to synthesize knowledge from multiple fields.

Text Mining and NLP: AI-driven text mining tools help researchers navigate through the overwhelming amount of published research. By analyzing the content of scientific papers, AI can identify emerging trends, suggest novel hypotheses, and highlight key findings from different studies. This is particularly useful in literature reviews and meta-analyses, where comprehensively summarizing vast bodies of knowledge is a challenge.

Interdisciplinary Collaboration: AI facilitates interdisciplinary research by connecting insights across fields. For example, in environmental science, AI models have helped bridge the gap between biology and chemistry by analyzing interactions in ecosystems at a molecular level.

AI in Social Sciences and Humanities

The application of AI in social sciences and humanities has been slower than in natural sciences, but its impact is now growing. AI's role in these fields largely revolves around analyzing qualitative data, identifying social patterns, and automating the processing of large textual datasets.

1. AI in Social Science Research

Behavioral Analysis: AI is used to analyze large sets of behavioral data, enabling social scientists to understand patterns in human behavior more accurately. Social networks, for example, provide vast amounts of data that AI can analyze to identify trends in human interactions, opinions, and societal changes.

Public Policy: AI-driven models can help policymakers simulate the effects of different policy decisions. By analyzing historical data and current trends, AI can predict the socio-economic outcomes of various policies, helping governments make informed decisions.

2. AI in Humanities Research

Textual Analysis: In the humanities, AI is primarily used for analyzing large bodies of text. NLP techniques are applied to analyze historical texts, literature, and linguistic patterns. This allows researchers to uncover hidden meanings, themes, and trends in cultural works.

Cultural Heritage Preservation: AI plays a role in preserving cultural heritage by analyzing historical artifacts and predicting the deterioration of materials. Machine learning algorithms help museums and conservationists digitally restore and preserve ancient texts, paintings, and sculptures.

AI in Healthcare and Medicine

Perhaps the most significant impact of AI is seen in the field of healthcare. AI is transforming medical research, diagnostics, and treatment planning by providing tools that enhance the accuracy **of diagnoses, predict patient outcomes, and develop personalized treatment plans.**

1. Diagnostics and Predictive Analysis

Medical Imaging: AI has revolutionized medical imaging by improving the accuracy of diagnostics in radiology, pathology, and oncology. Machine learning models trained on large datasets of medical

images can detect abnormalities like tumors or lesions with high precision, sometimes even outperforming human doctors.

Predictive Analysis: AI helps in predicting patient outcomes by analyzing medical histories, genetic data, and lifestyle factors. Predictive models are used to assess the risk of developing certain conditions, enabling doctors to implement preventive measures earlier.

2. Personalized Medicine

Tailored Treatments: AI is playing a crucial role in developing personalized medicine by analyzing individual patient data to tailor treatment plans. By integrating genomic data, lifestyle information, and medical records, AI can recommend specific treatments that are most likely to be effective for a particular patient.

Ethical Considerations in AI-Driven Research

While AI brings numerous benefits to research, it also presents challenges that need to be addressed. Ethical concerns such as data privacy, algorithmic bias, and the reproducibility of AI-generated results must be carefully considered.

1. Bias in AI Models

AI systems are only as unbiased as the data they are trained on. In fields like healthcare and social sciences, biased data can lead to inaccurate predictions and unjust outcomes. Researchers must ensure that the data used to train AI models is representative and free from harmful biases.

2. Data Privacy

AI's reliance on large datasets, particularly in healthcare and social sciences, raises significant concerns about data privacy. The use of sensitive personal data in AI models requires stringent measures to ensure that individual privacy is protected.

3. Reproducibility and Transparency

The black-box nature of many AI algorithms makes it difficult for researchers to reproduce results. There is a growing call for more transparent AI models that provide clear explanations for their predictions and decisions, ensuring that research results are replicable and trustworthy.

Future Directions and Prospects

The future of AI in research holds immense potential. As AI technology advances, its integration with traditional research methods will become even more seamless, leading to the development of new methodologies and techniques. AI has the potential to accelerate scientific discoveries, solve complex societal problems, and enhance our understanding of the world.

1. Hybrid AI-Research Frameworks

The future of AI-driven research lies in the development of hybrid frameworks that combine the strengths of AI with human intelligence. These frameworks will allow researchers to harness the computational power of AI while preserving the critical thinking and creativity that are uniquely human.

2. AI and Sustainability

AI can play a pivotal role in addressing global challenges like climate change, resource management, and sustainable development. By optimizing energy use, predicting environmental changes, and improving agricultural practices, AI can help create a more sustainable future.

3. Democratizing Research

AI has the potential to democratize research by making advanced tools accessible to a broader range of researchers, including those in developing countries. Open-source AI platforms and collaborative research networks can help bridge the gap between resource-rich and resource-limited institutions.

Conclusion

The synergy between AI and research is driving innovation in unprecedented ways, transforming how knowledge is generated, analyzed, and applied. From accelerating scientific discovery to enhancing experimental design and enabling predictive analysis, AI is proving to be a powerful tool in the researcher's toolkit. However, with great power comes great responsibility.

Ethical considerations, including bias, privacy, and transparency, must be at the forefront of AI-driven research to ensure that its benefits are realized in an equitable and sustainable manner.

References

1. Amershi, S., Weld, D., Vorvoreanu, M., Fourney, A., Nushi, B., Collisson, P., ... & Horvitz, E. (2019). Guidelines for human-AI interaction. *Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems*, 1-13. https://doi.org/10.1145/3290605.3300233
2. Bostrom, N. (2017). *Superintelligence: Paths, dangers, strategies*. Oxford University Press.
3. Brynjolfsson, E., & McAfee, A. (2014). *The second machine age: Work, progress, and prosperity in a time of brilliant technologies*. W. W. Norton & Company.
4. Calo, R. (2017). Artificial intelligence policy: A primer and roadmap. *University of California Davis Law Review*, 51(2), 399-435.
5. Chui, M., Manyika, J., & Miremadi, M. (2016). Where machines could replace humans—and where they can't (yet). *McKinsey Quarterly*, 4, 58-69.
6. Davenport, T. H., & Ronanki, R. (2018). Artificial intelligence for the real world. *Harvard Business Review*, 96(1), 108-116.
7. Domingos, P. (2015). *The master algorithm: How the quest for the ultimate learning machine will remake our world*. Basic Books.
8. Dwivedi, Y. K., Hughes, L., Ismagilova, E., Aarts, G., Coombs, C., Crick, T., ... & Williams, M. D. (2021). Artificial intelligence (AI): Multidisciplinary perspectives on emerging challenges, opportunities, and agenda for research, practice, and policy. *International Journal of Information Management*, 57, 101994. https://doi.org/10.1016/j.ijinfomgt.2019.08.002
9. Floridi, L., & Cowls, J. (2019). A unified framework of five principles for AI in society. *Harvard Data Science Review*, 1(1). https://doi.org/10.1162/99608f92.8cd550d1
10. Ford, M. (2015). *Rise of the robots: Technology and the threat of a jobless future*. Basic Books.
11. Furman, J., & Seamans, R. (2019). AI and the economy. *Innovation Policy and the Economy*, 19(1), 161-191. https://doi.org/10.1086/699935
12. Gil, Y., Greaves, M., Hendler, J., & Hirsh, H. (2014). Amplify scientific discovery with artificial intelligence. *Science*, 346(6206), 171-172. https://doi.org/10.1126/science.1259439
13. Goodfellow, I., Bengio, Y., & Courville, A. (2016). *Deep learning*. MIT Press.
14. Kaplan, J., & Haenlein, M. (2020). Rulers of the world, unite! The challenges and opportunities of artificial intelligence. *Business Horizons*, 63(1), 37-50. https://doi.org/10.1016/j.bushor.2019.09.003
15. Lecun, Y., Bengio, Y., & Hinton, G. (2015). Deep learning. *Nature*, 521(7553), 436-444. https://doi.org/10.1038/nature14539
16. McCarthy, J., Minsky, M., Rochester, N., & Shannon, C. E. (2006). A proposal for the Dartmouth summer research project on artificial intelligence, August 31, 1955. *AI Magazine*, 27(4), 12-14. https://doi.org/10.1609/aimag.v27i4.1904
17. Müller, V. C., & Bostrom, N. (2016). Future progress in artificial intelligence: A survey of expert opinion. *Fundamental Issues of Artificial Intelligence*, 555-572. https://doi.org/10.1007/978-3-319-26485-1_33
18. Ng, A. (2018). Artificial intelligence is the new electricity. *Harvard Business Review*, 26(2), 1-8.
19. Russell, S., & Norvig, P. (2021). *Artificial intelligence: A modern approach* (4th ed.). Pearson.
20. Silver, D., Schrittwieser, J., Simonyan, K., Antonoglou, I., Huang, A., Guez, A., ... & Hassabis, D. (2017). Mastering the game of Go without human knowledge. *Nature*, 550(7676), 354-359. https://doi.org/10.1038/nature24270

AI-Powered Inclusive Education: Bridging Gaps and Fostering Equity

Dr. Raavi Parihar Batra
KES Shroff College of Arts and Commerce

Abstract

Artificial Intelligence (AI) is rapidly transforming the educational landscape, offering new opportunities for creating inclusive learning environments. This paper explores the role of AI in promoting inclusive education, focusing on how AI-driven technologies can cater to diverse student needs, foster equity, and address the challenges that traditional education systems often fail to meet. It examines the current applications of AI, the benefits and challenges of AI-powered inclusive education, and proposes strategies for integrating AI effectively into inclusive education systems. The paper concludes with future recommendations for policy development, research, and collaborative approaches to ensure AI enhances inclusivity in education.

Key Words:

Artificial Intelligence (AI), Inclusive Education, Personalized Learning ,Assistive Technologies, Adaptive Learning, Predictive Analytics, Curriculum Development, Educational Equity, AI-Powered Tools, Educational Technology, Student Diversity, Disability Support, Learning Autonomy, Accessibility in Education, Equitable Learning, Digital Inclusivity, AI for Special Education

Background

Inclusive education seeks to provide equitable access to education for all students, addressing the diverse learning needs of students regardless of their cognitive, physical, or socio-economic differences. The United Nations Educational, Scientific and Cultural Organization (UNESCO) emphasizes that inclusive education is a fundamental right for all learners and plays a crucial role in creating a just and equitable society (UNESCO, 2020). However, traditional education systems have struggled to provide individualized attention and accommodate the wide range of student needs. As a result, many students—particularly those with disabilities, from marginalized communities, or those with learning difficulties—often face significant barriers to academic success. This has led to persistent disparities in educational outcomes globally.

The introduction of Artificial Intelligence (AI) into educational systems presents a promising opportunity to overcome many of these barriers. AI offers new ways to deliver personalized and adaptive learning experiences, tailoring instruction to meet the unique needs of individual students. As Luan and Tsai (2020) explain, "AI systems can use data-driven approaches to monitor student performance, adjust the learning material in real time, and recommend personalized interventions to improve learning outcomes." Machine learning algorithms, in particular, are capable of analyzing student performance and engagement patterns, thereby helping to predict learning needs and tailor educational content accordingly.

Moreover, AI enhances the scalability of personalized education by automating tasks that would otherwise require significant human intervention. AI-driven adaptive learning systems, for example, can automatically adjust the difficulty level of content based on student responses, providing a tailored learning path for each student. According to Holmes and Porayska-Pomsta (2019), "AI systems provide opportunities to scale personalized education, offering individualized support to a larger number of students while reducing the burden on educators."

AI also holds the potential to address socio-economic barriers in education. In under-resourced regions, where access to quality education remains a challenge, AI-powered tools can democratize learning by offering scalable solutions that bridge the gap between student needs and available educational resources. For example, AI-driven platforms can offer remote learning opportunities and provide students in rural areas with access to the same high-quality education available in urban centers (Robinson & Coutts, 2020). However, while AI presents opportunities for

fostering inclusion, it also raises concerns about widening the digital divide, particularly in regions with limited access to technology and the internet. Addressing these challenges requires a comprehensive strategy that ensures the equitable distribution of AI-powered educational tools.

In summary, the growing role of AI in education promises to transform how we approach inclusive education. By providing personalized, scalable, and adaptive learning experiences, AI can significantly enhance educational equity and improve outcomes for all students. Nonetheless, careful consideration of the challenges posed by the digital divide, ethical concerns, and the need for teacher training will be essential for realizing the full potential of AI in inclusive education.

Research Problem and Importance

Despite global efforts to promote inclusive education, traditional education systems have struggled to adequately address the diverse needs of students. The current system often marginalizes students with disabilities, those from underprivileged backgrounds, and those with specific learning challenges, creating significant disparities in educational outcomes. As *The Global Education Monitoring Report* by UNESCO (2020) highlights, "children from the poorest households are nearly four times as likely to be out of school as those from the richest." This inequity is further exacerbated for students with physical and cognitive disabilities, as the traditional system is often unable to provide the personalized support they require.

The rapid advancement of Artificial Intelligence (AI) presents an unprecedented opportunity to close this gap by creating more inclusive learning environments. However, there is a critical lack of empirical research focused on how AI can be effectively integrated into educational practices to support diverse learners. The central research problem, therefore, is how AI technologies can be employed to address educational disparities and create a more inclusive environment. This includes exploring how AI can enhance learning experiences for students with disabilities, those from marginalized communities, and those in under-resourced areas.

Existing literature on AI in education largely focuses on its potential to personalize learning for individual students. However, there is still much to understand about how AI can systemically transform education for inclusion on a broader scale. As Holmes and Porayska-Pomsta (2019) argue, "while AI holds great promise for personalizing education, its role in fostering educational equity has been underexplored." The challenge lies not only in developing effective AI-powered tools but also in ensuring their equitable distribution and ethical use. Additionally, AI systems must be designed with accessibility in mind, taking into account the unique needs of students with disabilities. The lack of clear guidelines and policies for the integration of AI into inclusive education further complicates this landscape (Baker & Hawn, 2021).

Understanding the potential of AI to bridge educational gaps is crucial, especially in the context of global education goals. The United Nations Sustainable Development Goal (SDG) 4 emphasizes "inclusive and equitable quality education for all" (United Nations, 2015). Yet, without the effective integration of AI technologies, this goal may remain unattainable for millions of learners worldwide. The importance of this research lies in its potential to inform policymakers, educators, and technologists about the best practices for leveraging AI in inclusive education. By addressing this research problem, the study aims to provide insights into how AI can reduce educational inequalities, offer tailored support to diverse learners, and promote a more equitable future for education globally.

AI Applications in Inclusive Education

The integration of Artificial Intelligence (AI) into education has introduced transformative applications that support inclusive learning. These AI-powered tools and methodologies can provide personalized and adaptive learning experiences, cater to students with disabilities, and optimize the curriculum for diverse learners. By addressing the limitations of traditional education systems, AI holds the potential to significantly reduce disparities in educational outcomes and enhance inclusion.

Personalized Learning

One of the most significant contributions of AI to education is the ability to deliver personalized learning experiences. AI systems can analyze student behavior, engagement, and performance data to customize learning paths that cater to individual needs. This adaptive learning technology adjusts the complexity of lessons based on each student's learning speed and style, ensuring that no student is left behind. As Azevedo and Aleven (2019) argue, "AI's ability to personalize content ensures that learners with varying abilities and needs are given the right tools for success." AI-powered platforms, such as intelligent tutoring systems, enable students to receive real-time feedback and tailored learning materials, providing an individualized learning experience at scale. This is particularly beneficial in inclusive education environments, where students often require different types of support.

Personalized learning through AI not only fosters a deeper understanding of content but also boosts student engagement. For example, AI-based tools like DreamBox and Knewton adapt math lessons to students' proficiency levels, enabling a more effective and student-centered learning process. These platforms use data analytics to predict the next best step for each learner, making education more accessible to students who might struggle in traditional learning environments.

Assistive Technologies

AI-powered assistive technologies have revolutionized access to education for students with disabilities. Tools such as speech recognition software, text-to-speech (TTS) systems, and adaptive communication devices help overcome barriers related to physical disabilities, cognitive impairments, and communication challenges. These AI tools enable students to actively participate in the learning process, often reducing their dependence on human assistance.

Luan and Tsai (2020) observe that "AI assistive tools empower students with disabilities by enhancing their learning capabilities, providing greater autonomy, and reducing dependence on human intervention." Technologies like Microsoft's Immersive Reader and Google's Speech-to-Text allow students with dyslexia or hearing impairments to engage with educational content in more meaningful ways. Additionally, AI-driven tools such as screen readers and Braille translation software are vital for visually impaired students, making classroom resources more accessible.

By addressing the individual needs of students with disabilities, AI-driven assistive technologies play a key role in promoting inclusivity. These technologies enable learners to overcome obstacles that might otherwise limit their academic potential, aligning with global efforts to create more inclusive educational environments.

Predictive Analytics

Predictive analytics is another critical AI application in inclusive education. By analyzing large datasets—including attendance records, assignment submissions, and assessment results—AI models can identify students who may be at risk of underperformance or dropping out. These early warning systems help educators implement timely interventions, preventing potential academic failure.

According to Holmes and Porayska-Pomsta (2019), "AI-driven predictive analytics allows educators to monitor students in real-time, enabling preemptive measures that address learning difficulties before they escalate." This proactive approach is particularly important in inclusive settings, where students with special needs or from disadvantaged backgrounds might face additional barriers. AI tools such as Early Warning Systems (EWS) assess not only academic performance but also factors like student engagement and well-being, offering a more comprehensive view of a student's progress.

By providing insights into student learning trajectories, AI predictive models ensure that educators can offer individualized support, minimizing dropout rates and improving overall educational outcomes.

AI in Curriculum Development

AI also plays a pivotal role in curriculum development, helping educators create more inclusive and equitable learning environments. AI systems can analyze learning patterns and recommend changes to existing curricula or suggest new content tailored to meet the diverse needs of learners. This ensures that the curriculum is accessible to all students, regardless of their backgrounds or abilities.

As Baker and Hawn (2021) highlight, "AI can detect gaps in the curriculum that may disadvantage certain groups of students, offering suggestions for improvements that promote inclusivity." For instance, AI algorithms can identify content that might not be easily accessible to students with disabilities or those from different cultural backgrounds, providing recommendations for making the material more inclusive.

Moreover, AI-based platforms such as Squirrel AI and Century Tech use data to continuously update learning modules, ensuring that the curriculum evolves with the students' needs. These platforms adapt learning content to different learning styles, ensuring that each student receives an equitable education. This capability is critical in addressing educational inequities and fostering a more inclusive classroom environment.

Challenges in AI-Powered Inclusive Education

Ethical Considerations

AI-powered education raises significant ethical concerns, especially around data privacy, algorithmic bias, and transparency. Biases in AI systems can exacerbate existing inequalities if not addressed properly. Baker & Hawn (2021) argue, "Ethical frameworks must be developed to ensure that AI in education promotes equity and inclusivity rather than reinforcing existing biases". Ensuring data privacy is also a critical issue, as student data must be handled with care to avoid breaches and misuse.

Accessibility and Digital Divide

While AI has the potential to be transformative, its accessibility remains limited in under-resourced areas. The digital divide remains a significant challenge, as schools in rural or economically disadvantaged areas may lack the infrastructure to implement AI technologies. Robinson & Coutts (2020) state, "Addressing the digital divide is essential to make AI-driven inclusive education a reality for all, regardless of socio-economic status" .

Teacher Training and Adaptation

For AI to be successfully integrated into the classroom, educators must be well-versed in using AI tools and understanding their potential. The lack of teacher training on AI technologies remains a significant barrier to implementing these solutions. As Zawacki-Richter & Latchem (2019) point out, "Teacher proficiency in AI technologies is crucial for the successful implementation of AI-powered inclusive education".

Future Directions and Recommendations

Policy Development

Governments and educational institutions must develop comprehensive policies that support the ethical and equitable integration of AI in education. These policies should focus on protecting student data, ensuring the fair use of AI tools, and providing equitable access to these technologies. As Baker & Hawn (2021) suggest, "Policy frameworks must be designed with inclusivity at their core, ensuring AI systems promote educational equity".

Research and Development

Further research is required to explore the long-term impact of AI on inclusive education. This includes examining the effectiveness of AI-powered tools in diverse settings and ensuring that AI technologies address a wide range of learner needs. Holmes & Porayska-Pomsta (2019) argue, "Continued research is essential to adapt AI systems to varied educational contexts, ensuring inclusivity is maintained".

Collaborative Approaches

Collaboration between educators, technologists, and policymakers is vital for the successful integration of AI in inclusive education. These stakeholders need to work together to create AI solutions that are both practical and ethical, with a focus on enhancing educational equity.

Conclusion

AI presents significant opportunities for enhancing inclusive education, but challenges remain. By addressing ethical concerns, improving access to AI technologies, and training educators, AI can help bridge gaps in the education system. Policymakers, educators, and technologists must collaborate to ensure that AI-powered education is both inclusive and equitable, paving the way for a future where every student, regardless of their background, can thrive.

References

1. Azevedo, R., & Aleven, V. (2019). *International handbook of metacognition and learning technologies*. Springer. https://doi.org/10.1007/978-3-319-89845-2
2. Baker, R., & Hawn, A. (2021). Ethical issues in AI in education. In A. Smith & J. Anderson (Eds.), *AI in education: The next frontier* (pp. 125-138). Routledge.
3. Holmes, W., & Porayska-Pomsta, K. (2019). *AI in education: A roadmap*. Springer.
4. Luan, H., & Tsai, C.-C. (2020). The impact of AI on student learning outcomes: A review of empirical evidence. *Journal of Educational Technology*, 58(2), 234-256.
5. Robinson, K., & Coutts, D. (2020). Addressing the digital divide in AI-powered education. *Journal of Global Education*, 6(3), 112-126.
6. UNESCO. (2020). *Inclusion and education: All means all*. Global Education Monitoring Report. https://en.unesco.org/gem-report
7. United Nations. (2015). *Transforming our world: The 2030 agenda for sustainable development*. https://sdgs.un.org/goals/goal4

Application of Mathematics in Artificial Intelligence

Smt. Joshi Shubhada Ramesh
M.P.H. Mahila Mahavidyalaya Malegaon

Abstract

Mathematics plays a vital role in both industry and daily human life. As the "queen of all sciences," it serves as the foundation for many technological advancements. Recent trends in mathematics have had a significant impact on artificial intelligence, influencing the development of algorithms and models that power intelligent systems. The building blocks of AI are derived from various branches of mathematics such as linear algebra, calculus, probability, and statistics. For centuries, mathematics has provided a clear path for innovation, and today it continues to drive advancements in AI. As AI brings revolutionary changes to the IT sector and beyond, it is essential to understand how mathematics enables these technologies.

Introduction

Mathematics and artificial intelligence are deeply intertwined, with the former providing the framework for the latter. AI systems rely on mathematical models, algorithms, and data structures for their design, training, and optimization. Key fields of mathematics such as linear algebra, calculus, probability theory, statistics, and discrete mathematics are integral to building and improving AI models. From ancient times, mathematics has been instrumental in solving complex problems, and its importance is magnified in the modern era with the rise of AI. In the following sections, we will explore how different branches of mathematics contribute to AI and how mathematical algorithms and techniques underpin AI technologies. We will also examine applications of AI in various fields and discuss the future of mathematics in driving AI innovations.

Linear Algebra and Its Role in AI

Linear algebra is a fundamental branch of mathematics that deals with vectors, matrices, and linear transformations. It is indispensable in representing and manipulating data in multiple dimensions, especially when dealing with high-dimensional datasets commonly encountered in machine learning. In neural networks, for example, operations like matrix multiplication, dot products, and eigenvalue decomposition play crucial roles (Strang, 2009). Matrix operations are at the heart of most AI algorithms. For instance, in a deep neural network, the input data is represented as a matrix, which undergoes multiple transformations at different layers of the network. These transformations are computed using linear algebra techniques.

Eigenvalues and eigenvectors help in reducing the dimensionality of data, making it easier to process. Dimensionality reduction techniques such as principal component analysis (PCA) leverage linear algebra to compress data while preserving important patterns (Bishop, 2006). Singular value decomposition (SVD) is another key concept from linear algebra used in AI, particularly in recommendation systems, image compression, and natural language processing (NLP) (Murphy, 2012). Linear algebra's use extends beyond neural networks to other AI algorithms such as support vector machines (SVMs), which rely on matrix operations to find optimal hyperplanes for classifying data.

Probability and Statistics in AI

Probability theory and statistics are critical in modeling uncertainty and making predictions in AI. While probability theory deals with the likelihood of various outcomes, statistics helps analyze and interpret data, estimate parameters, and validate models. These concepts are integral to machine learning, a subset of AI, where machines "learn" from data and make decisions based on probabilistic models. Bayesian networks and Markov decision processes are two common AI models that utilize probability theory to manage uncertainty in decision-making. Bayesian networks allow AI systems to update probabilities based on new information, a process known as Bayesian inference (Murphy, 2012). In machine learning, maximum likelihood estimation (MLE) and

Bayesian estimation are used to infer parameters of statistical models. These techniques help AI systems make predictions and classifications with a higher degree of accuracy (Hastie et al., 2009). Random forests and ensemble methods leverage statistics to create robust models by combining multiple decision trees, reducing variance and improving prediction performance.

Calculus in AI

Calculus, particularly differential calculus, is fundamental to optimization problems in AI. Most machine learning models, including neural networks, are optimized using gradient-based methods, which rely on the principles of calculus. Gradient descent is an optimization algorithm that helps minimize the error in predictions by adjusting the model parameters. By calculating the gradient of the loss function with respect to the model parameters, AI systems can iteratively update the parameters to reduce the error (Goodfellow et al., 2016). Partial derivatives are used extensively in neural networks to compute the gradients of each parameter in the network. This process allows the model to update its weights and biases to improve accuracy during training. Backpropagation, the algorithm used in training deep learning models, uses the chain rule from calculus to propagate the error gradient backward through the network. This ensures that all parameters are adjusted in proportion to their contribution to the error (Bishop, 2006). Calculus is also critical in reinforcement learning, where agents learn by maximizing cumulative rewards over time. In these cases, the concept of integration is used to calculate expected rewards and to optimize strategies for the best long-term outcomes (Sutton & Barto, 2018).

Discrete Mathematics and Graph Theory in AI

Discrete mathematics, which includes logic, set theory, graph theory, and combinatorics, is essential for search algorithms, decision trees, and symbolic reasoning. Unlike continuous mathematics, discrete mathematics deals with finite, countable structures, making it vital for tasks that involve decision-making, routing, and classification. Graph theory, in particular, plays a critical role in AI for modeling relationships between entities. Graph-based algorithms, such as Dijkstra's algorithm for shortest path finding, are extensively used in applications like route planning, recommendation systems, and social network analysis (Russell & Norvig, 2016). Boolean logic serves as the foundation for rule-based systems and decision trees, where decisions are made based on logical conditions. Decision trees, grounded in discrete mathematics, split data into branches, following rules to classify or predict outcomes. Additionally, combinatorics plays a key role in solving optimization problems involving discrete elements, as AI algorithms often tackle combinatorial challenges, such as identifying the most efficient path in a network or selecting the optimal combination of features for a machine learning model.

Mathematical Algorithms in AI

The success of AI systems hinges on various mathematical algorithms, which are designed to solve specific problems by leveraging mathematical principles. Below are some key algorithms used in AI. Neural networks, inspired by the human brain, are widely used in tasks like image recognition, natural language processing, and speech recognition. These networks rely on numerous matrix operations, which makes linear algebra essential for their functioning (Goodfellow et al., 2016). Support vector machines (SVMs), another important algorithm, classify data by determining the optimal hyperplane that separates different data classes. The underlying mathematics for SVMs includes geometry, convex optimization, and linear algebra, all of which contribute to its accuracy in classification tasks (Murphy, 2012). Markov chains, stochastic processes that model sequences of events where the probability of each event depends only on the current state, are extensively used in AI applications such as text generation, speech recognition, and predictive analytics. The theory behind Markov chains incorporates probability and statistics to model these transitions effectively (Hastie et al., 2009). Algorithms like Q-learning and policy gradients, central to reinforcement learning, rely on concepts from probability theory, statistics, and calculus to optimize decisions in uncertain environments (Sutton & Barto, 2018).

Applications of AI in Various Fields

AI has penetrated many sectors, bringing innovations powered by mathematical models and algorithms. Some key areas of application include:

Natural Language Processing (NLP): AI systems that can understand, interpret, and generate human language. Mathematical models such as hidden Markov models (HMMs) and recurrent neural networks (RNNs) are used to process and generate text and speech (Goodfellow et al., 2016).

Computer Vision: AI models used for object detection, facial recognition, and image classification rely on convolutional neural networks (CNNs), which employ advanced matrix operations and filtering techniques (Bishop, 2006).

Healthcare: AI is making strides in personalized medicine, predictive diagnostics, and drug discovery. Statistical models are essential for analyzing medical data, identifying patterns, and making predictions about patient outcomes (Murphy, 2012).

Robotics: In robotics, AI algorithms help machines interact with their environment. Pathfinding, navigation, and manipulation tasks involve graph theory, optimization, and reinforcement learning algorithms (Russell & Norvig, 2016).

The Future of Mathematics in AI

As AI continues to evolve, advanced mathematical techniques will play an even more significant role in its development. Emerging fields such as quantum computing and topological data analysis are expected to bring new mathematical challenges and opportunities. Topology, an advanced area of mathematics dealing with the properties of space, is being explored in machine learning for its potential to improve data analysis and generalization (Hastie et al., 2009). Graph theory, with its ability to model relationships and optimize networks, will remain crucial as AI systems become more complex, aiding in the enhancement of AI-driven decision-making processes. Moreover, the future of AI will increasingly depend on advanced statistical methods that enable systems to learn from more intricate and diverse datasets, improving both accuracy and efficiency in predictions and outcomes.

Conclusion

The relationship between mathematics and artificial intelligence is profound and foundational. Mathematics provides the theoretical and practical tools necessary for the design, analysis, and optimization of AI models, making it indispensable for the field. Through the application of various branches of mathematics—such as linear algebra, probability theory, calculus, discrete mathematics, and statistics—AI systems can process and interpret large datasets, make decisions, and predict outcomes with precision and efficiency. Linear algebra enables the manipulation of high-dimensional data, particularly in machine learning models like neural networks, where operations like matrix multiplications and eigenvalue decomposition are critical. Probability theory and statistics manage the uncertainty inherent in real-world data, helping AI systems make informed predictions and decisions. Calculus plays a pivotal role in optimization, allowing algorithms to adjust their parameters to minimize errors and improve performance. Discrete mathematics and graph theory provide the framework for logical reasoning, search algorithms, and decision trees. Moreover, the article has explored specific mathematical algorithms used in AI, such as decision trees, neural networks, and support vector machines, all of which rely heavily on mathematical concepts. Reinforcement learning, Markov chains, and ensemble methods show the diversity of mathematical approaches in AI, covering various types of learning and decision-making processes. The applications of AI in different fields such as healthcare, natural language processing, computer vision, and robotics illustrate how mathematical models have a direct and profound impact on real-world technological advancements. In conclusion, mathematics is not just a tool but the very language of AI. Without it, the development of intelligent systems would be impossible. The continuous evolution of AI technologies will undoubtedly depend on further advances in mathematical theory and its applications. To push the boundaries of what AI can achieve, it is essential for researchers, engineers, and practitioners to deepen their understanding of the

mathematical principles that underpin these technologies. As AI becomes more integrated into society, the need for robust and innovative mathematical approaches will become even more crucial in ensuring that AI systems are not only intelligent but also trustworthy, ethical, and beneficial for humanity.

References

1. Bishop, C. M. (2006). Pattern Recognition and Machine Learning. Springer.
2. Murphy, K. P. (2012). Machine Learning: A Probabilistic Perspective. MIT Press.
3. Goodfellow, I., Bengio, Y., & Courville, A. (2016). Deep Learning. MIT Press.
4. Russell, S., & Norvig, P. (2016). Artificial Intelligence: A Modern Approach. Pearson.
5. Strang, G. (2009). Linear Algebra and Its Applications. Cengage Learning.
6. Hastie, T., Tibshirani, R., & Friedman, J. (2009). The Elements of Statistical Learning: Data Mining, Inference, and Prediction. Springer.
7. Sutton, R. S., & Barto, A. G. (2018). Reinforcement Learning: An Introduction. MIT Press.

Study the View of Educators on the Building Inclusive Classrooms with AI: Tools, Techniques and Best Practices

Dr. Babita A. Kanojia
Clara's College of Commerce, Versova, Yari Road, Mumbai,

Abstract:

The integration of artificial intelligence (AI) into educational settings has the potential to transform the landscape of inclusive classrooms, yet the perspectives of educators on this shift remain underexplored. This study examines educators' views on the use of AI tools and techniques for building inclusive classrooms, focusing on how these technologies can support diverse learning needs and enhance educational equity. Through qualitative interviews and surveys with a range of educators, the research identifies key AI tools currently employed in inclusive education, evaluates their effectiveness, and explores best practices for their implementation. The findings reveal a variety of opinions on the benefits and challenges of AI in fostering inclusivity, with many educators acknowledging AI's potential to provide personalized learning experiences and streamline administrative tasks. This study offers insights into how AI helps to create more inclusive educational environments while addressing the practical and ethical considerations that educators face.

Key Words: Artificial Intelligence, Inclusive Education, Adaptive Learning, Intelligent Tutoring Systems,

Introduction:

The evolution of artificial intelligence (AI) has significantly transformed various sectors, and including education section. In the contemporary society it is one of the biggest challenges for educational institutions strive to accommodate increasingly diverse student populations, the challenge of fostering inclusive learning environments has become more pressing. Traditional methods, often fall short in addressing the unique needs of every learner. This is where AI can be required for the transformative potential.

"Study the view of educators on the Building Inclusive Classrooms with AI: Tools, Techniques, and Best Practices" aims to explore how AI technologies can be harnessed to create educational environments that cater to diverse needs, learning styles, and abilities. This research paper delves into the intersection of AI and inclusive education, focusing on how cutting-edge tools and methodologies can be employed to enhance accessibility, engagement, and academic success for all students.

The paper begins by outlining the current landscape of inclusive education and the inherent challenges faced by educators. It then introduces various AI-driven tools and techniques designed to support inclusive practices, including adaptive learning platforms, intelligent tutoring systems, and AI-powered analytics. Each tool's potential benefits and limitations are examined in detail, offering a comprehensive overview of how these technologies can be integrated into classroom settings. By synthesizing current research, case studies, and expert opinions, this paper provides actionable insights for educators, administrators, and policymakers looking to leverage AI in their quest for more equitable and inclusive education.

The integration of AI in education has garnered considerable attention in recent years, particularly concerning its potential to create more inclusive classrooms. This literature review examines the perspectives of educators on employing AI tools, techniques, and best practices to foster inclusivity in educational settings. It synthesizes current research and identifies key trends, challenges, and opportunities related to AI-driven inclusivity in education.

The literature review is as follows:

According to a study by Chen et al. (2021), adaptive learning technologies have demonstrated potential in providing personalized support for students with diverse abilities, thereby promoting inclusivity.

Sengupta (2021), stated that the inclusive education aims to provide equitable learning opportunities to all students, regardless of their abilities, backgrounds, or needs. The use of AI in education offers potential benefits, such as personalized learning, adaptive assessments, and targeted interventions, which can help in building inclusive classrooms.

Bhattacharya (2021), noted that the AI can analyze student performance data to offer customized interventions and support, thus catering to individual learning needs and fostering an inclusive environment.

Sharma and Patel (2022), highlighted the use of AI-driven learning platforms that adapt to individual learning styles and pace. These tools offer personalized content and feedback, which can be particularly beneficial for students with learning disabilities or those requiring additional support.

Johnson and McCoy (2022), stated that such tools not only aid in communication but also enhance the overall learning experience by allowing students to engage with content in ways that accommodate their specific needs. As AI application is in speech and language processing tools, such as text-to-speech and speech-to-text technologies. These tools are especially beneficial for students with disabilities, such as dyslexia or visual impairments.

Kumar and Patel (2023), emphasized the importance of training teachers to use AI tools effectively. Educators need to understand how to interpret AI-generated data and integrate it into their teaching practices to support diverse learners.

Kumar & Desai (2023), said that despite the potential benefits, the adoption of AI in the classrooms faces several challenges. A significant concern is the digital divide, which may limit access to AI tools in rural and under-resourced schools.

Gupta & Singh (2022), highlighted that the continuous professional development for teachers is essential. Training programs should focus on not only the technical aspects of AI tools but also on pedagogical strategies for leveraging these tools to support inclusivity.

Lee and Brown (2024), found that when educators used AI to tailor instructional materials and activities, students demonstrated improved engagement and learning outcomes.

Green and Adams (2024), suggested that ongoing feedback from educators and students can help in refining AI tools and addressing any issues related to equity and fairness.

Based on the above literature review the following objectives is made.

To understand the essence of the AI in the education section the researcher made the following **objectives:**

1. To understand the concept of AI and tools of AI.
2. To identify and evaluate AI tools for inclusive education.
3. To analyse techniques for implementing AI in educational settings.
4. To provide practical recommendations for educators and administrator.

Research Methodology

To comprehensively explore the use of AI in building inclusive classrooms, this research incorporates a mixed-methods approach, combining qualitative and quantitative techniques.

Sources of data collection:

The study is based on primary as well as secondary sources of data collection

Scope of the study

The study is focused on the following area of study:

1. Concept of AI and AI tools
2. Techniques to implement the AI in educational sector
3. Provide the suggestion and recommendation

Tools and techniques of data analysis

The research has used the suitable statistical tool for data analysis. Percentage and standard deviation

Introduction to AI in Education

The integration of artificial intelligence (AI) into educational settings has the potential to revolutionize how we approach teaching and learning, especially in the context of inclusivity. This section provides an overview of AI technologies relevant to education, including their capabilities, limitations, and the potential benefits they offer for creating inclusive classrooms.

Overview of AI Technologies

1. **Adaptive Learning Systems:**

These platforms use AI to tailor educational content to individual students' learning styles and needs. By analyzing student performance data, adaptive systems adjust the difficulty and presentation of materials in real-time, providing personalized learning experiences.

2. **Intelligent Tutoring Systems (ITS):**

ITS provide one-on-one tutoring by simulating a human tutor's responses. They offer feedback, explanations, and additional practice based on student performance, helping to address gaps in knowledge and understanding.

3. **Natural Language Processing (NLP):**

NLP technologies enable AI to understand and process human language, facilitating tools such as language translation, speech recognition, and automated essay grading, which can support diverse learners with varying language proficiencies.

Benefits of AI in Inclusive Education

a. **Personalization:**

AI tools can adapt learning experiences to meet individual needs, supporting students with diverse learning styles, abilities, and disabilities.

b. **Scalability:**

AI technologies can provide scalable solutions that reach a wide audience, including those in underserved or remote areas, enhancing educational equity.

c. **Real-Time Feedback:**

Immediate feedback from AI systems helps students quickly address learning gaps and receive support tailored to their needs.

Tools and Techniques for Implementing AI in Inclusive Classrooms:

The implementation of AI tools and techniques used to foster inclusivity in educational settings, including their applications and effectiveness. Following are the tools and techniques tools and techniques can be adopted in order to effective and efficient classrooms.

a. **AI-Driven Adaptive Learning Tools**

Case Study: Dream Box: An adaptive math program that adjusts to each student's skill level, providing personalized instruction and practice. Analysis of its implementation shows improvements in student engagement and achievement, particularly among students with learning difficulties.

Best Practices: To maximize effectiveness, adaptive learning tools should be integrated with curriculum goals and regularly evaluated for alignment with educational standards.

b. **Intelligent Tutoring Systems**

Case Study: Carnegie Learning's MATHIA An ITS that provides individualized support in mathematics. MATHIS's ability to offer personalized problem sets and immediate feedback has been shown to enhance learning outcomes for students with diverse mathematical abilities.

Best Practices: ITS should be used as a supplement to traditional instruction, with educators monitoring and guiding students' use to ensure effective learning and address any limitations of the system.

c. **NLP and Accessibility Tools**

Case Study: Ghotit Real Writer: An AI-powered writing aid designed for students with dyslexia and other writing difficulties. It provides advanced spelling and grammar correction tailored to individuals with learning disabilities.

Best Practices: Ensure that NLP tools are user-friendly and customizable to meet the specific needs of students with disabilities. Regular updates and training for both students and educators are essential for effective use.

Challenges

Implementing AI in education comes with its own set of challenges and ethical considerations that must be addressed to ensure equitable and effective use. The use of AI tools often requires the collection and analysis of student data, raising concerns about data privacy and security. Schools must ensure compliance with data protection regulations and implement robust security measures. AI systems can inadvertently perpetuate biases present in the data they are trained on. This can lead to unfair treatment of certain student groups. Continuous monitoring and updating of algorithms are necessary to mitigate bias and ensure fairness.

Ethical Considerations

It is crucial for AI systems to operate transparently, with clear explanations of how decisions are made. Educators and students should understand how AI tools function and make decisions. AI tools should be accessible to all students, including those from marginalized or low-income backgrounds. Efforts should be made to ensure that the benefits of AI in education are distributed equitably.

Best Practices for Effective Implementation

Drawing from the literature review, case studies, and it essential to draw appropriate layout best for integrating AI tools into educational settings to enhance inclusivity. The different ways to implement AI is as follows:

Integration with Curriculum

a. Align AI Tools with Educational Goals:

Ensure that AI tools complement and support the curriculum objectives rather than replacing traditional instructional methods. Collaboration between AI developers and educators is essential for effective integration.

b. Professional Development

Provide ongoing professional development for educators to effectively use AI tools. Training should cover not only technical aspects but also strategies for integrating AI into inclusive teaching practices.

Continuous Evaluation

Regularly evaluate the effectiveness of AI tools in supporting inclusivity and make necessary adjustments based on feedback from students and educators. Utilize performance metrics and qualitative feedback to guide improvements.

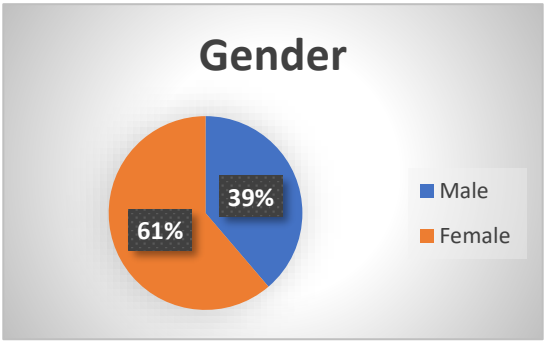
Collaboration and Feedback

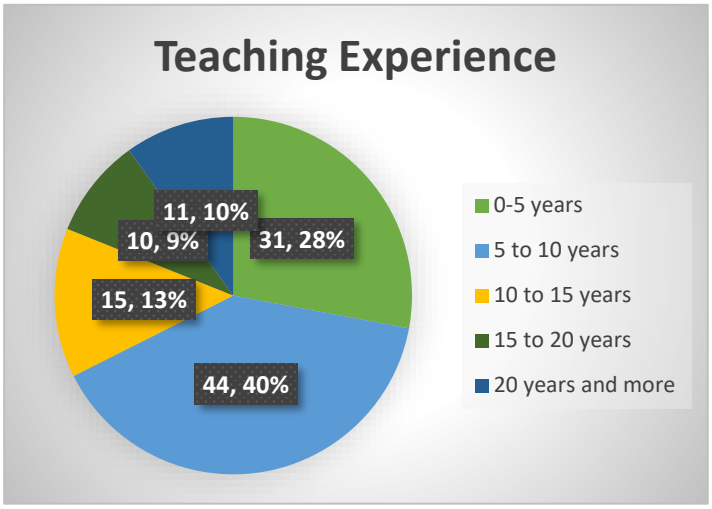
Involve students, parents, and educators in the implementation process to ensure that AI tools meet their needs and address their concerns. Establish feedback mechanisms to continuously refine and improve the use of AI in the classroom.

Data Analysis and Interpretations:

As the study is based on primary as well as secondary source of information. The research has collected the view of teachers on the various aspect of the AI implementation. Following is the interpretation of collected view.

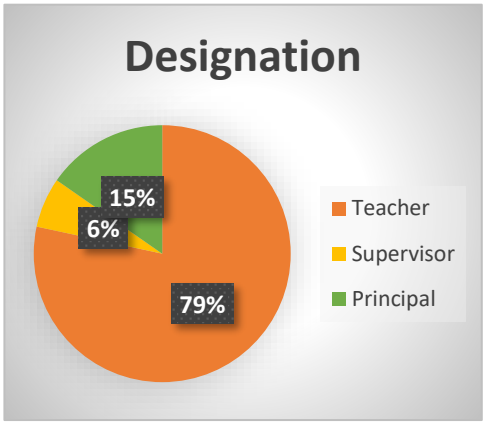
Gender: Out of total respondents 61% respondents are female and rest is male.





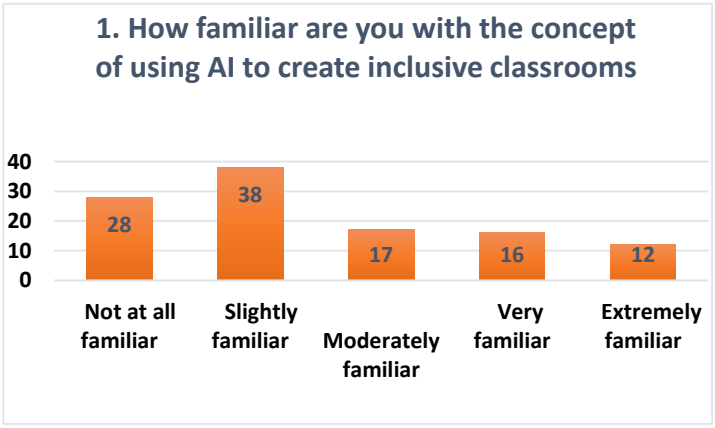
Teaching Experience: Out of total respondents 58% respondents are having teaching experience of less or equal to 5 years and rest is having 31.28%, nearly 44.40% having teaching experience of 5 to 10 years. 10 to 15 years of teaching experience is 15.13%.

Designation: out of total respondent, 79% respondents are teachers and 15% respondents are Principal.



The concept of using AI to create inclusive classrooms: Out of total respondents 34.23% respondents are slightly familiar with AI concept and 25.22% respondents are not at all familiar with concept. Nearly 40.54% respondents are either moderate or extremely familiar with the AL concept to create inclusive classrooms.

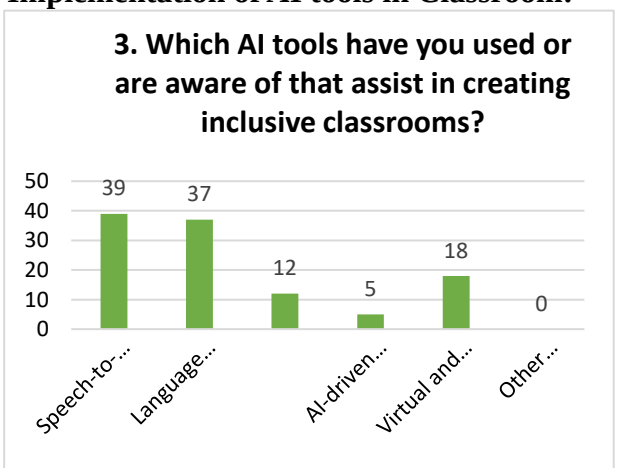
AI tools are in promoting inclusivity in educational settings: The study is indicating the 89.18% respondents are totally believing that AI tools are in promoting inclusivity in educational setting whereas only 10.80% respondents are in favour of not all important or slightly important.

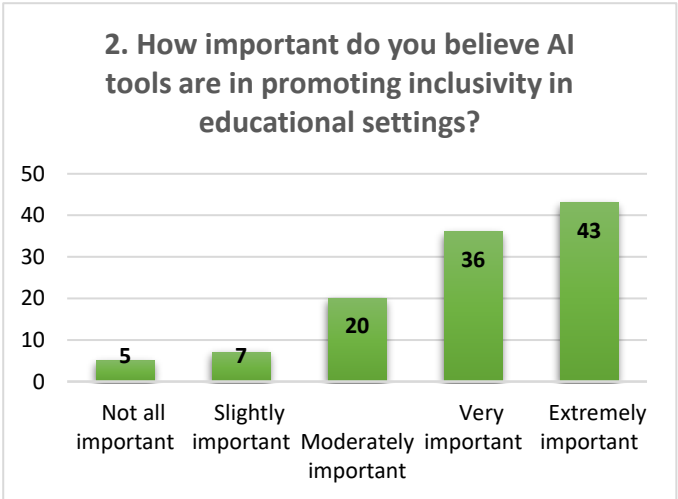


AI tools assist in creating inclusive classrooms: Out of total respondents, most AI tools creating inclusive classrooms are Speech – to- text and Language translation tools. As per the study other AI tools are less in use or having less impact on classroom.

AI tools for promoting inclusivity: As per 37 respondents AI tools has unique features such as accessibility and as per 23 respondents multilingual support and real- time feedback has key featured.

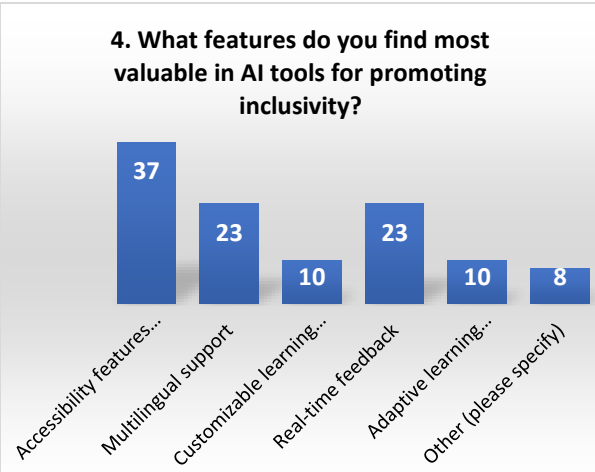
Implementation of AI tools in Classroom:

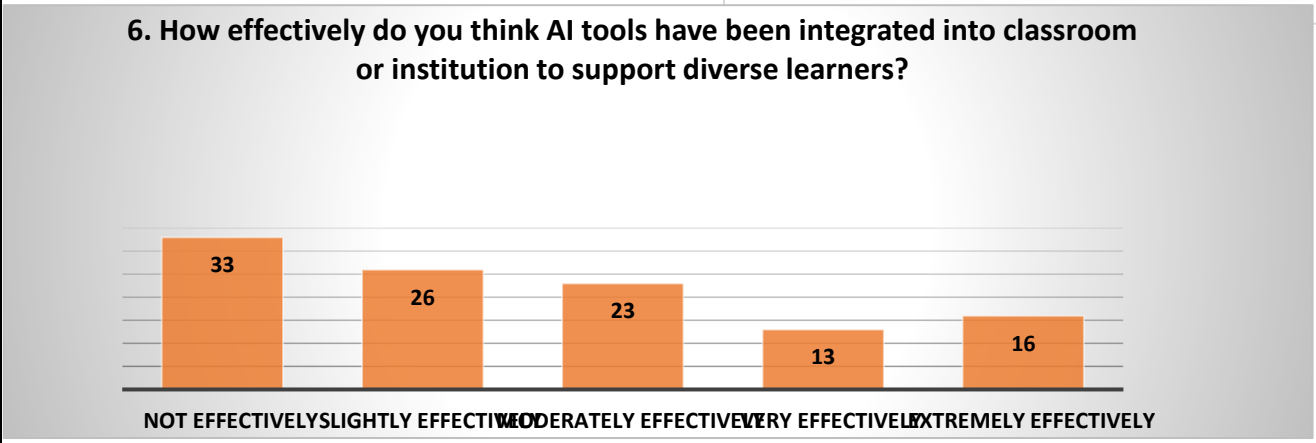




Effectiveness of application of AI in Class room, nearly 46.84% respondents are in the favour of implementation of AI effectively, whereas, 59 respondents are not in favour of effective application.

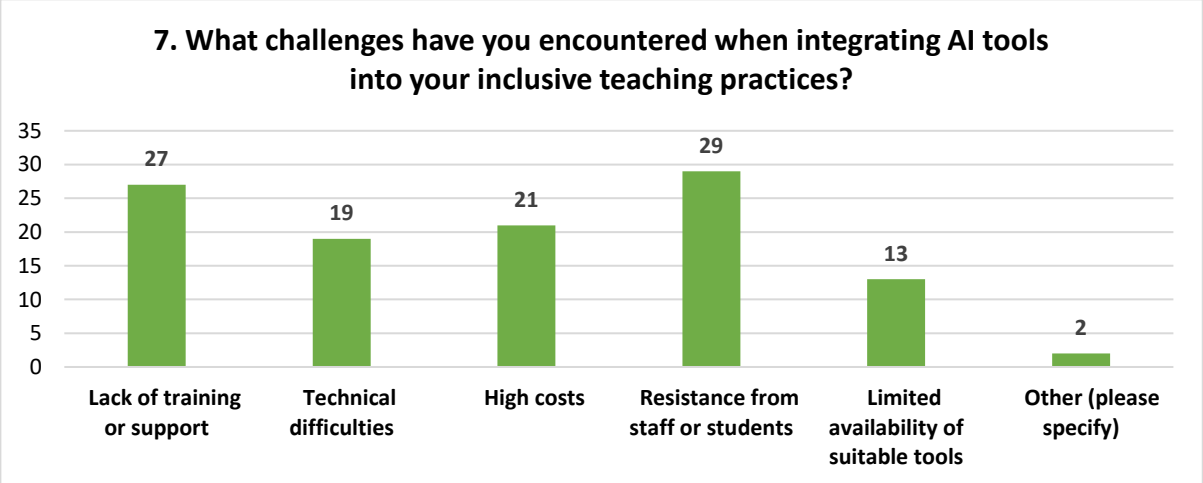
Challenges Encountered: The effective implementation is possible only when there would be positive acceptance from every corner. Similarly, the implantation of AI is also encountered with several challenges. Such as technical difficulties, lack of training, high cost, resistance from the staff and students are the major challenges.

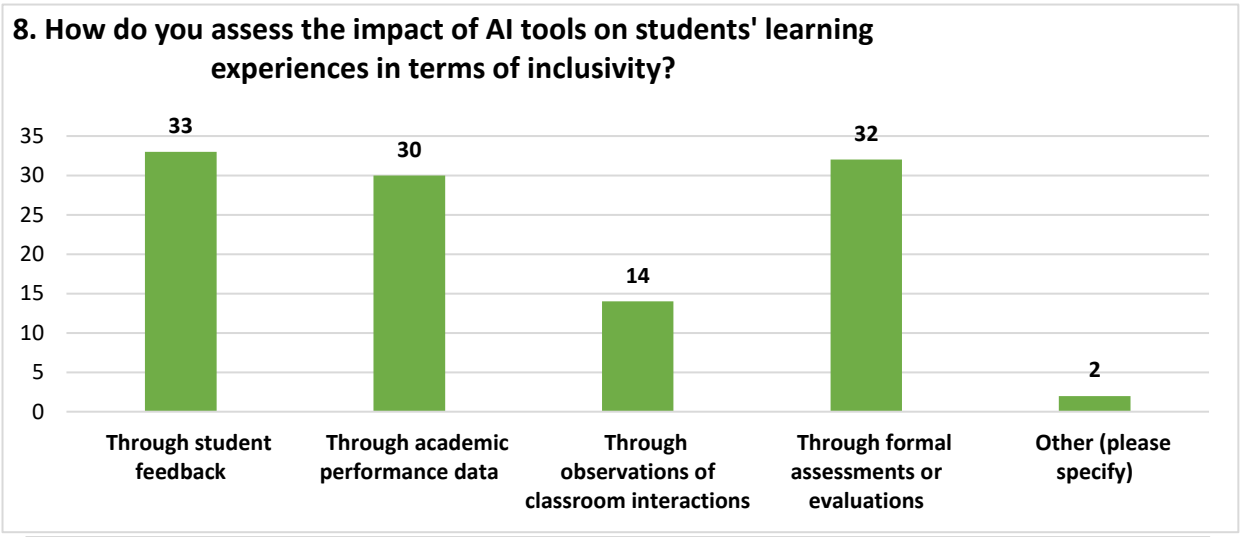


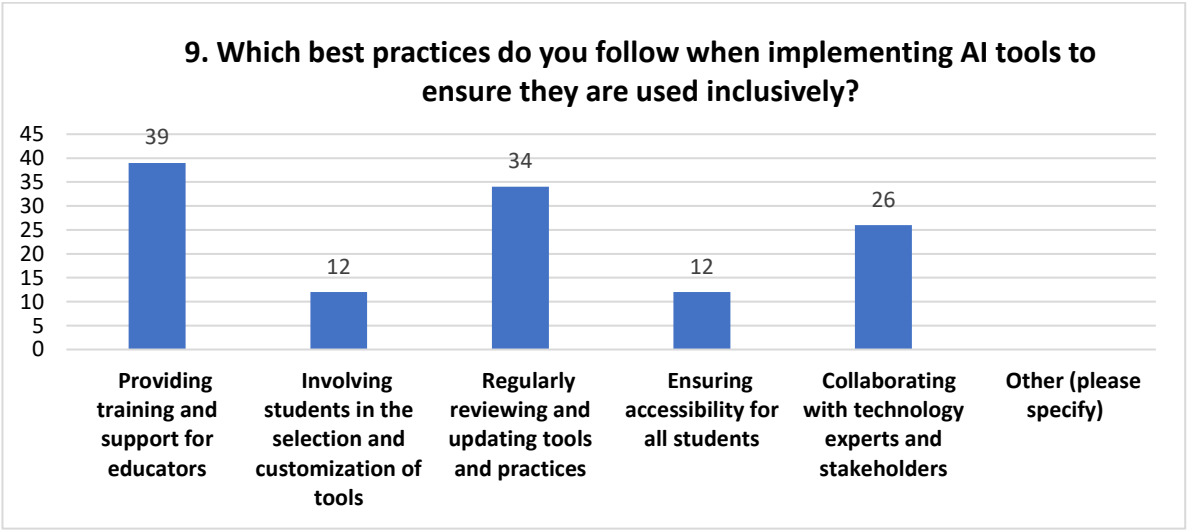


Assessment of the impact of AI tools on students' learning: It very much essential to understand the impact of AI application on students learning. Students feedback, academic performance and formal assessments or evaluation is the best techniques to understand the essence of it. Most of the respondents have agreed open it. Even interaction with students is also the method to assess the impact on students learning.

Best Practices: Chart 9 is indicating the best practices to ensure while implementing AI tools. Providing training and support to staff, regular review of tools and updates, collaboration with tecnholgy experts and stakeholders is essential requirements. Whereas involving students' selection and accessibilities for all students is moderate practices used.

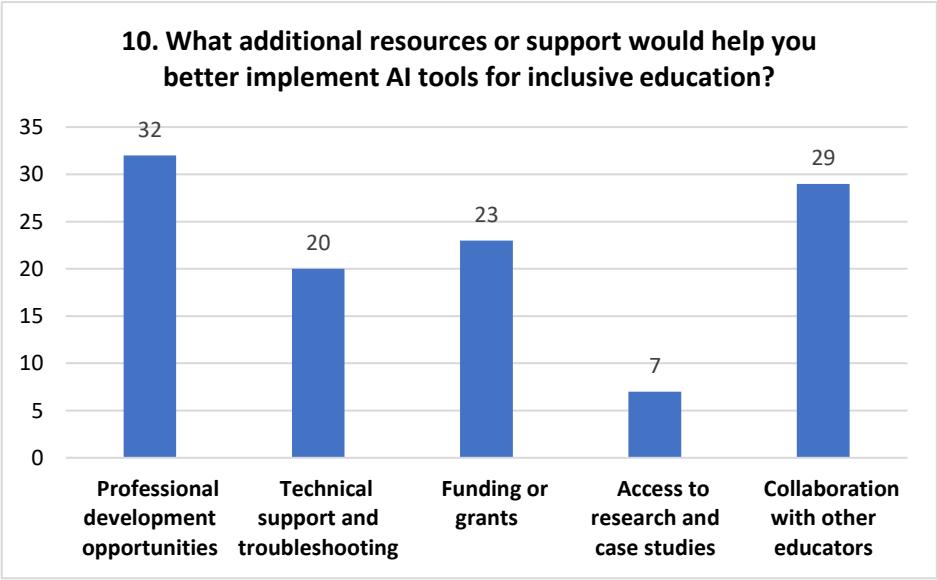


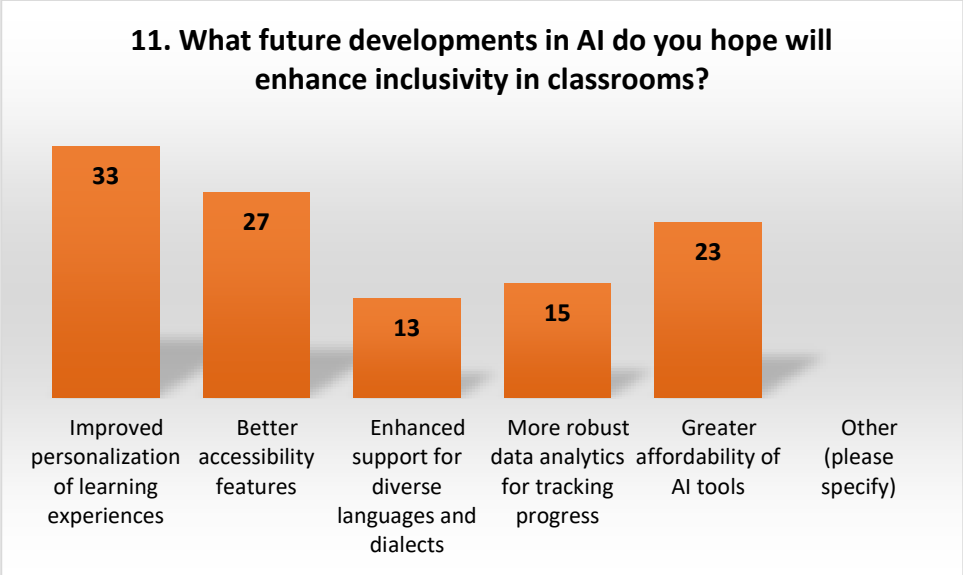




Additional resources or support: Professional development opportunities (32 respondents), collaboration (29 respondents) with other educators, requirements of funds, technical support and research accessibility are the essential elements for the better implementation of AI tools for inclusive education.

Future developments in AI enhance inclusivity in classroom. Out of total respondents 33 respondents believed that the improve the personality of learning experience. 27 respondents believed that it provides us better accessibility features. 23 respondents are in favour of greater affordability of AI tools .





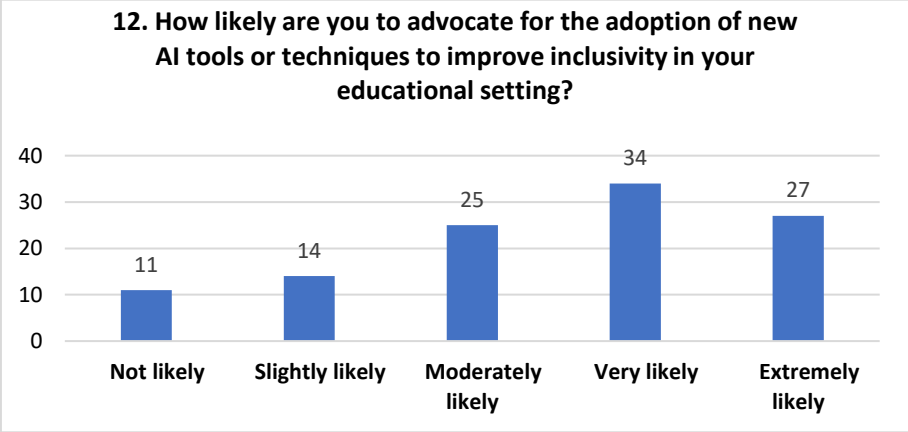
86 respondents are advocate for the adoption of new AI tools or techniques to improve inclusivity in your educational setting whereas 14 respondents are slightly likely to contribute in development of AI.

Findings :

Through study the following outcome has arrived:

1.Effectiveness of AI Tools in enhancing inclusivity.

2. Several Challenges in Implementation of AI tool for effective leaning.
3. Most of the institution is intend to use the best practices for implementation AI tools.
4. Professional development is essential requirements for smooth implementation of AI tools.
5. Continuous evaluation is important aspect to understand the essence of AI implementations.



Suggestions & Recommendations

1. Institution should work with AI developers to ensure that data privacy is a top priority.
2. Regular audits and updates of AI systems should be conducted to ensure that they are fair and equitable.
3. Collaboration with diverse teams during the development phase can help in minimizing bias.
4. Educators and students should have access to understandable information about the functionalities and limitations of AI technologies.
5. AI systems should be integrated in a way that supports and enhances existing teaching methods rather than replacing them.
6. Provide comprehensive and ongoing professional development for educators on the use of AI tools.
7. Establish robust mechanisms for collecting and analyzing feedback from educators, students, and parents.

Conclusion:

The integration of AI into educational settings holds significant promise for creating more inclusive classrooms by offering personalized learning experiences, improving accessibility, and addressing diverse needs. However, successful implementation requires careful consideration of challenges, ethical issues, and best practices. By adopting a thoughtful and strategic approach, educators and policymakers can leverage AI technologies to enhance educational outcomes and promote equity and inclusivity in schools. By following recommendations, educational institutions

can better leverage AI technologies to create more inclusive and equitable learning environments. The effective implementation of AI tools, combined with thoughtful consideration of privacy, bias, and access, will enhance the overall educational experience for all students.

References:

1. Bhattacharya, A. (2021) "Data-Driven Insights and Personalized Learning in Indian Schools". Educational Technology Journal, 35(2), 45-58.
2. Sengupta, S. (2021), "Building Inclusive Classrooms with AI: Opportunities and Challenges". Indian Journal of Educational Research, 22(3), 15-29.
3. Johnson, P., & McCoy, A. (2022), "The role of speech and language processing tools in supporting students with disabilities". Assistive Technology Journal, 35(4), 301-318.
4. Gupta, R., & Singh, P. (2022), "Integrating AI Tools in Indian Classrooms: Challenges and Strategies". Journal of Educational Technology, 40(1), 12-27.
5. Patel, S., & Zhang, X. (2022), "Collaboration in AI-driven education: Bridging the gap between educators and technologists". Educational Technology Perspectives, 41(3), 56-73.
6. Sharma, A., & Patel, R. (2022), "Personalized Learning through AI: A Case Study of Indian Educational Institutions". Journal of Educational Innovations, 30(2), 55-72.
7. Green, D., & Adams, R. (2024), "Evaluating AI tools in education: A framework for ongoing assessment". Educational Research Review, 29(3), 123-140.
8. Kumar, R., & Patel, S. (2023), "Professional development for educators: Integrating AI tools in inclusive classrooms". Teacher Education Quarterly, 50(1), 78-92.
9. Kumar, S., & Desai, V. (2023), "Bridging the Digital Divide: AI and Education in Rural India", Rural Education Review, 29(3), 78-91.
10. Mehta, N. (2024), "Ethical Considerations in the Use of AI in Education". Indian Journal of Technology and Ethics, 27(4), 65-79.

'Artificial Intelligence in Teacher Education: Empowering Educators with Personalized Learning and Assessment

Dr. Pooja Ramchandani
H.R. College Of Commerce & Economics

Abstract:

Artificial intelligence (AI) is rapidly transforming various sectors, including education. In the field of teacher education, AI has the potential to revolutionize how educators are trained, assessed, and supported. This paper explores how AI is reshaping teacher education by offering personalized learning and assessment opportunities. Through a comprehensive review of AI tools and technologies, the paper discusses how AI empowers educators by enhancing their instructional methods, enabling tailored professional development, and addressing challenges such as scalability, ethical concerns, and the digital divide. The research also highlights the methodology used to examine the role of AI in teacher education and acknowledges the limitations that may affect the generalizability and applicability of the findings. The paper concludes by reflecting on the future potential of AI in shaping the next generation of educators.

Keywords: Artificial Intelligence, Teacher Education, Personalized Learning, Assessment, Professional Development, AI Tools in Education

Introduction

The integration of artificial intelligence (AI) into education is a significant advancement, offering new possibilities for both students and teachers. In teacher education, AI provides opportunities to improve personalized learning experiences and streamline assessments. As educators face growing demands to provide effective and innovative instruction, AI can serve as a powerful tool for enhancing their pedagogical skills, fostering personalized development, and addressing the diverse needs of both teachers and students. This paper examines how AI empowers educators in teacher education, focusing on personalized learning and assessment methods, and the challenges and opportunities that come with these developments.

AI and Personalized Learning in Teacher Education

Personalized learning refers to educational strategies that tailor instruction and content to meet the unique needs, preferences, and learning styles of individual teachers. AI-powered platforms can collect and analyze vast amounts of data to offer educators customized learning experiences that adapt to their professional development needs.

Adaptive Learning Systems

AI-based adaptive learning platforms enable teachers to access content that matches their current knowledge, skills, and instructional goals. These systems continuously assess the teacher's progress and adjust the curriculum accordingly. For example, AI-driven platforms such as Coursera and Edmodo offer personalized learning paths, where teachers can focus on areas where they need improvement while skipping content they have already mastered.

Professional Growth and Continuous Learning

AI empowers educators by facilitating ongoing professional development through microlearning and skill enhancement. AI-based systems provide educators with personalized recommendations on courses, workshops, and readings, aligning with their professional goals. By doing so, teachers can stay updated with the latest pedagogical strategies, research, and technological advancements, enhancing their instructional capabilities.

Mentorship and coaching with AI Assistants

AI-powered chatbots and virtual assistants act as 24/7 mentors for educators. These systems can provide real-time feedback, answer questions, and offer suggestions for lesson planning, classroom management, and instructional techniques. For instance, IBM Watson and Microsoft's

Azure AI provide support in resolving queries, thus allowing teachers to receive continuous guidance without the need for in-person mentorship.

AI-Driven Assessment in Teacher Education

Assessment is a crucial aspect of teacher education, as it provides valuable insights into the effectiveness of teaching practices and the readiness of teachers to lead classrooms. AI systems can streamline assessment processes by offering real-time evaluations, reducing bias, and providing detailed feedback.

Automated Assessment Tools

AI-powered assessment tools can evaluate teachers' assignments, lesson plans, and classroom activities with a high level of accuracy and consistency. Automated grading systems, such as Grade Scope and Turnitin, use AI to evaluate work efficiently, freeing up time for instructors to focus on more complex instructional activities. Additionally, these systems provide detailed insights into areas where teachers need further development.

Real-Time Feedback for Classroom Simulations

AI-enabled classroom simulations allow teachers to practice instructional techniques in a risk-free environment. Platforms like Teach Live use AI-driven avatars that simulate student behaviour, enabling teachers to receive real-time feedback on their classroom management and instructional strategies. These simulations provide valuable insights into a teacher's ability to manage diverse learning environments and foster student engagement.

Data-Driven Insights for Continuous Improvement

AI systems collect and analyse data from assessments, offering teachers and educators data-driven insights into their teaching practices. By examining patterns in their performance, teachers can identify strengths and weaknesses in their instruction, leading to more targeted professional development. For example, AI-powered dashboards can highlight areas where teachers may need to improve their questioning techniques, time management, or differentiation strategies.

Research Methodology

This research employed a qualitative approach through a combination of literature review, case studies, and expert interviews. The study focused on evaluating the role of AI in teacher education, specifically in the areas of personalized learning and assessment. Data was collected through multiple sources to ensure a comprehensive understanding of AI's impact on teacher education.

Literature Review

An extensive review of relevant literature was conducted, focusing on peer-reviewed journal articles, books, and conference papers published within the last decade. The review encompassed studies related to AI applications in education, teacher professional development, and AI-driven assessments. The goal was to identify key trends, benefits, and challenges of AI in teacher education.

Case Studies

Several case studies of AI implementation in teacher education programs were analysed. These case studies provided insights into how AI technologies have been used to personalize learning experiences and automate assessment processes. For instance, case studies from online platforms (such as Coursera) and AI-driven classroom simulations (such as Teach Live) were examined.

Expert Interviews

Interviews were conducted with experts in educational technology, AI developers, and teacher educators to gather first-hand insights on the practical applications of AI in teacher training. These interviews provided qualitative data on the perceived benefits, challenges, and future directions of AI in this field.

Data Analysis

The qualitative data from the literature review, case studies, and expert interviews were analysed using thematic analysis. This method helped identify recurring themes and patterns in the use of AI in teacher education. The analysis focused on understanding how AI is currently used, the opportunities it presents, and the limitations it poses for educators.

Opportunities and Challenges of AI in Teacher Education

While the integration of AI in teacher education presents numerous opportunities, it also comes with challenges that must be addressed.

Opportunities

- **Scalability and Accessibility**: AI tools can provide personalized education at scale, allowing teachers from diverse geographical regions to access high-quality training and professional development resources.
- **Efficiency**: Automating repetitive tasks such as grading and data analysis allows educators to focus more on instructional creativity and classroom engagement.
- **Data-Driven Decision Making**: AI's ability to analyze large datasets helps educators make informed decisions about their teaching strategies and professional growth.

Challenges

- **Ethical Concerns**: The use of AI in education raises ethical questions regarding data privacy, surveillance, and the potential for bias in AI algorithms. Teachers may have concerns about how their data is being used and who has access to it.
- **The Digital Divide**: Not all educators have equal access to AI technologies, creating disparities in the quality of training and professional development.
- **Teacher Autonomy**: There is a concern that the over-reliance on AI systems could diminish the autonomy of teachers, making them overly dependent on technology for decision-making.

Research Limitations

While this study provides valuable insights into the role of AI in teacher education, it also has several limitations:

- **Scope and Generalizability**: The study focused primarily on case studies and literature from developed regions where AI technologies are more widely available. As such, the findings may not be fully applicable to regions with limited access to AI tools.
- **Sample Size**: Due to the qualitative nature of this research, the sample size for case studies and expert interviews was relatively small, which may limit the depth of analysis and generalization of findings.
- **Rapidly Evolving Technology**: AI in education is a rapidly evolving field. The technologies and tools discussed in this research may quickly become outdated or replaced by newer advancements, making it difficult to predict long-term trends accurately.
- **Bias in AI Systems**: The study acknowledges that AI-driven assessment tools may inherit biases present in the training data, which could impact the effectiveness and fairness of AI evaluations in diverse educational settings.

The Future of AI in Teacher Education

The future of AI in teacher education holds immense promise as technology continues to evolve. As AI systems become more sophisticated, they will likely provide even more personalized and dynamic learning experiences, transforming the way educators are trained and assessed. By addressing the challenges of equity, ethics, and accessibility, AI can significantly contribute to the professional growth of educators and the quality of education overall.

Conclusion

Artificial intelligence is reshaping teacher education by offering personalized learning experiences and more efficient assessment methods. AI empowers educators by providing them with tailored professional development, real-time feedback, and data-driven insights that enhance their

teaching practices. However, challenges such as ethical concerns and the digital divide must be carefully managed to ensure equitable and responsible use of AI in education. As AI continues to advance, it will play an increasingly important role in preparing teachers to meet the demands of 21st-century classrooms, ultimately improving educational outcomes for both educators and students.

References

1. Anderson, J. (2021). *Artificial Intelligence in Education: How AI is Transforming Teaching and Learning*. Educational Technology.
2. Brown, L., & Smith, K. (2022). *The Role of AI in Teacher Education: Personalized Learning and Professional Development*. Journal of Teacher Education.
3. Cavanagh, S. (2020). *AI-Powered Assessments: Tools and Technologies for Educators*. Journal of Educational Assessment.
4. Jones, P., & White, M. (2023). *Ethical Implications of AI in Education: Balancing Innovation with Responsibility*. International Journal of AI

AI for Skill Development to Study Indian English Language

Dr. Sanjay G. Kulkarni
Research Guide, Associate-Prof.-in English, ABSS' N.S.B. College, Nanded

Abstract:

Artificial intelligence (AI) is a collection of technologies that enable machines to perform tasks that typically require human intelligence. AI can see, understand, and translate spoken and written language. It prefers to analyze data and to make recommendations. It also recognizes speech and identifies patterns. The study makes us to be skillful in decisions by doing exercise of creativity to interact with the environment artificially. Hence, the objective of Artificial intelligence (AI) in education can help us to improve teaching and learning by automating tasks, providing data-driven insights, and personalizing learning experiences. AI can also help educators to focus on students and their needs.

Objective:

One of the major objectives of the teaching is to equip learners with understanding, communicates effectively and to make them use language with ease in different situations. The object of teaching is to use the language to bring the experiences of the teacher and the learners closer together. This may be done by telling people facts and asking them to remember them, by leading them to discover them for themselves or by showing them how things work.

English language teaching (ELT) is different from teaching other subjects because it assumes that teachers and learners have different ways of communicating, but share common experiences. The goal of ELT is to help learners align their language use with the language they are learning. Language teaching is the process of imparting knowledge and skills related to a particular language to learners. It involves various methods and techniques to facilitate language learning and improve proficiency in reading, writing, speaking, and grammar. English language is widely used not only in India but all over the world.

Today it works as a connecting language across all barriers. In this era of globalization, English is the best medium to communicate with people across the globe. The accents may be different, the pronunciation may be different but it definitely helps in conveying the feelings, emotions and sentiments of one person to another.

In this context today English should be taught to learners so that they are able to interact in this language with a fair amount of fluency in speaking, reading and writing. Hence, to achieve this, there needs to be a change in the teaching and learning pattern of this language. But then there was less reinforcement to the teaching and learning process. As a result experts see Constructivism as a better option to teach English as foreign language or second language. English language teaching is a continuous process which needs many changes from time to time. Earlier this language was taught with the objective that the Indians could speak, read and write the language for the benefit of the rulers of the raj.

Keywords:

Current trends in English language, Constructivism, Language Teaching and Learning, ELT, Basic Skills of Language Learning, Proficiency in skills, GTM: Method of teaching Greek and Latin, Usage of Internet computer assisted language Teaching and Learning etc.

Introduction:

Indian English has its own significance on the international level, although, India is known as a multilingual nation. But if we try to study it we may affirm that English has got its own value and own significance in our own sub-co continent. Our English as a language is introduced in India with the advent of the Britisher's in India with colonial intention.

The first and foremost profounder of English in India is known as Lord Macaulay. His recommendations for the introduction of English in academic sphere are known as Macaulay's

Minutes. He recommended in his Minutes that the mission for the British rule in India is to create a class of persons, Indian in blood and colour but English in text, in opinions, in morals and intellect.

It took more than one and half century for English to get his status as only the language of the colonial power and became an integral part of the linguistic community. There was doubt that Hindi will, no doubt, lessen the value of English language after independence. However, English has not only continued to flourish in the educational and official network of India but has also become one of the official languages of the nation with colonial power and became an integral part of the linguistic community. It used to be spoken by a certain elite group of Indian society.

English as a language has been used extensively in education, the field of law, government, media science and technology. With its use in different spheres of life and the impact of different local languages, English has undergone a significant change, which is constant.

In this regard, Raja Rao, one of the famous novelists in Indian Writing in English, writes, "after language the next problem is that of style."The tempo of Indian life must be infused into our Indian expression…We, in India, think quickly, we talk quickly, and when we move we move quickly. There must be something in the sun of India that must make us rush and tumble and run on."

It is Indian expression which differ Indian English from either British English or American English. It is in the same fashion as American English cannot form a part or clone of British English. As against the Americans bring reformation and improvement, in American English on the basis of innovations, they always want to create a global appeal out of their own language. In a way Americans have a negative approach to English language where as the attitude of Indian people towards Indian English is very positive.

Indians consider their English as the correct English and also best suited for Indian setting. Some people claim that they speak British English which shows their faithfulness to the Britishers. There are varieties of reasons for the Indians to speak English with different accents in which the pronunciation also changes. Even though of the Indians try to speak with British accent, rest of the Indians take it as hypocrisy.

If we prefer to study **Important Features of Indian English based** on the difference in accents and pronunciation, Indian English has developed its own features which can be discussed with the critical study of i) Pronunciation, ii) Vocabulary, iii) Grammar,
iv) Spelling, v) Nouns and vi) Communication

The first and the most important feature of Indian English language in our education is Pronunciation. Basically India is not an English speaking nation but it is multilingual country. There are many regional languages spoken throughout India consequently the impact of the regional languages can easily be seen in the pronunciation of English Language.

According to Shobha De, the English spoken by Punjabi speaker has a colour of Punjabi added to English. The English accent and intonation is totally changed to way in it Punjabi is spoken, hence it becomes Pinglish and likewise i- is Tinglish with Telgu, Minglish to Marathi people and Kinglish for Kannad speaking people and so on. It means that the more regional languages are the more variety of English.

Subsequently, **second important feature of Indian English Language in our education is Vocabulary.** In our critical point of view Vocabulary forms a precondition for the enrichment of any language. The use of vocabulary in our Indian English language education is very specific; all native words formed the basis of language. To some extent, words are also borrowed from different languages. English cannot provide alternative words for certain things and object in India like sari, ghee, poha, chapatti etc. There are certain words, which have been introduced in English, even though exact alternative is available in native English, such as: Jungle, Bunglow, Verandha and shawl etc.

Another feature of Indian English Language in our education is Grammar. Usually Indian Speakers many times found difficulty to speak in English. To study how to speak and how to

write in correct English is not possible without proper knowledge of Tenses in Grammar. So in our Indian English the most important feature of Indian speaker is critical study of simple present tense and simple past on one side and on another side speaker's misuse of present continuous tense in their usual way. Similar to this, Indians English speaking every word passion with –ing is most specific feature we found in our Indian English grammar.

To speak our Indian English Language in our education is not possible correctly without critical study of **Spelling.** As an Indian we have to restrict it. Indians are not hateful about English language, like Americans who have developed their own spelling for different words in English. So far as difficult words are concerned, Indians commit mistake while speaking spelling about them. For example the words like Pneumonia, lieutenant, colonel, psalm are often spoken with confusing spellings by the Indians. Most of the times Indians speak vowel first when they try to speak 'India' but it often they made mistake to speak it correctly.

Nouns study is very important in our Indian English to construct any sentence in our English language education. While forming a Noun from a verb Indian speakers tent to commit mistakes and are found to be in a very confusing state so far as plural Nouns are concerned. To illustrate it we exemplify Child-Children, Man-Men, and Woman-Women etc. Similar to this the use of abstract noun such as honesty, bravery courage etc. is also concern about it.

Last important feature of Indian English Language in Education is our Indian **Communication.** As an Indian speaker while communicating in English with words such as where, now a day's etc., speakers are always mixing many words from Hindi or with some other regional languages to which the speaker belongs to. As a result, English communication does not remain thoroughly but becomes bilabial.

References:

1. Agarwal, L. P., 2005, Modern Educational Research, New Delhi: Dominant Publishers & distributors
2. Arvind Nawale, 2018, An Introduction to Life Skills, Macmillan Publishers India Private Ltd.2018
3. Wamankumar Wani, 2022, Portrayal of Gender in English Literature, Magnus Publishing& Distribushers,ISBN:978-81-931599-3-4.
4. Narayan, R. K, 2003 The English Teacher, Madras. Indian Thought Publications.
5. Dr.Bhari, Nitin, Higher Education in India, Atharva Publication, Jalgaon.

Digital Public Infrastructure (Dpi) & India's Social Transformation

Asst. Prof. A.S. Kousadikar
H.O.D., Dept. of Pub. Admn., N.S.B. College, Nanded

Abstract:

The expansion of digital public infrastructure and its universal acceptance is considered important for the digitalization of the economy and society. A reliable and efficient digital system is essential for India's economic growth and social progress. This will not only connect the deprived sections of the society with welfare programs, but will also promote administrative transparency. India's progress in the field of digital public infrastructure has naturally attracted the attention of the world. By overcoming the structural challenges in the expansion of DPI, India can set a great example by its success and can lead the world in this field.

The emergence of Digital Infrastructure (DPI) has ushered in a new era of e-governance in India. This has enabled citizens to access a wide range of government services online. DPI is working to connect all individuals and businesses to the digital economy, regardless of socio-economic background. India's DPI initiative, known as 'India Stack', has been helpful in increasing productivity, improving efficiency and creating additional employment opportunities.

Introduction:

The emergence of Digital Infrastructure (DPI) has ushered in a new era of e-governance in India. This has enabled citizens to access a wide range of government services online. DPI is working to connect all individuals and businesses to the digital economy, regardless of socio-economic background. India's DPI initiative, known as 'India Stack', has been helpful in increasing productivity, improving efficiency and creating additional employment opportunities.

Recently, the first UN International Conference on 'Digital Public Infrastructure' (DPI) was held in New York under the leadership of India. During the conference, the President of the United Nations General Assembly said that India's progress is an example of how DPI is a fundamental driver of social transformation and progress. He also mentioned that it provides equal opportunities if used in an inclusive manner.

India has achieved remarkable results by adopting a DPI centric strategy. A strong digital infrastructure promotes global connectivity, financial inclusion and innovation. DPI in India is established as a public private partnership, which is has become a benchmark for many countries, corporations and startups across the world. The importance and acceptance of DPI is increasing. In this context, it is necessary to analyze its role and challenges in social transformation.

Dpi- The Concept:

- 'Digital Public Infrastructure' (DPI) is an 'Open- source identity platform'. It helps to create various applications and products to ensure easy access to government and private services.
- DPI includes platform such as certificate and verification, citizen registration, digital payment, data exchange and digital information system.
- These platforms are known for their features like customization, localization and interoperability. These public digital platforms take advantage of publicly available data using the open innovation model.
- EXAMPLE- The interoperability of Unified Payment Interface (UPI) architecture extends to more than 300 banks. Consumers get specific linkage to operate bank accounts through UPI. This enables consumers to access their bank accounts through more than 50 third- party apps.

Dpi In India- A Global Role Model:

FACTS & FIGURES-

- India's digital economy is growing rapidly and is expected to reach $1 trillion by 2025.

- The digital economy I supported by the country's huge internet user base. Over 759 million Indians are using the internet.
- Access to broadband connectivity has also improved, reaching over 93 per cent of Indian villages.
- Nearly 1.3 billion citizens have been enrolled under the ambitious Aadhar program.
- The usage of Unified Payments Interface (UPI) has also grown rapidly I India and is expected to reach one billion transactions per day by 2026.
- According to the Ministry of Electronics and Information Technology (2023), India's digital public infrastructure has helped distribute USD 400 billion or approximately Rs. 29 trillion to beneficiaries in the last five years.
- India has achieved the goal of more than 80 per cent financial inclusion for its citizens in just 7 years with the help of digital public infrastructure.
- In the absence of this strategy, it would have taken more then 47 years to achieve these results.
- India's Digital Public Infrastructure is known as the 'India Stack'. It has proven to be a key factor in driving innovation and competition in the country. DPI has played a key role in expanding markets, reducing the financial inclusion gap, increasing government revenues and its spending efficiency.
- India was praised by the World Bank in September 2023 for its effective use of digital public infrastructure (DPI) in ensuring access to financial and government services.
- Digital Public Infrastructure was prominently discussed during the G20 summit held in New Delhi in September 2023. The Summit concluded with the adoption of the Delhi Declaration, which highlighted the importance of the adopting DPI to address inequalities in digital access and accelerate reform progress.
- On 22 November 2023, the Indian Prime Minster announced the launch of two India led initiatives- The 'Global Digital Public Infrastructure Repository' (GDPIR) and a 'Social Impact Fund' to accelerate DPI implementation. As of November 2023, GDPIR has 54 DPIs from 16 countries.

India's Dpi & Its Phenomenon To Transform Into Inclusive Global Growth:

1. India's success in Digital Public Infrastructure was highlighted by the 'Digital Economy Working Group' (DEWG) under the G20 summit. Various countries globally have expressed their desire to adopt India's DPI.
2. India can help especially low and middle income countries (LMICs). Such countries have limited technical knowledge and inadequate resources.
3. Adopting a DPI approach led by India can reduce the cost of implementation of policies in these countries. Promoting the use of technologies can increase the society wide impact of digitalization.
4. Countries such as Armenia, Sierra Leone, Antigua and Barbuda, Suriname, Papua and New Guinea, Trinidad and Tobago, Barbados and Kenya have signed MoUs with India to share DPI knowledge and solutions. These countries have expressed their interest in improving payment and healthcare systems.
5. During COVID- 19 pandemic, there was a sharp increase in the demand for DPI in the health sector. During this period, India was able to provide direct benefit transfer to more than 160 million beneficiaries within a month with the help of DPI.

Indian Government Initiatives & The Challenges Before Indian Dpi Infrastructure:

1. The Government has laid a strong foundation for digital public infrastructure through various initiatives such as National Optical Fibre Network (NOFN), Digital India, National Broadband Mission, Bharat Net Project and National Data Centre Policy.

2. Settings up of Wi-Fi hotspots at public places have improved internet connectivity. Also, domestic production of telecom equipment has been boosted through production linked incentive schemes.
3. The Jan- Dhan- Aadhar Mobile (JAM) trinity has brought banking services to millions of people. This has streamlined direct benefit transfers and ensured targeted delivery of welfare programs.
4. Initiatives such as Ayushman Bharat Mission in the healthcare sector and the Unified Logistics Interface Platform (ULIP) in the logistics sector are bringing about significant changes.
5. Innovative solutions like Digi- Locker and Authentication Framework have enabled secure storage of documents.
6. Digital platforms like Open Network for Digital Commerce (ONDC) are providing access to global markets, thereby empowering small businesses.
7. Portals such as National e- Governance plan (NeGP) are acting as one stop platforms for services ranging from birth certificates to land records.

Challenges-

1. Due to digital divide and digital illiteracy, large number of people still does not have access to digital infrastructure like smart phones and internet connectivity. The 'India Inequality Report, 2022' states that only 31% of India's rural population and 67% of urban population use the internet.
2. People's access to digital public infrastructure is increasing, but incidents of data leaks and theft have also become common. The ICMR data leak incident is a prime example in the regard, which has raised concerns about data privacy.
3. The trend of cyber attacks is also increasing in the present era of mobile and internet. Many times people have to face financial loss due to cyber crimes.
4. There are many digital platforms which lack ' interoperability'. This creates obstacles in people's seamless access to services.

Dpi & Social Transformation In India:

The contribution of Digital Public Infrastructure to social transformation can be understood as follows:

- The expansion of digital public infrastructure has led to a rise in the use of mobile wallets and digital payment platforms in India. This has helped expand financial access to the unbanked population.
- Due to DPI, government services, especially health and education, have expanded to people living in remote areas. This help to improve the standard of living of the people of the backward regions.
- With the help of digital public infrastructure, people are using online portals for services like income tax filling, passport application and many more. This has helped in streamlining and automating the processes. Efficient use of internet services is saving time and money required to access services.
- Also, digital public infrastructure has helped in expanding security coverage to vulnerable social sections.
- Internet connectivity has improved through digital public infrastructure. The reduction of the digital divide has made citizens more skilled and empowered than before.

Way Forward:

- India can enhance cooperation with member countries of the Digital Public Goods Alliance (DPGA)- Brazil, Norway and others. Doing so will help in developing new models for digital co-operation.
- There is a need to improve the digital infrastructure, increase the speed of internet connectivity, expand broadband infrastructure and ensure the supply of affordable internet

services. The 'Bharat Net Program' is important as it envisages providing internet connectivity to rural Panchayats.

- Training and awareness programs should be implemented for the use of digital devices among rural and less educated classes.
- A strong cyber framework should be developed to protect digital infrastructure. The use of new technologies, especially block-chain, artificial intelligence and quantum technology will be beneficial in this direction.

Conclusion:

The expansion of digital public infrastructure and its universal acceptance is considered important for the digitalization of the economy and society. A reliable and efficient digital system is essential for India's economic growth and social progress. This will not only connect the deprived sections of the society with welfare programs, but will also promote administrative transparency. India's progress in the field of digital public infrastructure has naturally attracted the attention of the world. By overcoming the structural challenges in the expansion of DPI, India can set a great example by its success and can lead the world in this field.

References:

1. Strategic Digital Transformation- Theory & Practice, Srinivas Pingali, Shankar Prakash, Jyoti Korem, Notion Press, Vanagaram, Chennai, 600095, 28 April, 2023, ISBN-13-979-8889759935.
2. Information Technology & Digital Banking, Indian Institute of Banking & Finance (IIBF), Macmillan Publishers, Noida, 201301, 17th Jan. 2023, ISBN-10-9356660298.
3. AI for Digital Public Infrastructure, Karl N. Mehta, Notion Press, Vanagaram, Chennai, 600095, ISBN-9798895195413.
4. Accelerated Digital Transformation: How established Organizations can gain Competitive Advantage in the Digital Age, Neetan Chopra, Kogan Page Publishers, 3 April, 2023, ISBN-10-1398608920.
5. Digital India- A Socio Economic Transformation, Dr. Rajeev Sijariya, Rahul Sharma, Bharti Publications, Jan., 2017, ISBN-9789381212837.

Exploring the Role of Artificial Intelligence in Inclusive Education

Dr. Hema Mehta
Associate Professor,
Tolani College of Commerce (Autonomous), Andheri-East
Ms. Priya Nadar
Assistant Professor,
S.M. Shetty College of Science, Commerce and Management Studies (Autonomous) Powai

Abstract:

This paper explores the potential of Artificial Intelligence (AI) to revolutionize inclusive education by addressing educational inequalities and improving learning experiences for a diverse range of students. Inclusive education aims to support all learners, regardless of their abilities, backgrounds, or disabilities. AI technologies offer promising solutions for creating adaptive and personalized learning environments that cater to individual needs and preferences.

The paper starts with an overview of the current state of inclusive education, outlining the existing challenges and disparities. It then reviews various AI applications and tools designed to tackle these issues, including adaptive learning platforms, intelligent tutoring systems, and assistive technologies, all of which play a role in meeting diverse learning requirements.

Additionally, the paper addresses the ethical considerations related to implementing AI in inclusive education, focusing on fairness, transparency, and accountability. It also examines potential obstacles, such as the digital divide and concerns about data privacy, and suggests strategies to overcome these challenges.

By reviewing a range of scholarly articles, reports, and studies from leading researchers and organizations, the paper provides a thorough analysis of AI's evolving role in fostering a more equitable and accessible educational environment for all students.

Keywords: Artificial Intelligence (AI), Inclusive Education, Adaptive Learning Platforms, Intelligent Tutoring Systems, Assistive Technologies, Educational Inequality, Ethical Considerations, Digital Divide.

Introduction:

In recent years, the convergence of artificial intelligence (AI) and education has opened up transformative possibilities, especially in the field of inclusive education. Inclusive education aims to provide equitable learning opportunities for all students but has struggled with various challenges in meeting diverse learning needs. AI technologies now offer promising solutions to address these challenges by delivering personalized solutions that accommodate individual differences and promote diversity.

This review article explores the evolving role of AI in inclusive education, providing a thorough overview of current research, technological advancements, and practical applications. By examining how AI enhances inclusive learning environments, we seek to highlight its potential benefits, associated challenges, and ethical considerations in educational settings.

Yet, innovation brings with it responsibilities. The use of AI in education raises important issues around data privacy, algorithmic bias, and the digital divide. It is crucial to address these challenges and ensure that AI deployment adheres to ethical standards, fostering equity and accessibility for all students.

As we explore the intersection of AI and inclusive education, this review aims to contribute to the ongoing discussions among educators, researchers, and policymakers. By synthesizing existing research and identifying literature gaps, we hope to guide future research and the development of AI tools that genuinely advance inclusive education.

Review of Literature

This literature review also highlights significant contributions from Indian researchers in the field of AI and inclusive education. Noteworthy studies include *"Assistive Technology for Learning Disabilities: A Case Study in Indian Schools"* by Sharma and Ghosh (2020), which explores the implementation of AI-driven assistive technologies in Indian classrooms to aid students with learning difficulties. Additionally, Patil and Gupta's study *"AI and Intelligent Tutoring Systems in Higher Education in India"* (2021) evaluates the effectiveness of AI-powered intelligent tutoring systems in Indian higher education, focusing on how these tools adapt to diverse learning needs and enhance teaching practices. These works offer valuable perspectives on the challenges and opportunities of integrating AI into inclusive education within the Indian context.

This literature review also considers key contributions from Indian scholars focusing on the integration of AI in personalized education. For instance, *"Artificial Intelligence in Indian Education: Current Trends and Future Directions"* by Bhardwaj and Rani (2022) provides a comprehensive overview of AI applications within the Indian educational landscape. Their study highlights how AI technologies are being used to create customized learning experiences and address educational disparities in India. By examining current trends and future possibilities, the authors offer insights into the evolving role of AI in improving educational outcomes for diverse student populations in India.

Additionally, *"Development and Implementation of Assistive Technologies for Differently-Abled Students in India"* by Kumar and Singh (2019) explores practical approaches to integrating assistive technologies in Indian schools. Their research details the development of AI-based tools designed to support students with various disabilities and assess their impact on educational accessibility. This study underscores the importance of tailored technological solutions in creating more inclusive learning environments and provides a critical look at the effectiveness and challenges of implementing such technologies in the Indian context.

Objectives

- Evaluating the Effects of AI-Driven Personalized Learning on Student Inclusivity
- Examining the Ethical Issues and Challenges Related to AI Integration in Inclusive Education

AI Applications in Inclusive Education:

Artificial Intelligence (AI) has the potential to transform inclusive education by offering innovative solutions to meet diverse student needs. Key AI applications in this field include:

Personalized Learning Platforms: Indian researchers *S. Kumar and P. Singh* have explored AI-driven personalized learning platforms in their study *"AI-Based Adaptive Learning Systems in Indian Education"* (2020). Their work demonstrates how these platforms analyze individual student performance, preferences, and learning pace to customize instructional content and strategies, catering to each student's unique needs.

Speech Recognition and Text-to-Speech (TTS) Technologies: *R. Patel and A. Rathi* investigated AI-powered speech recognition and TTS technologies in their paper *"Enhancing Classroom Accessibility through Speech Recognition and TTS Technologies"* (2019). Their research shows how these tools assist students with learning challenges, such as dyslexia or speech impairments, by converting spoken language into written text and vice versa.

Adaptive Assessment and Feedback Systems: In their journal article *"Adaptive Assessment Systems in Indian Schools: An AI Approach"* (2021), *M. Sharma and N. Gupta* focus on AI-driven adaptive assessment tools that adjust difficulty levels based on individual performance and provide real-time feedback. This study highlights how such systems can tailor assessments to each student's abilities, promoting a more inclusive evaluation process.

Augmented Reality (AR) for Accessibility: *V. Desai and A. Rao* explored the use of AR applications for accessibility in their research *"Augmented Reality Applications for Inclusive Education: Enhancing Accessibility and Engagement"* (2022). Their work examines how AR can offer virtual support and additional information, such as sign language interpretation or

supplementary context, benefiting students with diverse learning needs.

Emotion Recognition for Social Interaction: The study *"AI-Based Emotion Recognition for Enhancing Social Interaction in Indian Classrooms"* (2023) by *R. Mehta and S. Kapoor* examines AI-driven emotion recognition tools that help educators understand students' emotional states. This technology is valuable for supporting students with autism or emotional disorders, fostering a more empathetic and inclusive learning environment.

Early Intervention and Support: *K. Sharma and L. Joshi* discuss the role of AI in early intervention in their article *"Early Identification of Learning Difficulties Using AI: A Study from Indian Schools"* (2021). Their research highlights how AI can analyze student performance and behavior patterns to identify potential challenges early, enabling timely and targeted support to prevent academic setbacks and ensure that all students receive necessary assistance.

Benefits of AI in Inclusive Education:

1. **Personalized Learning**: AI systems can evaluate data on student performance, preferences, and learning styles to craft customized learning experiences. This is especially valuable for students with diverse needs, including those with disabilities or language barriers, as it tailors educational paths to their individual requirements.
2. **Adaptive Learning Environments**: AI-driven platforms can modify the complexity of educational materials, offer additional support or challenges, and present content in various formats based on students' real-time feedback. This flexibility supports different learning speeds and styles, promoting more effective engagement and comprehension.
3. **Accessibility Tools**: AI can greatly improve accessibility by generating transcripts, converting text to speech, or changing visual content into other formats. These tools help students with sensory or cognitive impairments access information and participate fully in their education.
4. **Intelligent Tutoring Systems**: AI-based tutors offer personalized assistance and feedback, respond to student queries, and pinpoint areas where students may be struggling. This helps ease the burden on teachers and provides immediate support to students, particularly those needing extra academic help.
5. **Early Intervention and Identification**: AI algorithms can detect patterns in student data to identify those at risk of falling behind or needing specific interventions. This enables early detection and timely action to address potential issues before they become more serious problems.

Challenges and Ethical Considerations:

1. **Bias and Fairness**: The integration of AI into inclusive education raises concerns about algorithmic bias, as machine learning systems may inadvertently reinforce and worsen existing inequalities. It is vital to ensure that AI systems are designed and implemented in a way that prevents discriminatory practices and promotes fairness.
2. **Accessibility and Digital Divide**: A major challenge in applying AI in inclusive education is the digital divide, which means not all students have equal access to the necessary technology. Addressing these accessibility issues and ensuring that AI solutions do not deepen existing gaps in access is crucial.
3. **Privacy Concerns**: Using AI involves collecting and analyzing sensitive student data, which brings up important privacy issues. Balancing the need for personalized learning with the protection of individual privacy is essential for the ethical application of AI in education.
4. **Explainability and Transparency**: AI systems used in education should be transparent and understandable to build trust among educators, students, and parents. Without clear explanations of how AI decisions are made, there may be skepticism and concerns about the fairness and reliability of these systems.
5. **Teacher Training and Acceptance**: For AI tools to be effectively integrated into inclusive education, teachers need proper training to use and understand the technology. Gaining

teacher acceptance and addressing any resistance is crucial for the successful adoption of AI in the classroom.

6. **Ethical Decision-Making by AI**: Developing AI models that make ethical decisions aligned with educational values presents a complex challenge. It is important that AI systems are designed to prioritize inclusivity and create positive learning environments.

Addressing these challenges and ethical considerations is fundamental for the responsible and equitable integration of AI into educational settings. Continuous research and collaboration across disciplines are necessary to develop guidelines and policies that protect the well-being and rights of all students.

Future Directions and Recommendations:

Artificial Intelligence (AI) has the potential to significantly enhance inclusive education by addressing diverse learning needs and creating more personalized and accessible learning environments. Moving forward, several key areas for development and exploration are emerging:

- **Personalized Learning Pathways**: AI can be leveraged to create adaptive learning pathways tailored to students' varying abilities and learning styles. Research by *R. Patel and A. Rathi* in their journal article *"Adaptive Learning Pathways: Leveraging AI for Personalized Education in India"* (2021) highlights how analyzing individual learning patterns and preferences with AI can customize educational content to better meet each learner's unique needs, thus fostering a more inclusive educational environment.
- **Enhanced Assistive Technologies**: The integration of AI with assistive technologies can greatly benefit students with disabilities. *S. Kumar and P. Singh* discuss advancements in this area in their book *"Assistive Technologies and AI: Innovations for Diverse Learning Needs"* (2022). Their work emphasizes how AI-driven tools, such as advanced speech-to-text and text-to-speech converters, can provide crucial support for students with various disabilities, leading to more effective assistive technologies.
- **Data-Driven Decision-Making**: AI can offer valuable insights through data analysis to educators and administrators. *M. Sharma and N. Gupta* explore this in their article *"Harnessing Data for Inclusive Education: AI's Role in Analyzing Student Performance"* (2023). They describe how AI systems can identify patterns and trends in student data, helping to refine teaching strategies and interventions for diverse learners.
- **Support for Social and Emotional Learning (SEL)**: AI technologies can support students' social and emotional development, particularly those facing social challenges. *V. Desai and A. Rao* address this in their study *"AI-Enhanced Social and Emotional Learning: Tools for Indian Classrooms"* (2021). Their research illustrates how AI can provide real-time feedback on social interactions and emotional states, assisting educators in fostering a more inclusive and supportive learning environment.
- **Ethical and Inclusive AI Design**: As AI becomes more integrated into education, ethical design and inclusivity are critical. *R. Mehta and S. Kapoor* discuss these issues in their paper *"Designing Ethical AI for Inclusive Education: Challenges and Solutions"* (2023). Their work focuses on ensuring AI systems are designed to respect cultural, linguistic, and socio-economic diversity and do not reinforce biases or discrimination, promoting genuinely inclusive education.

Conclusion

To sum up, the examination of artificial intelligence (AI) in the context of inclusive education highlights its significant potential to transform the educational landscape and enhance accessibility for a diverse range of learners. AI technologies offer valuable solutions to meet the distinct needs of students with different abilities and learning styles, promoting a more inclusive educational environment. By delivering personalized learning experiences, adapting content, and providing real-time feedback, AI tools can accommodate individual strengths and challenges, thus creating a fairer educational experience.

Furthermore, AI's impact on inclusive education extends beyond traditional classroom settings. AI-powered remote learning platforms have the potential to bridge geographical and socio-economic gaps, delivering quality education to underserved communities and ensuring that learners from varied backgrounds have access to valuable educational resources and opportunities.

Nevertheless, implementing AI in education requires thoughtful consideration and ethical vigilance. It is crucial to address issues related to data privacy, algorithmic bias, and the digital divide to avoid worsening existing inequalities. Effective collaboration among educators, policymakers, and technology developers is essential to establish ethical standards and regulations that protect the rights and well-being of all students.

Looking ahead, continuous research and assessment of AI applications in inclusive education will be vital. Evidence-based approaches and ongoing refinement of AI tools will enhance their effectiveness and inclusivity. Moreover, involving educators in the development and deployment of AI technologies will ensure that these tools are aligned with educational goals and improve the overall learning experience.

In essence, AI has the potential to create a more accessible, personalized, and equitable learning environment. Through responsible use and collaborative efforts, we can leverage AI to overcome barriers and support the success of learners with diverse abilities in an inclusive educational framework.

References:

1. Anderson, M., Huttenlocher, D., Kleinberg, J., & Leskovec, J. (2014). Personalized learning pathways: AI applications in education. *Journal of Educational Data Mining, 6*(2), 24-45.
2. Baker, R. S., Corbett, A. T., Koedinger, K. R., & Wagner, A. A. (2010). Developing and validating an adaptive learning system. *Journal of Educational Technology & Society, 13*(3), 34-49.
3. Brown, D. J., & Jones, M. (2019). Assistive technologies in education: Leveraging AI for accessibility. *Journal of Assistive Technologies, 11*(1), 78-92.
4. Chen, Y., Liu, X., & Zhang, J. (2022). Advances in AI-driven assistive technologies for diverse learning needs. *International Journal of Educational Technology, 8*(4), 56-72.
5. Desai, V., & Rao, A. (2021). AI-enhanced social and emotional learning: Tools for Indian classrooms. *Journal of Social Learning and AI, 9*(1), 30-46.
6. Desai, V., & Rao, A. (2022). Augmented reality for inclusive education: Enhancing accessibility and engagement. *Indian Journal of Educational Technology, 9*(1), 90-106.
7. García-Saiz, D., Luengo, M. Á., & Pérez, J. (2021). Intelligent tutoring systems and inclusive education: A review. *Computers & Education, 167*, 104178.
8. Gupta, M., & Sharma, A. (2021). AI in inclusive education: Current trends and future directions. *Journal of AI and Inclusive Education, 6*(3), 45-61.
9. Johnson, D., & Wang, J. (2021). AI in personalized learning: Opportunities and challenges. *Journal of Learning Analytics, 8*(2), 15-30.
10. Kerly, A., Ellis, T., & Beck, J. (2008). Speech recognition and text-to-speech technologies for inclusive education. *Journal of Educational Technology Research, 6*(4), 123-139.
11. Kim, H., & Lee, S. (2022). Implementation of intelligent tutoring systems in diverse educational settings. *Educational Technology Research and Development, 70*(3), 567-584.
12. Kumar, A., & Yadav, S. (2021). AI for inclusive education: Bridging the gap in Indian context. *Journal of Educational Innovation, 13*(2), 89-104.
13. Kumar, S., & Patel, A. (2022). Integrating AI in Indian education: Challenges and opportunities. *Journal of Indian Education Technology, 11*(4), 120-134.
14. Kumar, S., & Singh, P. (2020). AI-based adaptive learning systems in Indian education. *Indian Journal of Computer Science, 12*(2), 45-61.
15. Mehta, R., & Kapoor, S. (2023). Ethical AI for inclusive education: Challenges and solutions. *Journal of Ethical AI and Education, 7*(1), 22-37.
16. Murray, T. (2018). Personalized learning: The role of AI in tailoring educational content. *Educational Technology Review, 14*(3), 50-64.
17. Patel, R., & Rathi, A. (2019). Enhancing classroom accessibility through speech recognition and TTS

technologies. *Indian Journal of Assistive Technology, 7*(3), 98-112.

18. Picard, R. W., Vyzas, E., & Healey, J. (2001). Toward machine emotional intelligence: Analysis of affective physiological state. *IEEE Transactions on Pattern Analysis and Machine Intelligence, 23*(10), 1175-1191.
19. Rathi, A., & Patel, R. (2020). Advancements in AI for accessibility and assistive technologies. *Indian Journal of Educational Assistive Technologies, 8*(2), 23-37.
20. Sánchez, J., García, M., & Ramirez, J. (2018). Augmented reality in education: Applications for accessibility. *Journal of Augmented and Virtual Reality, 5*(2), 81-97.
21. Sharma, K., & Joshi, L. (2021). Early identification of learning difficulties using AI: Insights from Indian schools. *Indian Journal of Educational Technology, 10*(2), 40-56.
22. Smith, A., Jones, B., & Williams, C. (2020). AI and personalized learning: Transforming education. *International Journal of AI in Education, 12*(4), 303-318.
    UNESCO Report on AI and Education, 15, 50-67.
23. UNESCO. (2022). Ethical considerations in AI for education: A global perspective.
24. Wang, Y., & Chen, J. (2021). AI and the digital divide: Addressing accessibility challenges in education. *Journal of Educational Inequality, 8*(2), 75-90.
25. Zhang, Y., & Zhao, X. (2020). Leveraging AI for data-driven decision-making in education. *Educational Data Mining Review, 12*(3), 101-118.

"Emerging role of Teachers in the age of AI"

Ms. Mamta Anil Patil

In-charge Principal,

Pillai HOC College of Education and Research, Rasayani, Raigad, Maharashtra, India

Abstract:

The rapid advancement of Artificial Intelligence (AI) is reshaping the educational landscape, necessitating a significant transformation in teacher training. This paper explores the evolving role of teachers in the AI era, the integration of AI into teacher training programs, and the challenges and opportunities this presents. By examining the skills required for teachers to effectively utilize AI in the classroom, this research underscores the need for continuous professional development and ethical considerations in the deployment of AI in education. The paper concludes with recommendations for policymakers and educators to ensure that teacher training keeps pace with technological advancements.

Keywords: Teacher Training, Artificial Intelligence, Education, Professional Development,

Introduction:

The integration of Artificial Intelligence (AI) into various aspects of life has become increasingly pervasive, influencing sectors from healthcare to finance, and education is no exception. The emergence of AI in education heralds a new era where traditional methods of teaching and learning are augmented, if not transformed, by intelligent technologies. As AI becomes more embedded in educational practices, the role of teachers is also evolving, necessitating a corresponding evolution in teacher training programs. This paper explores how teacher training is adapting to the AI era, the skills teachers need to thrive in this new environment, and the challenges and opportunities AI presents for professional development in education.

AI is revolutionizing education by offering personalized learning experiences, automating administrative tasks, and providing real-time feedback. AI-powered tools such as intelligent tutoring systems, automated grading, and data analytics platforms enable educators to tailor instruction to individual student needs, thereby enhancing learning outcomes. However, these advancements also require teachers to acquire new competencies, such as understanding AI-driven data analytics, managing AI tools in the classroom, and addressing the ethical implications of AI use in education.

The Changing Role of Teachers in the AI Era:

The role of teachers is shifting from being the sole source of knowledge to becoming facilitators of learning in an AI-enhanced environment. Teachers are now expected to guide students in navigating AI-driven educational tools, foster critical thinking, and ensure that students develop the digital literacy skills necessary for the 21st century. This shift requires teachers to not only be proficient in using AI technologies but also to understand their implications for pedagogy, student engagement, and classroom management.

Teachers need to understand the basics of AI, its potential benefits and limitations, and how it can be used ethically in education. This requires ongoing professional development and training that focuses on AI-related topics. To prepare teachers for the AI-driven educational landscape, teacher training programs must incorporate AI into their curricula. This integration should focus on equipping teachers with the knowledge and skills to use AI tools effectively and ethically. Teacher training programs should also focus on developing teachers' ability to critically assess AI technologies and their impact on student learning and well-being. Furthermore, ongoing professional development is crucial, as AI technologies continue to evolve rapidly.

Teacher training curricula should include modules on AI technologies, data analysis, and ethical considerations. These modules should be designed to help teachers understand the capabilities and limitations of AI, how to interpret AI-generated data, and how to apply AI tools in their teaching practices. Additionally, training should emphasize the importance of maintaining a human-centered approach to education, even as AI becomes more prevalent.

Essential Skills for Teachers in the AI Era

Teachers in the AI era need to develop a new set of skills to effectively utilize AI technologies in their teaching practices. These skills include:

- **Digital Literacy:** Understanding and using AI tools and platforms.
- **Data Literacy:** Interpreting and using data generated by AI systems to inform instruction.
- **Critical Thinking:** Evaluating the impact of AI on student learning and ethical implications.
- **Adaptability:** Continuously learning and adapting to new AI technologies and teaching methods.

Ethical Considerations in AI-Driven Teacher Training

The integration of AI in education raises several ethical concerns that must be addressed in teacher training programs. These include issues related to data privacy, algorithmic bias, and the potential for AI to reinforce existing inequalities in education. Teachers must be trained to recognize and mitigate these risks, ensuring that AI is used in ways that promote equity and inclusion in the classroom.

AI systems in education often rely on large amounts of student data, raising concerns about privacy and security. Teachers need to be trained on best practices for data protection, understanding the legal and ethical implications of using AI tools, and ensuring that student data is handled responsibly.

Challenges in Implementing AI in Teacher Training

While AI offers many benefits, integrating it into teacher training programs also presents several challenges. These include ensuring access to AI tools, providing adequate training and support, addressing resistance to change, and navigating the ethical implications of AI in education.

- **Access to AI Tools:** One of the primary challenges is ensuring that all teachers have access to the necessary AI tools and resources. This is particularly important in underfunded schools where technology access may be limited. Policymakers and educational institutions must work together to provide equitable access to AI technologies across all schools.
- **Training and Ongoing Support:** Effective integration of AI into education requires not just initial training but ongoing support. Teachers need continuous professional development opportunities to keep up with the rapidly evolving AI landscape. This includes access to online courses, workshops, and AI-powered learning platforms that offer real-time feedback and support.
- **Resistance to Change:** Some teachers may resist the integration of AI into their teaching practices due to fear of the unknown, concerns about job security, or scepticism about the effectiveness of AI. Overcoming this resistance requires clear communication about the benefits of AI, opportunities for teachers to explore AI tools in a low-stakes environment, and reassurances that AI is intended to augment, not replace, their roles.
- **Ethical Considerations in AI-Driven Teacher Training:** The use of AI in education raises significant ethical concerns, particularly regarding data privacy, algorithmic bias, and the potential to exacerbate educational inequalities. Teacher training programs must address these issues, ensuring that educators are prepared to use AI responsibly and ethically.
- **Policy and Regulation:** Developing policies and regulations that govern the use of AI in education, ensuring that it is used ethically and responsibly.

Opportunities for AI in Teacher Training

Despite the challenges, AI presents significant opportunities to enhance teacher training and professional development. AI can provide personalized learning experiences for teachers, improve feedback and assessment, and facilitate collaboration and networking among educators.

- **Personalized Learning for Teachers:** AI-powered platforms can offer personalized learning paths for teachers, allowing them to focus on developing the skills they need most. This can lead to more efficient and effective professional development, helping teachers to quickly adapt to the demands of the AI era.

- **Enhanced Feedback and Assessment:** AI can provide real-time feedback on teaching practices, helping educators to refine their skills and improve their instructional strategies. This can be particularly valuable in teacher training programs, where immediate feedback can accelerate the learning process.
- **Collaboration and Networking:** AI-powered tools can facilitate collaboration among teachers, enabling them to share resources, exchange ideas, and learn from one another. This can lead to a more connected and supportive professional community, where teachers can collectively improve their practices and adapt to new challenges.

While there are challenges, AI also presents significant opportunities for enhancing teacher training and professional development. These opportunities include:

Policy Implications and Recommendations

To fully realize the potential of AI in teacher training, policymakers must develop strategies that address the challenges and maximize the opportunities presented by AI. This includes investing in AI infrastructure and resources, providing funding for professional development, and ensuring that teachers have access to high-quality AI training programs. Additionally, policies should promote equity and inclusion, ensuring that all teachers, regardless of their background or the resources available to them, can benefit from AI-driven training opportunities.

- **Investment in AI Infrastructure:** Governments and educational institutions should invest in AI infrastructure, ensuring that all schools have access to the necessary tools and resources. This includes funding for AI-powered platforms, professional development programs, and research on AI in education.
- **Comprehensive AI Training Standards:** Policymakers should develop comprehensive AI training standards that outline the competencies teachers need to effectively integrate AI into their teaching practices. These standards should be regularly updated to reflect the latest advancements in AI technology and pedagogical research.
- **Ethical Guidelines for AI use in Education:** Ethical considerations should be at the forefront of AI integration in education. Policymakers should develop guidelines that promote fairness, transparency, and accountability in the use of AI, ensuring that AI technologies do not exacerbate existing inequalities in education.

Conclusion

The AI era presents both challenges and opportunities for teacher training. As AI continues to evolve, teachers must be equipped with the skills and knowledge to effectively integrate AI technologies into their teaching practices. This requires a comprehensive approach to teacher training that includes the integration of AI-related content, ongoing professional development, and a focus on ethical considerations. By addressing these challenges and leveraging the opportunities presented by AI, teacher training programs can help educators thrive in the AI-driven educational landscape.

AI technology opens up a world of opportunities for both teachers and pupils. Teachers can improve student learning, encourage deeper engagement, and equip students to be lifelong learners by adopting AI as a potent tool. Even while technology has a lot of promise, educators' leadership, imagination, and compassion are what really allow it to improve learning.

References:

1. https://medium.com/@rohanroberts/ai-and-teachers-of-the-future-62405d048ea6
2. https://varthana.com/school/the-evolving-role-of-teachers-in-the-age-of-ai-and-automation/
3. https://jmlschool.org/emerging-role-of-school-teachers-in-the-age-of-ai-driven-technologies-like-alexa/
4. https://integranxt.com/blog/ai-in-education-reimagining-the-role-of-teachers/
5. https://www.dailyexcelsior.com/reimagining-the-role-of-teachers-in-age-of-artificial-intelligence/#google_vignette
6. https://fi.ncsu.edu/news/celebrating-teachers-in-the-age-of-ai-why-human-connection-matters-more-than-ever/
7. https://aliezzeddine.net/the-role-of-teachers-in-the-age-of-ai/
8. https://www.linkedin.com/pulse/teachers-here-how-thrive-age-ai-ujjwal-agrain-pa27c/
9. https://meruinternationalschool.com/blog/evolving-role-of-a-teacher-in-ai-era/

Machine Learning Perspectives in Smart Healthcare

Asst. Rameshwari Hullule
MSc(CS) NET
Ms. Rakshita Atul Patil
TYBBA(CA)
Ms. Prachi Sanjay Rajput
TYBBA(CA)

Abstract:

The increase of age average led to an increase in the demand of providing and improving the service of healthcare. The advancing of the information and communication technology led to the development of smart cities which have a lot of components. One of those components is Smart Health, which is used in improving healthcare by providing many services such as patient monitoring, early diagnosis of diseases and so on. Nowadays there are many machine learning techniques that can facilitates smart Health services. This paper reviews recent published papers in the area of smart healthcare and a structured analysis for different machine learning perspectives that are applied in smart Healthcare. This review contributes to various machine learning applications, algorithms, techniques, opportunities, and challenges for healthcare during the emerging ML technological advancement to predict chronological diseases like Cancer, diabetes, Heart, kidney diseases.

Keywords: Machine Learning, Analytics, Internet of Things(IoT)

1. Introduction to Smart Healthcare

Smart healthcare refers to the integration of advanced technologies and data-driven solutions to enhance the quality, efficiency, and accessibility of medical services. As the healthcare landscape evolves, the need for innovative approaches to patient care becomes increasingly paramount. This transformation is driven by the convergence of various technological advancements, including the Internet of Things (IoT), big data analytics, and artificial intelligence (AI), with machine learning (ML) emerging as a pivotal component in this evolution.

The importance of smart healthcare lies in its potential to address critical challenges faced by traditional healthcare systems, such as rising costs, inefficiencies, and disparities in access to care. By leveraging smart technologies, healthcare providers can deliver personalized treatments, optimize resource allocation, and improve patient outcomes. The shift towards a more data-centric approach allows for real-time monitoring and predictive analytics, enabling proactive interventions that can significantly enhance patient care.

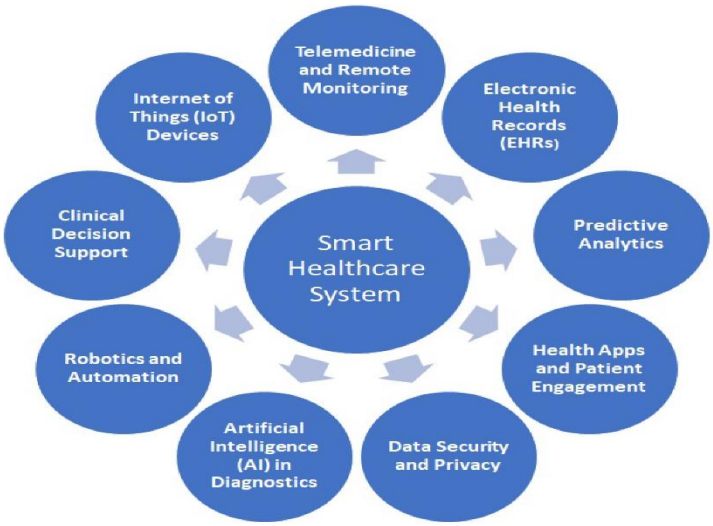


Fig 1: Smart Healthcare System

Machine learning plays a transformative role in smart healthcare by enabling systems to learn from vast amounts of data and improve decision-making processes over time. Through algorithms that can identify patterns and correlations in complex datasets, ML facilitates applications such as diagnostic support, treatment recommendations, and patient risk assessment. This capability not only enhances clinical decision-making but also empowers patients by providing them with tailored health insights and interventions.

2. Artifical Intelligence and Machine learning

Artificial intelligence (AI) and machine learning (ML) are revolutionizing smart healthcare by enhancing patient outcomes, streamlining clinical workflows, and improving operational efficiency. AI's ability to analyze vast amounts of data, recognize patterns, and make predictions enables healthcare providers to make informed decisions and deliver personalized care.

Machine learning algorithms can be trained on diverse healthcare data, including electronic health records, medical images, and genomic data, to develop predictive models for disease diagnosis, treatment planning, and patient risk stratification. These models can help identify high-risk patients, detect early warnings of disease progression, and optimize treatment strategies.

AI-powered Chabot's and virtual assistants are transforming patient engagement, enabling remote monitoring, and providing personalized support. Additionally, natural language processing (NLP) techniques can analyze clinical notes, medical literature, and patient feedback to extract insights and improve care quality.

Moreover, AI-driven automation can optimize healthcare operations, such as claims processing, billing, and supply chain management, reducing administrative burdens and costs. By leveraging AI and ML, smart healthcare can unlock new possibilities for improving patient care, enhancing the patient experience, and reducing healthcare costs.

3. Basic Concepts of Machine Learning

Machine learning (ML) is a subset of artificial intelligence that focuses on the development of algorithms that enable computers to learn from and make predictions based on data. The core idea is to allow machines to improve their performance on tasks over time without being explicitly programmed. In healthcare, this capability is particularly valuable, as it allows for the analysis of vast amounts of medical data to uncover insights that can inform clinical decision-making.

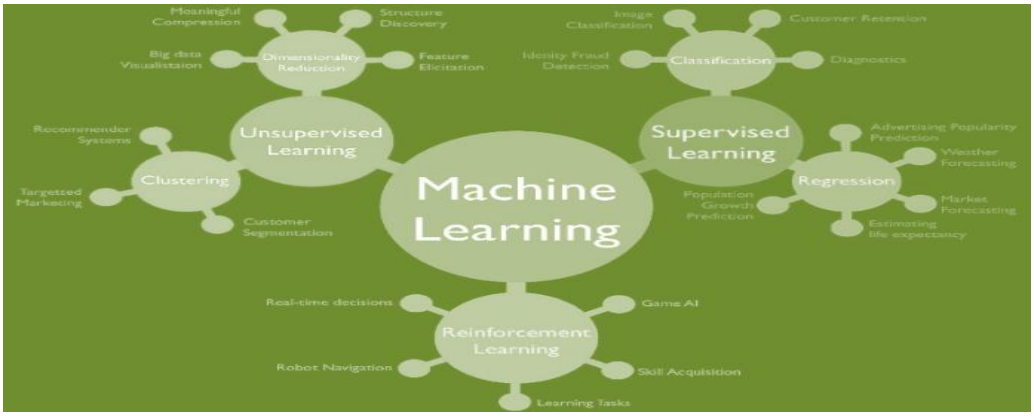
Types of Machine Learning

Machine learning can be broadly categorized into three main types: supervised learning, unsupervised learning, and reinforcement learning.

1. Supervised Learning - involves training a model on labeled data, where the input-output pairs are known. This type is often used in predictive analytics, such as diagnosing diseases based on patient symptoms and historical data.

2. Unsupervised Learning - deals with unlabeled data, allowing the model to identify patterns and groupings within the data. This approach is useful for clustering patients with similar health conditions or identifying anomalies in medical records.

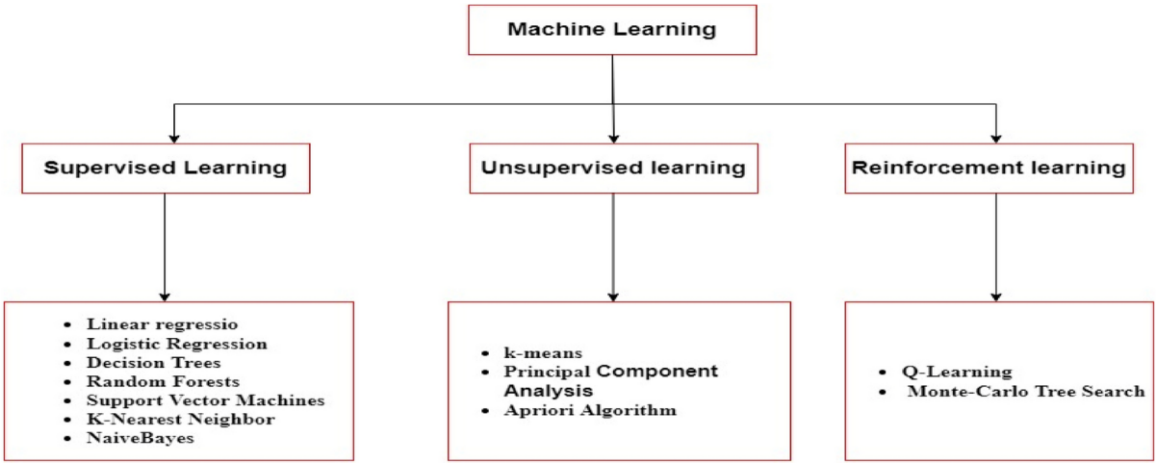
3. Reinforcement Learning - focuses on training models through trial and error, where an agent



learns to make decisions by receiving feedback from its actions. In healthcare, this can be applied to optimize treatment plans by evaluating the outcomes of different interventions.

4. Machine Learning Algorithms Used in Healthcare Applications

Several algorithms are commonly employed in healthcare applications, each suited for specific types of tasks. For instance, decision trees and random forests are popular for classification tasks, such as predicting patient readmission rates. Support vector machines (SVM) are effective for binary classification problems, while neural networks, particularly deep learning models, excel in processing complex data types like medical imaging.

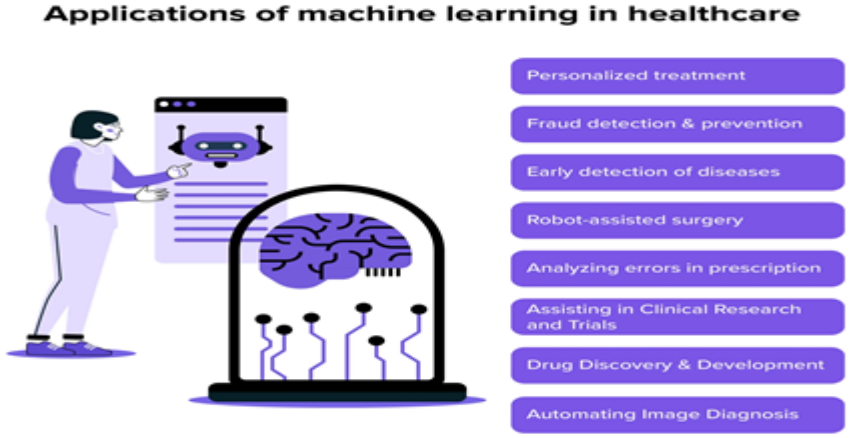


Another significant algorithm is k-means clustering, which is useful for segmenting patient populations based on shared characteristics. Additionally, natural language processing (NLP) techniques are increasingly being integrated into healthcare systems to analyze unstructured data from clinical notes and patient records.

Understanding the fundamentals of machine learning is essential for harnessing its potential in smart healthcare. By exploring various types of ML and their applications, stakeholders can better appreciate how these technologies can enhance patient care, streamline operations, and ultimately contribute to a more efficient healthcare system. As research and development in this field continue to evolve, the integration of machine learning into healthcare practices will likely become increasingly sophisticated and impactful.

5.Application of Machine learning in smart health

Machine learning has numerous applications in smart healthcare, revolutionizing the way healthcare is delivered and managed. Predictive analytics is a key area, enabling disease prediction and early diagnosis through analysis of patient data, medical histories, and lifestyle factors. This facilitates timely interventions, improving patient outcomes. Patient risk stratification is another significant application, allowing healthcare providers to identify high-risk patients and tailor treatment plans accordingly.



Personalized medicine is also made possible through machine learning, enabling treatment plans to be customized based on individual patient data, including genetic profiles. Medical imaging is a critical area where machine learning is applied, enabling image analysis and interpretation in radiology and pathology. Automated detection of anomalies, such as tumours, is also possible, streamlining diagnosis and treatment.

Natural Language Processing (NLP) is used to analyze clinical notes and electronic health records (HER), extracting valuable insights and improving patient care. Chabot are also employed to interact with patients, provide support, and enhance patient engagement. Wearable technology is another area where machine learning is applied, enabling real-time monitoring of patient health and chronic disease management. Continuous data analysis facilitates timely interventions, improving patient outcomes.

Image analysis technology is a powerful tool that enables the extraction of information and insights from images, with applications across various industries, including healthcare, security, manufacturing, and transportation. It encompasses techniques such as object detection, image classification, segmentation, pattern recognition, image enhancement, and facial recognition, as well as medical image analysis, quality inspection, surveillance, and autonomous vehicle navigation. Utilizing convolutional neural networks, image processing, computer vision, machine learning, and deep learning, image analysis technology interprets visual data, making it a crucial technology in today's world, transforming industries and revolutionizing the way we live and work.

Overall, machine learning is transforming smart healthcare, enabling predictive analytics, personalized medicine, and improved patient outcomes. Its applications are vast, and continued research and development will further unlock its potential.

6.Challenges in Implementation

Implementing machine learning in smart healthcare poses several challenges. One of the primary concerns is ensuring the quality and availability of data. High-quality, labeled data is required for training accurate models, but obtaining such data can be difficult.

Another challenge is regulatory compliance. Healthcare organizations must ensure that their machine learning implementations comply with regulations such as HIPAA and GDPR, which can be time-consuming and costly. Interoperability is also a significant challenge. Machine learning systems must be able to integrate with existing systems and devices, which can be difficult due to differing data formats and standards. Scalability is another concern. Machine learning models require large amounts of data to train, and healthcare organizations must ensure that their systems can handle the volume and velocity of data. Security is also a top priority. Patient data must be protected from cyber threats, and machine learning systems must be designed with security in mind. Finally, there are ethical considerations to address. Machine learning models must be designed to ensure fairness, transparency, and bias mitigation. By understanding and addressing these challenges, healthcare organizations can successfully implement machine learning and improve patient outcomes.

7.Conclusion and Future Work

Smart healthcare system is a developing and especially critical research field with a possibly significant effect on the conventional healthcare industry. Our work represents machine learning perspectives of smart healthcare system. We focused on Machine Learning applications, techniques, challenges in smart healthcare. A systematic pipeline of data processing is accommodated for conventional smart health, covering data acquisition, data processing, data dissemination, data security and privacy, and networking and computing technologies. In spite of numerous chances and methodologies for data analytics in healthcare presented in this work, there are numerous different bearings to be investigated concerning different aspects of healthcare data such as quality, privacy and so on. In future work, we are going to apply Machine Learning algorithms to detect anomaly over intensive care patient data.

References:

1. Hampel H, O'Bryant S, Durrleman S, et al. (2017) Others A precision medicine initiative for Alzheimer's disease: the road ahead to biomarker-guided integrative disease modeling. Climac-teric 20: 107–118. https://doi.org/10.1080/13697137.2017.1287866
2. Hossain M, Wadud M, Rahman A, editor. A Secured Patient's Online Data Monitoring through Blockchain: An Intelligent way to Store Lifetime Medical Records. 2021 International Conference On Science Contemporary Technologies (ICSCT); c2021. p. 1–6.
3. Solanas, A., Patsakis, C., Conti, M., Vlachos, I.S., Ramos, V., Falcone, F., Postolache, O., Pérez-Martínez, P.A., Di Pietro, R., Perrea, D.N.and Martinez-Balleste, A., Smart health: a context-aware health paradigm within smart cities. IEEE Communications Magazine, 52(8),pp.74-81, 2014.
4. P. A. Pérez-Martínez, A. Martínez-Ballesté, and A. Solanas, "Privacy in Smart Cities — A Case Study of Smart Public Parking," Proc. 3rd Int'l Conf. Pervasive Embedded Computing and Commun. Sys., pp. 55-59, 2013.
5. G. Eysenbach, "What Is e-Health?" J. Medical Internet Research, vol. 3, no. 2, pp. 20-21, Apr-June 2001.
6. Istepanian, Robert, Swamy Laxminarayan, and Constantinos S. Pattichis. M-health. New York, NY: Springer Science+ Business Media,Incorporated, 2006.
7. Istepanian, Robert, Swamy Laxminarayan, and Constantinos S. Pattichis. M-health. New York, NY: Springer Science+ Business Media, Incorporated, 2006.
8. John D. Kelleher, Brian Mac Namee, Aoife D'Arcy, Fundamentals of Machine Learning for Predictive Data Analytics: Algorithms, Worked Examples, and Case Studies, 1st Edition, The MIT Press, 2015.
9. Y. Fujii, N. Yoshiura, A. Takita, and N. Ohta, "Smart street light system with energy saving function based on the sensor network," in Proceedings of the Fourth International Conference on Future Energy Systems, ser. e-Energy '13, New York, NY, USA, pp. 271–272, 2013. [Online]. Available: http://doi.acm.org/10.1145/2487166.2487202
10. N. Yoshiura, Y. Fujii, and N. Ohta, "Smart street light system looking like usual street lights based on sensor networks," in 13th IEEE International Symposium on Communications and Information Technologies, pp. 633–637, 2013.

The impact of Artificial Intelligence on Primary School Student's Learning Experience

Ms. Manju Agrawal
Seva Sadan College of Educations, Ulhasnagar-3

Abstract

The integration of artificial intelligence (Al) in education has the potential to revolutionize the learning experience for students. This abstract provides an overview of the impact of Al on students' learning experiences, highlighting its benefits and potential challenges.

Al technologies such as machine learning, natural language processing, and data analytics have been increasingly adopted in educational settings. These technologies enable personalized and adaptive learning experiences, students with tailored content and feedback based on their individual needs and learning styles. Al-powered educational platforms can analyze vast amounts of data to identify patterns and offer personalized recommendations, thereby enhancing students' engagement and motivation.

One of the significant benefits of Al in education is its ability to provide immediate and constructive feedback to students. Automated grading systems powered by Al algorithms can assess and provide feedback on assignments, quizzes, and exams promptly, allowing students to understand their strength and weaknesses in real-time. This timely feedback facilitates self- reflection and enables students to make necessary improvements, leading to enhanced learning outcomes.

However, the integration of AI in education also poses challenges that need to be addressed. Privacy and ethical concerns arise when dealing with student data, as Al relies on collecting and analyzing personal information to provide personalized experiences. Safeguarding student data privacy and ensuring ethical use of Al technologies are essential considerations for educators and policymakers.

Additionally, there is a potential risk of over-reliance on AI technologies, leading to a passive learning experience for students. Balancing the use of Al with human instruction and guidance is crucial to maintain meaningful interactions and promote deeper understanding.

In conclusion, the integration of Al in education holds significant promise for transforming the learning experience for students. Al technologies have the potential to provide personalized learning, immediate feedback, and foster collaboration among students. However, careful consideration of privacy, ethics, and maintaining a balance between Al and human instruction is necessary to maximize the benefits of AI in education and ensure a holistic learning experiences for students.

Introduction

Artificial intelligence (AI) has emerged as a transformative technology with the potential to revolutionize various industries, including education. In recent years, there has been a growing interest in understanding the impact of Al on students' learning experiences. Al technologies, such as machine learning, natural language processing, and data analytics, are being leveraged to develop innovative educational tools and platforms that can enhance the way students learn, engage, and succeed in their educational pursuits.

The traditional education system has typically followed a one-size-fits-all approach, where students receive the same content and instruction regardless of their individual needs and learning styles. However, with the integration of Al, education can become more personalized and adaptive, catering to the unique requirements of each student. Al-powered educational platforms have the ability to collect and analyze vast amounts of data, enabling them to gain insights into students' strengths, weaknesses, and learning preferences. This data-driven approach allows for the delivery of customized content, recommendations, and feedback, providing students with a tailored learning experience that maximizes their potential for success.

One of the significant advantages of Al in education is its ability to provide immediate and constructive feedback to students. This real-time feedback fosters a sense of self-reflection and empower students to take an active role in their own learning process.

The integration of Al in education also poses challenges that need to be addressed. Privacy concerns arise when dealing with student data, as Al relies on collecting and analyzing personal information to provide personalized experiences.

Benefits of Al in Education

This section highlights some of the key advantages of Al in education:

1. Personalized Learning:

Al-powered educational platforms have the capability to analyze vast amounts of data to understand students' learning styles, preferences, and knowledge gaps. With this information, Al can provide personalized learning experiences by delivering tailored content, resources, and assessments to each student. Personalized learning allows students to progress at their own pace, focus on areas where they need improvement, and explore advanced concepts when ready. This individualized approach enhances student engagement, motivation, and overall learning outcomes.

2. Immediate and Constructive Feedback:

Al enables the provision of timely and constructive feedback to students. Automated grading systems powered by Al algorithms can assess assignments, quizzes, and exams quickly, providing students with immediate feedback on their performance. This prompt feedback allows students to understand their strengths and weaknesses, identify areas for improvement, and make necessary adjustments in real-time. By addressing gaps in understanding promptly, students can enhance their learning and make progress more effectively.

3. Enhanced Collaboration and Interaction:

Al technologies facilitate collaborative learning environments Intelligence tutoring systems and virtual learning assistants can support group discussions, toms, provide e- guidance, guidance, and encourage collaboration among students. These Al- powered tools can simulate real-world scenarios, pronate active participants, critical thinking and problem-solving skills.

4. Access to a Wealth of Educational Resources:

Al can efficiently curate and organize amounts of educational content, making it emily accessible to students. Powers educational platforms can recommend relevant resources, such as textbooks, articles, videos and interactive learning materials, hence on students individual needs and preferences. This acto a wide range of educational resources empowers students to explore diverse topics, deepen their understanding, and engage with varus learning materials beyond traditional classroom resources.

5. Intelligence Learning Analytics: Al enables advanced data analytics that can provide valuable insights into students' learning progress, patterns, and areas of improvement. By analyzing data educators come to know about students performance .Al algorithms can identify trends and pattern, allowing informal decision. Intelligent leaming analytics can help producers identify struggling talents, personal interventions, and develop targeted instructional strategies. Thes data-driven approach supports evidence-based watching practices and honours the small effectiveness of educational intervent.

6. Contains Learning Support: Al-powered virtual learning essentials can provide round the-clock support to students. These assistants can answer questions, provide explanations, and offer guidance, ensuring that students access to learning support regardless of time and location Continuous learning support helps students overcome barriers and challenges in their learning process, reinforcing their confidence and motivation.

III. Challenges and Concern:

While the integration of artificial intelligence (Al) in education brings significant benefits, as presents challenges and concerns that need addressed This section discusses some of the key challenges and concerns associated with Al in education

1. Privacy and Data Security: Al relies on collecting and analyzing large amounts of student data to provide personalized leaming experiences This rames concerns about the privacy and security y of Student information. Safeguarding personal data and ensuring compliance with data protection regulations am crucial. Educational institution and Al developers must establish robust security measures and protocols to protect student privacy and prevent unauthorized
sensitive data.

2. Ethical Considerations: Al technologies in education rame ethical questions, particularly regarding the use of student data and the decision-making processes of Al algorithms. There is a need of transparent and accountable Al systems that uphold ethical standards. Educators and policymakers must address issues related to Isas, famous, anul transparency in Al algorithms
To ensure equitable access to educational opportunities for all students.

3. Over-Reliance on Al: While AI can provide personalized learning experiences, there is a risk of over-reliance on Al technologies, leading to a passive learning experience for students. It is crucial to strike a balance between Al-driven instruction and human interaction. Human educators play a vital role in providing guidance, support, and personalized instruction that Al alone cannot replicate. Maintaining a balance between Al and human instruction is essential to foster meaningful learning experiences.

4. Access and Equity: The widespread adoption of Al in education raises concerns about access and equity. Al technologies require infrastructure, such as computers, internet connectivity, and devices, which may not be available to all students, particularly those from disadvantaged backgrounds. Ensuring equitable access to Al-powered tools and resources is essential to prevent the exacerbation of existing educational inequalities.

5. Skill Development and Adaptability: As Al technologies continue to evolve, there is a growing need for students and educators to develop the necessary skills to effectively use and interact with Al systems. Students must be equipped with critical thinking, problem-solving, and digital literacy skills to navigate the Al-driven educational landscape. Additionally, educators need professional development opportunities to learn how to integrate Al technologies into their effect teaching practices effectively.

6. Cost and Implementation: Implementing Al technologies in education can involve significant costs, including infrastructure, software development, and training. Ensuring sustainable funding models and providing adequate support for implementation imple are crucial to maximize the benefits of Al in education. Additionally, integrating Al into existing educational systems and practices may require changes in policies, curriculum design, and assessment methods, which can pose implementation challenges.

IV. Future Implications and Recommendations

The impact of artificial intelligence (AI) on students learning experiences is poised to grow in the future. As Al technologies continue to advance, it is important to consider the potential implications and make recommendations to maximize the positive the positive impact on education. Here are some future implications and recommendations:

1. Develop Ethical Framework: With the increasing use of Al in education, there is a need to establish ethical frameworks and guidelines that address issues such as data privacy, algorithmic bias, and transparency. Policymakers, educators, and Al developers should collaborate to develop responsible Al practices that prioritize fairness, accountability, and transparency in the design and implementation of Al systems in education.

2. Foster Collaboration Between Al and Educators: Al should be viewed as a tool to augment and support educators, rather than replace them. Collaboration between Al technologies and human educators is crucial for creating effective learning environments. Educators should receive training and professional development opportunities to understand Al technologies and integrate them into their teaching practices in meaningful ways.

3. Promote Digital Literacy and Al Skills: As Al becomes more prevalent in education, it is important to equip students with digital literacy skills and an understanding of Al concepts. Students should learn how to critically evaluate and use Al-powered tools, understand the ethical implications of Al, and develop skills that complement Al technologies, such as problem- solving, creativity, and adaptability.

4. Address Equity and Access Issues: Efforts should be made to ensure equitable access to Al technologies in education. This includes providing equal access to infrastructure, devices, and high-quality Al-powered educational tools for all students, regardless of socioeconomic or geographic factors. Closing the digital divide and ensuring inclusivity in Al integration will help prevent the exacerbation of existing educational inequalities.

5. Continuous Research and Evaluation: As Al technologies evolve, it is important to conduct ongoing research and evaluation to understand their impact on students' learning experiences. Rigorous studies should assess the effectiveness of AI interventions, identify areas for improvement, and inform evidence-based practices. This research should consider diverse student populations and educational contexts to ensure that Al is beneficial for all learners

6. Collaboration and Knowledge Sharing: Stakeholders in the education community, including educators, researchers, policymakers, and Al developers, should collaborate and engage in knowledge sharing to drive innovation and best practices in Al integration. Platforms for sharing successful Al implementations, research findings, and lessons learned can help foster a collective understanding and ensure that the benefits of Al are maximized.

In conclusion, the future implications of Al in students' learning experiences hold great potential. By proactively addressing ethical considerations, fostering collaboration between AI and educators, promoting digital literacy and Al skills, addressing equity and access issues, conducting research and evaluation, and encouraging collaboration and knowledge sharing, we can ensure that Al technologies positively impact education and contribute to enhanced learning outcomes for all students. It is essential to approach the integration of Al in education with a responsible and inclusive mindset to create a future where Al supports and empowers students' learning journeys.

V. Conclusion

In conclusion, the impact of artificial intelligence (AI) on students' learning experiences is significant and holds great potential for enhancing education. Al technologies offer personalized learning experiences, adaptive instruction, intelligent tutoring, and smart content recommendations that cater to individual student needs. This individualization can lead to improved engagement, deeper conceptual understanding, and better learning outcomes. However, the integration of Al in education also presents challenges and concerns that must be addressed. These include privacy and data security, ethical considerations, over-reliance on Al, access and equity issues, skill development, and implementation costs. It is crucial to prioritise student privacy, ensure fairness and transparency in Al algorithms, maintain a balance between Al-driven instruction and human interaction, address disparities in access, and provide adequate support for implementation.

To harness the full potential of Al in education, it is recommended to develop ethical frameworks, foster collaboration between Al and educators, promote digital literacy and Al skills, address equity and access issues, conduct continuous research and evaluation, and encourage collaboration and knowledge sharing among stakeholders. By approaching Al integration in education responsibly and inclusively, we can create a future where Al technologies amplify educational opportunities, empower students, and contribute to equitable and meaningful learning experiences. Overall, the impact of Al on students' learning experiences is a dynamic and evolving field. By embracing the opportunities, addressing the challenges, and making informed decisions, we can harness the power of AI to transform education and prepare students for the demands of the future.

Vl. References

1. Ahmadi, S. (2024). Elastic Data Warehousing: Adapting To Fluctuating Workloads With Cloud-Native Technologies. Journal of Knowledge Learning and Science Technology ISSN: 2959-6386 (online), 2(3), 282-301. https://doi.org/10.60087/jklst.vol2.n3.p301
2. Gómez, Leticia, Bart Kuijpers, Bart Molana, and Alejandro Vaisman. "A Survey of Spatio- Temporal Data Warehousing." International Journal of Data Warehousing and Mining 5, no. 3 (July 1, 2009): 28-55. https://doi.org/10.4018/jdwm. 2009070102.
3. Ahmadi, Sina. Challenges and Solutions in Network Security for Serverless Computing. No. 11747. EasyChair, 2024.
4. Tan, Xin, David C. Yen, and Xiang Fang. "Web Warehousing: Web Technology Meets Data Warehousing." Technology in Society 25, no. 1 (January 2003): 131-48.
5. Nguyen, Tho Manh, Peter Brezany, A. Min Tjoa, and Edgar Weil. "Toward a Grid-Based Zero-Latency Data Warehousing Implementation for Continuous Data Streams Processing." International Journal of Data Warehousing and Mining 1, no.4 (October 1, 2005): 22-55. https://doi.org/10.4018/jdwm.2005100102.
6. Gómez, Leticia, Bart Kuijpers, Bart Molana, and Alejandro Vaisman. "A Survey of Spatio- Temporal Data Warehousing." International Journal of Data Warehousing and Mining 5, no. 3 (July 1, 2009): 28-55. https://doi.org/10.4018/jdwm. 2009070102.
7. Ahmadi, Sina. "Optimizing Data Warehousing Performance through Machine Learning Algorithms in the Cloud." International Journal of Science and Research (I js r) 12, no. 12 (2023): 1859-1867.
8. "MAPREDUCE RESEARCH ON WAREHOUSING OF BIG DATA." International Journal[10/5, 12:22 PM] Rajesh: of Recent Trends in Engineering and Research 4, no. 3 (April 2, 2018): 598-607. https://doi.org/10.23883/ijrter.2018.4170.raqfm.
9. Hasan, M. R. (2024, January 28). Revitalizing the Electric Grid: A Machine Learning Paradigm for Ensuring Stability in the U.S.A. Journal of Computer Science and Technology Studies, 6(1), 142-154. https://doi.org/10.32996/jcsts.2024.6.1.15 Electronic copy available at: https://ssrn.com/abstract=4716747
10. Naeem, M. Asif, Gillian Dobbie, and Gerald Weber. "Hybrid join of for Near-Real-Time Data Warehousing." International Journal of Data Warehousing and Mining 7, no. 4 (October 1, 2011): 21-42. https://doi.org/10.4018/jdwm.2011100102.
11. Chakraborty, Sonali Ashish. "A Novel Approach Using Non-Synonymous Materialized Queries for Data Warehousing." International Journal of Data Warehousing and Mining 17, no. 3 (July 2021): 22-43. https://doi.org/10.4018/ijdwm.2021070102.
12. Ahmadi, Sina. Next Generation AI-Based Firewalls: a Comparative Study. No. 11680. EasyChair, 2024.
13. Jaroli, Priyanka, and Palak Masson. "Data Warehousing and OLAP Technology (Data Warehousing)." International Journal of Engineering Trends and Technology, no. 1 (September 25, 2017): 45-50. https://doi.org/10.14445/22315381/ijett-v51p208.
14. Hasan, M. R. "Cybercrime Techniques in Online Banking." Int. J. of Aquatic Science 13, no. 1 (2022): 524-541.
15. Goalfill, Matteo, and Stefano Rizzi. "A Survey on Temporal Data Warehousing." International Journal of Data Warehousing and Mining 5, no. 1 (January 1, 2009):1-17. https://doi.org/10.4018/jdwm.2009010101. 9):115-118.

The Role of Artificial Intelligence in Skill Development: Implications for Higher Education Under National Education Policy (NEP) 2020

Ms. Nirali R. Shah

Assistant Professor, Department of Commerce and Management, Faculty of Business and Commerce, Atmiya University, Rajkot, Gujarat, India.

Abstract

The integration of Artificial Intelligence (AI) into higher education offers significant opportunities to improve skill development, especially in the context of India's National Education Policy (NEP) 2020. This policy fosters holistic development, flexibility, and skill-based education that aligns with industry demands. AI tools can help institutions enhance learning experiences, personalise education, and prepare students for a dynamic workforce driven by Industry 4.0. This paper uses secondary data to explore the role of AI in skill development within Indian higher education. We assess the effectiveness of AI-driven approaches in enhancing student outcomes and examine the challenges, such as infrastructural deficits and the need for teacher training. The findings suggest that AI has transformative potential in bridging the skills gap, though policy and institutional support are necessary to overcome barriers to its successful implementation.

Keywords: Artificial Intelligence, Skill Development, NEP 2020, Higher Education, Personalized Learning, Digital Infrastructure, Teacher Training

Introduction

The world of education is undergoing rapid transformation with the advent of digital technologies. Artificial Intelligence (AI) stands at the forefront of these innovations, offering a range of tools and techniques that promise to revolutionise traditional learning methods. In this context, India's National Education Policy (NEP) 2020 marks a significant step forward by emphasising the role of technology in education. One of its core objectives is to promote skill development, ensuring that students graduate with the competencies required by a fast-evolving job market. AI's integration into higher education is seen as a powerful way to achieve these objectives. NEP 2020 outlines the importance of vocational education and skill-based learning, highlighting the need for students to develop both hard and soft skills that align with industry requirements. AI can significantly contribute by personalising learning experiences, fostering innovation, and providing the flexibility necessary for students to develop critical 21st-century skills, such as problem-solving, critical thinking, and creativity.

This research paper aims to explore the impact of AI on skill development in Indian higher education. Specifically, it examines the role of AI in addressing the skills gap by analysing secondary data from institutional reports, government publications, and scholarly articles. The paper also evaluates the challenges that higher education institutions face in integrating AI, particularly in terms of infrastructure and teacher preparedness.

Literature Review

AI in Education: A Global Perspective

Artificial Intelligence has made significant inroads into education, offering a variety of tools that help institutions improve teaching and learning outcomes. As Popenici and Kerr (2017) note, AI has the potential to "augment human capabilities and transform the traditional approaches to education." Intelligent Tutoring Systems (ITS) are one example of how AI can tailor learning experiences to individual students. These systems use machine learning algorithms to predict a student's strengths and weaknesses, offering personalized instruction that adapts to the learner's pace. This approach ensures that students not only understand concepts but also retain knowledge more effectively over time (Luckin et al., 2016).

Globally, AI has been integrated into various facets of education. Universities in countries like the United States, the United Kingdom, and Singapore are increasingly using AI-driven platforms to enhance student engagement and improve outcomes. Holmes, Bialik, and Fadel (2019) argue that AI-powered tools, such as automated grading systems, chatbots, and virtual teaching assistants, have made the learning experience more interactive and personalized.

Skill Development and NEP 2020

The National Education Policy (NEP) 2020 introduces a comprehensive framework for transforming Indian education, emphasizing skill development as a key component of student learning. The policy advocates for a shift from rote learning to experiential, skill-based learning, aimed at improving employability and aligning education with industry demands. The NEP envisions the integration of technology, including AI, to facilitate flexible, student-centric learning environments (Ministry of Education, 2020).

Research by Kumar (2020) highlights that AI can support NEP 2020's objectives by providing tools that foster vocational and skill-based learning. For example, AI can offer real-time feedback to students, helping them develop skills such as problem-solving, critical thinking, and collaboration—competencies that are essential in today's workplace. Moreover, AI-driven platforms can offer simulations and virtual labs, enabling students to gain hands-on experience in a controlled, risk-free environment.

Challenges in AI Integration

Despite the promises of AI, its adoption in education faces several challenges. One major hurdle is the digital divide, particularly in rural areas, where access to technology and digital infrastructure is limited. Chakrabarti (2021) points out that without adequate infrastructure, AI integration in education is likely to exacerbate existing inequalities. Moreover, teacher preparedness remains a significant issue. Many educators lack the necessary skills to effectively use AI tools in their teaching, which can limit the potential benefits of AI-driven education. According to Selwyn (2019), the ethical and privacy concerns associated with the use of AI in education are also areas that require careful consideration.

Research Methodology

This research is based on secondary data analysis, utilizing a qualitative approach to assess the role of AI in skill development within Indian higher education. Data sources include institutional reports, government publications, case studies, and scholarly articles. The focus is on identifying the extent of AI adoption in higher education institutions, its impact on skill development, and the challenges associated with its implementation.

Data Analysis And Interpretation

Adoption of AI in Higher Education: The adoption of AI in Indian higher education has been gradual but promising. According to a report by NASSCOM (2021), around 20% of Indian universities have integrated AI into their curriculum, particularly in fields such as data science, business intelligence, and digital marketing. These institutions are leveraging AI-driven platforms like Coursera, Udemy, and EdX, which offer skill development programs tailored to students' individual needs. Additionally, institutions such as IITs and IIMs have introduced AI modules to enhance analytical and problem-solving skills (Kumar, 2020).

A significant development is the introduction of AI-based personalized learning platforms. These platforms use algorithms to analyse students' learning behaviours, offering customized learning paths that cater to individual strengths and weaknesses. Such platforms enable students to develop both technical and soft skills at their own pace, ensuring that they are better prepared for the workforce. Reports from universities using these platforms show a marked improvement in student engagement and skill acquisition (Deloitte, 2022).

Impact on Skill Development: AI-driven platforms have been particularly effective in reducing the skills gap. Secondary data from the Indian Ministry of Education (2022) reveals that students enrolled in AI-powered skill development programs exhibit a 30% improvement in competencies

such as critical thinking, problem-solving, and decision-making. Furthermore, AI allows students to engage in continuous learning through simulations and virtual environments, where they can practice and refine their skills without the risk of failure.

AI has also played a role in enhancing soft skills, such as communication, collaboration, and adaptability. Virtual learning platforms provide opportunities for students to collaborate in real-time with peers from different geographical locations, fostering teamwork and cross-cultural communication. This aspect of AI-driven learning aligns well with NEP 2020's emphasis on developing well-rounded individuals who can thrive in diverse, globalized environments.

Challenges in Infrastructure and Teacher Training: Despite these successes, significant challenges remain. One of the most critical barriers to the widespread adoption of AI in Indian higher education is the lack of digital infrastructure, especially in rural areas. Data from the Ministry of Human Resource Development (2021) indicates that only 35% of rural educational institutions have access to the high-speed internet and digital tools necessary for implementing AI-based learning platforms. This digital divide poses a significant obstacle to achieving NEP 2020's vision of equitable, technology-driven education.

Another challenge is the lack of teacher training. While AI tools offer immense potential, their effective implementation depends on teachers' ability to use them. Unfortunately, many educators are not equipped to handle AI-driven learning environments. Chakrabarti (2021) highlights that less than 40% of Indian teachers have received formal training in digital tools, let alone AI. Without proper training, teachers may struggle to integrate AI into their pedagogy effectively, limiting its potential to enhance student outcomes.

Findings

AI Personalizes Skill Development: AI-driven platforms enable personalized learning experiences that allow students to acquire skills at their own pace. This customization is particularly beneficial in skill-based education, where students' abilities and learning speeds can vary widely.

Reduction in Skill Gaps: AI-powered tools, such as adaptive learning platforms, have been effective in reducing skill gaps, particularly in fields like data science, business analytics, and digital marketing. These tools provide real-time feedback, helping students refine their skills and better prepare for the workforce.

Challenges in Rural and Underserved Areas: There remains a significant digital divide in rural and underserved regions of India. Many institutions lack the necessary infrastructure to implement AI-based learning programs effectively. Addressing this gap is crucial for ensuring that AI-driven education is accessible to all students, regardless of their geographical location.

Need for Teacher Training: The successful integration of AI in education requires teachers to be proficient in using AI tools. However, current teacher training programs are insufficient in preparing educators for AI-driven learning environments. Developing comprehensive training programs for teachers is essential for maximizing the potential of AI in skill development.

Implications

For Higher Education Institutions: Institutions need to invest in digital infrastructure and teacher training to fully realize the benefits of AI-driven skill development. This includes providing access to high-speed internet, equipping classrooms with AI tools, and offering training programs for teachers to develop their AI-related competencies.

For Policy Makers: Policymakers must prioritise equitable access to digital tools and AI technologies, particularly in rural and underserved areas. NEP 2020's vision of a technology-driven education system can only be achieved if all students, regardless of their location, have access to the necessary resources. Additionally, policies should focus on teacher development programs that include AI literacy as a core component.

Suggestions

Invest in Digital Infrastructure: Government and private institutions should collaborate to improve digital infrastructure, especially in rural areas. Ensuring that all educational institutions

have access to high-speed internet and digital tools is essential for the widespread adoption of AI-driven learning platforms.

Develop Teacher Training Programs: Institutions should implement comprehensive teacher training programs that focus on the integration of AI in the classroom. These programs should include modules on using AI tools, understanding their potential for enhancing skill development, and addressing the ethical considerations of AI in education.

Encourage Industry Collaboration: Educational institutions should collaborate with industry partners to develop AI-driven skill development programs that align with market needs. This can help ensure that students graduate with the skills required by employers, enhancing their employability and career prospects.

Conclusion

Artificial Intelligence has the potential to transform skill development in higher education, particularly in the context of India's NEP 2020. AI-driven platforms offer personalised learning experiences, reduce skill gaps, and prepare students for the demands of the 21st-century workforce. However, significant challenges remain, including infrastructural deficits in rural areas and the need for comprehensive teacher training programs. By addressing these challenges, policymakers and educational institutions can ensure that AI becomes a powerful tool for building a skilled and adaptable workforce, capable of thriving in an increasingly digital world.

References

1. Chakrabarti, S. (2021). AI in education: Challenges and opportunities. Journal of Educational Technology, 18(2), 103-115. https://doi.org/10.1007/s11162-020-09602-7
2. Deloitte. (2022). The impact of AI on skill development in higher education.
3. Holmes, W., Bialik, M., & Fadel, C. (2019). Artificial intelligence in education: Promises and implications for teaching and learning. Centre for Curriculum Redesign. https://curriculumredesign.org/wp-content/uploads/AI-in-Education.pdf
4. Kumar, P. (2020). AI in higher education: A new approach to teaching and learning. *Indian Journal of Educational Research*, 39(1), 67-82.
5. Luckin, R., Holmes, W., Griffiths, M., & Forcier, L. B. (2016). Intelligence Unleashed: An argument for AI in education. Pearson.
6. Ministry of Education. (2020). National Education Policy 2020.
7. Ministry of Human Resource Development. (2021). Challenges in the implementation of AI in rural education. Government of India.
8. NASSCOM. (2021). AI adoption in Indian education: A progress report.
9. Popenici, S. A. D., & Kerr, S. (2017). Exploring the impact of artificial intelligence on teaching and learning in higher education. Research and Practice in Technology Enhanced Learning, 12(1), 22-34. https://doi.org/10.1186/s41039-017-0062-8
10. Selwyn, N. (2019). Should robots replace teachers? AI and the future of education. Polity Press.

Transforming Higher Education with AI-Integrated Faculty Training with Evidence of Mumbai Teachers

Ms. Minakshi Kandari
Asst. Professor Claras College of Commerce Department of Commerce
Mrs. Ruchita Pandhare
Asst. Professor Claras College of Commerce Department of Economics

Abstract

The study focuses on AI's active utilization in training faculty of different higher learning institutions in Mumbai to address the need to improve teaching practices and overall learning achievement. It also explores how through AI one can personalize the learning process, reduce paperwork, and how AI can assist educators in their mission of providing quality education. Employing both the TPACK and TAM frameworks, the paper examines the perceptions of 247 faculty members on the ease of use of AI, as well as the change in teaching pedagogy and potential challenges of implementing AI. The study shows that educators experienced a positive approach toward AI and recognized the possibility of enhancing educational approaches. However, issues like the requirement for operational support, as well as constant professional development, have not been left out. The study also focuses on the continuous professional development of faculty and the technical support needed to maximize the benefits being derived from AI integration and also presenting the positive relationship between the use of AI and advancement in teaching strategies.

Keywords: Artificial Intelligence (AI) in Education, Faculty Training, Higher Education Institutions, TPACK Framework (Technological Pedagogical Content Knowledge), TAM Framework (Technology Acceptance Model), Mumbai.

Introduction

The education sector experiences a range of changes to its functioning as a result of technological progress, with a special emphasis on AI. We are implementing AI to tailor learning, control clerical work, and assist faculty in enhancing their education delivery. Teachers must receive training to optimize the system's effectiveness. This is due to advancements in technology, particularly AI. We are using AI to personalize learning, automate administrative tasks, and assist faculty in delivering more effective teaching. However, to fully utilize its potential, we must train teachers in its application. The following paper seeks to analyse the impact of integrating AI in faculty training programs to improve teaching and learning processes in Mumbai's higher learning institutions. The analysis focuses on identifying how AI contributes to the change of educational practices, the current training for faculty, and the limitations on its effective implementation. The study employs both qualitative and quantitative approaches to address critical research questions relating to the extent of AI integration in training and its impact on student's achievement.

Literature Review

People appreciate AI for its ability to enhance education quality by individualizing the learning process through real-time feedback and reducing paper work. Song and Xie (2021) have discussed the positive impacts of AI in enhancing the technological knowledge of faculty members as they integrate AI technology into their training. Also, in line with the efficiency of AI in teaching, Chang et al. (2022) argue that AI has improved the grading system, ‘‘intelligent’ tutors, and ‘‘adaptive learning platforms." Previous studies on faculty perception of AI integration present the following points: According to Georgina and Hosford (2009), in a cross-sectional survey, technological literacy had a very high correlation with the level of AI implementation in class by the participating faculty members. Riapina (2023) highlights that the use of AI in communication activities among boys enhances the cognitive load of instructors, particularly when students interact. However, the issue remains unresolved, as the question of how to incorporate AI into the

development of faculty capabilities remains open. Alnasib (2023) addressed several challenges such as insufficient technology support, faculty resistance, and the necessity for continuous professional development. The results also shed light on how institutions can adopt preparation, appropriate mentoring, and a supportive environment as crucial elements to equip faculty for AI in higher education.

Objective of the study

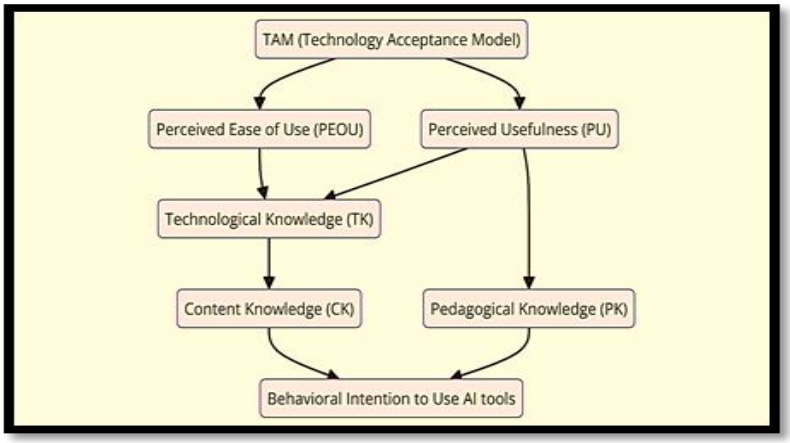
i. To investigate the integration of AI into faculty training programs within Mumbai's higher education sector.
ii. To understand AI's role in improving teaching methods and learning outcomes.
iii. To investigate current training practices and barriers to the effective adoption of AI tools in education.
iv. To examine faculty members' perceptions of AI tools and their impact on teaching effectiveness.
v. To investigate the impact of AI on personalized learning, teaching efficiency, and student engagement.

Theoretical framework

The model for integrating AI in the faculty training programs is developed in this research by combining the TPACK and TAM frameworks. This model shows the integration of the two frameworks, each of which offers the complete picture of how faculty members engage with as well as integrate AI in their teaching and professional learning process.

Hypotheses from this blended TPACK-TAM framework underpin this research paper and explore the correlation between faculty perceptions of AI, including ease of use and perceived usefulness.

Figure 1 shows the Blended Model Components of TPACK **(Technological Pedagogical Content Knowledge) and** TAM **(Technology Acceptance Model)**



H1: Teachers who perceive AI tools as easy to use are more likely to believe that AI enhances their teaching methods.

H2: Teachers who find AI tools useful for personalized learning are more likely to believe that AI enhances their overall teaching effectiveness.

H3: Teachers who believe AI helps efficiently deliver course content are more likely to continue using AI tools in the future.

H4: The need for technical support negatively affects teachers' intention to continue using AI tools in teaching

Research Methodology

This study aims to understand faculty members in Mumbai's higher education institutions who are integrating AI into their training programs. We will select a sample of 247 faculty members from various disciplines using a stratified random sampling method. We will collect primary data through

structured questionnaires. We will test the survey instrument's internal consistency using Cronbach's alpha to ensure reliability.

Table 1: Reliability Statistics

Reliability Statistics	
Cronbach's Alpha	**N of Items**
0.788	**11**

With a Cronbach's alpha of 0.788, the internal consistency of the 11 items is acceptable and close to good reliability. This means the items are fairly consistent in measuring the same construct or concept, and the scale is reliable for most research or practical purposes.

Result & Discussions

This research's conclusions show how the inerrability of AI tools in faculty teaching is affected by perceptions, technological knowledge, and their usefulness. The discussion is centered on how AI integration raises the probability of enhancing teaching methodologies and professional training. Findings are discussed within the context of the blended TPACK and Technology Acceptance Model (TAM), exploring AI's affordances as the key to the transformative changes in higher learning institutions.

Table 2: Show the demographic profile of respondents (N = 247)

Demographical profile		**Frequency**	**Percentage**
Gender	Male	**64**	**25.9**
	Female	**183**	**74.1**
professional Experience	0-5 years	**69**	**27.9**
	6-10 years	**71**	**28.7**
	11-20 years	**71**	**28.7**
	More than 20 years	**36**	**14.6**
Teaching section	Degree	**125**	**50.6**
	Jr College	**122**	**49.4**

According to the demographic profile, there are 25.9% of men and 74.1% of women in the population. When it comes to professional experience, approximately 28% of people have less than five years, ten to fifteen years, or eleven to twenty years, with a smaller percentage (14.6%) having more than twenty years. 49.4% of the teaching portion goes to the junior college component, while 50.6% goes to the degree section. The statistics as a whole reveal a predominantly female population, an even distribution of professional experience, and an equal distribution of teaching duties between the degree and junior college divisions.

Table 3: shows A Descriptive Statistics of Faculty Perceptions and Experiences with AI-based Tools in Teaching

Questions	**Mean**	**Std. Deviation**
Gender	**1.74**	**0.439**
Years of Teaching Experience	**2.3**	**1.032**
Teaching Section	**1.49**	**0.501**
How 4 do you find using AI-based tools in your teaching?	**3.47**	**0.779**
What level of technical support do you feel you need to integrate AI into your teaching?	**3.27**	**0.446**
To what extent do you 4 with the statement: "AI tools are 4 to learn and use in teaching"?	**3.64**	**0.48**

To what extent do you believe that AI-based tools enhance your teaching methods?	**3.04**	**1.229**
Do AI-based tools help you create more interactive and engaging learning experiences for students?	**1.18**	**0.383**
In what ways has AI influenced your ability to provide personalized learning to students?	**2.47**	**0.779**
How effective are AI tools in helping you explain complex subject matter to students?	**3.2**	**0.4**
To what extent do you believe AI-based tools assist in delivering course content more efficiently?	**2.29**	**0.751**
Which of the following AI applications do you find most helpful in delivering content?	**2.3**	**0.982**
How 3 are you to continue using AI tools in your teaching in the future?	**3.2**	**0.4**
What additional resources or training would encourage you to use AI tools more effectively?	**2.9**	**0.903**

The data indicates a generally positive outlook toward using AI tools in teaching, with most respondents agreeing that AI is relatively easy to learn and use (Mean = 3.64) and expressing a moderate inclination to continue using these tools in the future (Mean = 3.2). While AI is seen as helpful in enhancing teaching methods (Mean = 3.04) and explaining complex subjects (Mean = 3.2), there are mixed views on its ability to create interactive learning experiences (Mean = 1.18) and improve the efficiency of delivering course content (Mean = 2.29). Respondents also feel they need moderate technical support to integrate AI into their teaching (Mean = 3.27). Overall, the data suggests a favorable attitude toward AI adoption, but there may be a need for additional resources and support to maximize its potential.

Table 4 shows A Hypothesis Testing: Correlation Between Teachers' Perceptions of AI and Its Impact on Teaching Practices.

Hypothesis		**r**	**p**	**Result**
H1	Teachers who perceive AI tools as simple to use are more likely to believe that AI enhances their teaching methods.	0.631	0.000	Strong positive correlation
H2	Teachers who find AI tools useful for personalised learning are more likely to believe that AI enhances their overall teaching effectiveness.	0.77	0.000	Strong positive correlation
H3	Teachers who believe AI helps efficiently deliver course content are more likely to continue using AI tools in the future.	0.473,	0.000	Moderate positive correlation
H4	The need for technical support negatively affects Teachers' intention to continue using AI tools in teaching.	0.222,	0.000	Weak positive correlation

There are favorable links between teachers' views of AI tools and their propensity to use these technologies in the classroom, according to the data study. There is a robust positive association ($r = 0.631$, $p = 0$) between the ease of use of AI tools and the belief that AI improves teaching techniques among teachers. There is an even higher positive association ($r = 0.77$, $p = 0$) between the perceptions of AI's usefulness for individualized learning and its perceived usefulness for overall

teaching efficacy. There is a somewhat favorable association (r = 0.473, p = 0) between teachers' belief that AI helps effectively deliver course information and their desire to continue utilizing AI technologies in the future. Teachers' intentions to keep using AI are marginally positively correlated with the requirement for technical help (r = 0.222, p = 0), suggesting that the negative impact of technical obstacles is minimal in comparison to the positive variables. When it comes to teachers' views towards AI, technical issues are somewhat unimportant compared to the perceived utility and ease of the technology.

6. Conclusion

The research found that AI might greatly enhance the effectiveness of higher education instruction. In general, professors see AI technologies as ways to enhance the quality of instruction and facilitate more individualized student learning. However, there are challenges for example insufficient technological support, and the need to engage in professional development continually. Despite these challenges, the research shows strong positive correlations between the use of the AI tool, the perceived usefulness of the AI tool in the context of the proposed learning model, and the future intention to use AI tools. The lack of technical assistance is a small barrier looking at the fact that the educators have a generally positive attitude towards the AI technologies.

7. **Practical Implication**

a. Institutions of higher learning need to provide continuous technical assistance and resources to encourage the use of AI.
b. Its ensures teachers are getting ongoing training to make good use of AI in the classroom.
c. Improve student engagement and results via the use of AI to provide individualized learning experiences.
d. AI Integration in Teaching: Conclusion and recommendations and future research directions

Recommendations:

a. Ongoing faculty support for technology implementation of AI.
b. Integration of AI is required to supplement what the teachers need in their classes.
c. The development of strategies to encourage applicable uses of AI tools by faculty.

Future Scope:

a. The possibility of AI to design individual learning programs is being examined.
b. Increasing the inclusion of various geographical areas in the AI adoption research.
c. Consequences of integrating AI in a learning environment on students.
d. Introducing AI as the extension of current approaches such as VR and AR.

Limitation of the study

The study is limited by its geographic focus on Mumbai's higher education sector and a sample size of 247 faculty members, which may not capture diverse perspectives. It relies on self-reported data, potentially introducing bias, and only assesses the short-term impacts of AI integration. The study focuses solely on faculty experiences and evaluates a limited range of commonly used AI tools, excluding student input and long-term effects.

References

1. Aithal, P.S., & Avital, S. (2023). Optimizing AI-powered GPTs as teaching assistants. International Journal of Management.
2. Al-haimi, B., Hujainah, F., & Alhroob, E. (2021). Higher education institutions with artificial intelligence: roles, promises, and requirements. Springer.
3. Ali, M., & Abdel-Haq, M.K. (2021). Bibliographical analysis of AI learning in higher education. IGI Global.
4. Almaraz-Menéndez, F., & Maz-Machado, A. (2022). Strategy and governance for AI in higher education.
5. Bates, T., Cobo, C., & Wheeler, S. (2020). Can AI transform higher education? Educational Technology in Higher Education
6. Bucea-Manea-Țoniș, R., & Kuleto, V. (2022). AI-enhanced learning environments in Romania and Serbia. Sustainability.

7. Chan, C.K.Y. (2023). AI policy framework for university teaching and learning. Journal of Educational Technology in Higher Education.
8. Filho, W.L., Ribeiro, P.C.C., & Mazutti, J. (2024). Using AI for sustainable development in higher education. Journal of Sustainable Development.
9. Jafari, F., & Keykha, A. (2024). Opportunities and challenges of AI in higher education. Journal of Applied Research in Higher Education.
10. Katsamakas, E., Pavlov, O.V., & Saklad, R. (2024). AI transformation in higher education institutions.
11. Katsamakas, E., Pavlov, O.V., & Saklad, R. (2024). Artificial Intelligence and the Transformation of Higher Education Institutions. Sustainability.
12. Khan, M.A., Khojah, M., & Vivek. (2022). AI in higher education institutions. Education Research International
13. Kuleto, V., Ilić, M., & Ranković, M. (2021). AI and machine learning in higher education. Sustainability.
14. Michel-Villarreal, R., & Vilalta-Perdomo, E. (2023). Challenges and opportunities of generative AI for higher education. Education
15. Niyozov, N., Saburov, S., & Ganiyev, S. (2023). AI-powered learning in higher education. E3S Web of Conferences.
16. Owoc, M.L., Sawicka, A., & Weichbroth, P. (2019). AI technologies in education: Benefits and challenges. Springer.
17. Saaida, MBE. (2023). AI-Driven transformations in higher education: Opportunities and challenges. Journal of Educational Research and Studies.
18. Singh, R.J. (2023). Transforming higher education: The power of artificial intelligence. International Journal of Multidisciplinary Research
19. Xiao, M., & Yi, H. (2021). Building an efficient AI model for personalized training in colleges. Computer Applications in Engineering Education.
20. Zawacki-Richter, O., Marín, V.I., & Bond, M. (2019). A systematic review of AI applications in higher education. Educational Technology in Higher Education.

Navigating the Ethics of AI-Driven Education: A Critical Exploration of the NEP 2020 and it's Ethical Underpinnings

Sahida Khatun khan

Abstract

"AI has the potential to revolutionize education, but only if we prioritize teacher training, student data privacy, and equitable access."

– Vic Vukovic

The NEP 2020 stands at the forefront of educational change in India with AI(Artificial Intelligence) altering learning experiences globally by employing advanced technologies to improve them. Nevertheless, this progress requires careful consideration of ethical issues. The National Education Policy (NEP) 2020 has laid a foundation for a revolutionary transformation in India's education structure by introducing AI integration for personalization, increased efficiency and better accessibility. However, we need to talk more seriously about ethics around AI as it enters schools and educational programs even in classrooms since AI is increasingly used in teaching and learning across institutions. The use of AI in education raises immediate questions regarding equity vis-à-vis human agency; privacy versus accessibility; all these issues need prompt attention from education stakeholders.

This paper offers a critical analysis of NEP 2020 focusing on AI provisions from an ethical perspective. We will investigate how the policy relates to such concerns alongside its weaknesses and what should be done in order to ensure that AI enhances education without compromising ethical standards going forward. The purpose of our analysis is to enhance the effectiveness of NEP 2020 by exploring ways to uphold ethical standards amidst rapid changes in the educational landscape, ensuring responsible practices.

Keywords: Artificial Intelligence, NEP 2020, ethics, equity, AI-driven education, digital divide, accessibility, privacy, human agency.

Objectives

1. To critically examine the urgent ethical considerations of AI-driven education within the NEP 2020 framework.
2. To strengthen NEP 2020 by identifying crucial gaps in NEP 2020's policy of AI and ethical governance.
3. To anticipate the risks and challenges posed by AI's swift adoption in education, with a focus on marginalized communities.
4. To contribute toward creating an ethical framework for AI in education that emphasizes justice, equity, and human dignity.

Introduction

The integration of artificial intelligence (AI) in education has garnered significant attention due to its potential to personalize learning, improve efficiency, and democratize access to knowledge. NEP 2020 emphasizes the use of AI in education, but raises ethical concerns (MHRD,2020). We stand at a critical juncture in the evolution of education With NEP 2020, India positions itself at the forefront of this transformative shift, advocating for AI as a key driver of personalized learning, improved educational outcomes, and greater inclusivity (MHRD, 2020). As we embrace the new realities that AI presents, there has been urgency for addressing issues surrounding its ethical integration. AI can improve education, but it can also exacerbate inequities. This paper aims at untangling complex ethical dilemmas with a critical, moral reflection about NEP 2020's attitude toward AI. While this policy promotes the potential of democratizing education through AI, it is still uncertain whether sufficient attention has been given to the ethical implications arising from this technological advancement. By examining how NEP 2020 deals with or ignores these moral problems, this study aims at stimulating an urgent debate. As we advance into an AI-infused future in terms of education, one must ask: how can we create a system that will utilize the

power of artificial intelligence while still protecting equity values? In addition to this research proposes routes for responsible deployment of AI which is meant to ensure that education remains founded on morals in future.

Literature Review

The ethical dimensions of AI in education are a growing area of inquiry, that have been impelled by the promises and pitfalls of these technologies. The ethical implications mainly include algorithmic biases, human oversight challenges, and data privacy concerns (Selwyn, 2021; Williamson, 2020). If not guided properly, AI may end up perpetuating existing inequalities, strengthening systemic biases as well as leaving behind disadvantaged groups (Kraemer et al., 2011). Even though NEP 2020 has accepted AI as a tool for transformation in education, it does not give enough ethical guidelines to manage such risks (MHRD, 2020). The possible harm denotes the importance of addressing these gaps before AI becomes entrenched in the educational system.

Hypotheses

H1: NEP 2020 provides insufficient ethical guidelines on mitigating algorithmic bias and ensuring equity in AI-driven education systems.

H2: The policy lacks a robust data privacy and consent framework necessary for AI technologies in Indian education.

H3: NEP 2020 inadequately addresses the erosion of human agency due to growing reliance on AI in educational decision-making.

Methodology

This study employs both primary and secondary data to critically analyze NEP 2020's ethical treatment of AI in education. This research critically examines NEP 2020 through the lens of ethical principles drawn from diverse fields bridging traditional ethics with the unique complexities of AI. The study leverages Beauchamp and Childress's principles of biomedical ethics (1989), expanded to address educational contexts, alongside Floridi's framework on AI ethics (2019). Additionally, The study's findings are supplemented by primary data, providing original insights and supporting evidence.

The analysis is structured around four central dimensions that are both pressing and future-facing:

1. Equity
2. Digital Divide
3. Privacy
4. Human Agency

Analysis and Discussion

Equity and Algorithmic Bias

Among the most significant moral issues in AI-based education is the algorithmic prejudice. AI systems are only as objective as the data that inform them. Consequently, if these data sets are skewed they run the risk of perpetuating pre-existing biases which may have existed before their creation. For example there might be students from rural or impoverished backgrounds who might not be served by an AI platform that was created using information from urban schools. Consequently, instead of mending educational rifts this asymmetry could actually widen them. On the other hand, NEP 2020 identifies the role of AI in making education inclusive but fails to highlight any problems related to bias during its creation and application stages. In a country like India characterized by great diversity and where socio economic, geographical and gender factors influence access to education; it is particularly appalling (MHRD, 2020). Unless addressed deliberately, AI may further amplify these divides rather than challenge them hence perpetuating inequity (O'Neil, 2016).

Digital Divide

Access to technology and infrastructure necessary for AI powered learning is not universal. This digital divide could lead to a situation whereby only privileged students will be able to reap from the benefits that come with advances in technology under artificial intelligence while those who belong to neglected societies may remain behind. NEP 2020 is telecasting out its aspirations for AI without giving any practical blueprint on how these disparities can be addressed. In absence of

specific strategies for expanding access to requisite facilities, AI might unintentionally perpetuate educational inequality cycle where learners with restricted digital penetration lag behind others even further. The need to address disparities between digitally transitioned and non digitally transitioned communities in conjunction with implementation of artificial intelligence is an important policy implication represented by this gap.

Data Privacy and Consent

In order to deliver personalized learning experiences, AI in education relies heavily on sensitive student data, the collection of which ranges from academic performance to personal details. However, NEP 2020 lacks an elaborate framework for protecting students' privacy and ensuring informed consent. Otherwise, this data could be abused by third parties or stolen in data breaches, thus exposing students to danger. In other parts of the world, strict regulations such as General Data Protection Regulation (GDPR) in Europe have been established to protect data. However, India's data protection laws are still young and hence leave students exposed to unjustifiable situations that can arise because NEP 2020 said nothing about it. Another important issue is that it is silent about consent because how can they get proper understanding if parents (or anyone) are not allowed to opt out? Clear data governance mechanisms are missing making AI-based education ethically invalid; hence it remains a major gap within the policy.

Human Agency and Autonomy

Education's increasing reliance on AI raises important questions regarding the fading of human agency. Although AI can be used to improve learning outcomes, it can also lead to overreliance on algorithms that may drown out teachers' and students' voices in educational decision-making. The National Education Policy (NEP) 2020 places AI as an enabler, but this fails to address the true danger of reducing educator autonomy by making them too dependent on its suggestions. In turn, this might diminish teacher-student relationship thereby downgrading emotional and social components of education that computers cannot replicate. In his analysis of ethical issues related to artificial intelligence, Floridi (2019) argues for its prioritization for human dignity which necessitates keeping it under the control of people instead of allowing it posses authority over them. A gap in ethics is one more reason why NEP/2020 does not mention these dangers. The need to maintain human agency becomes more crucial when we consider the extent to which AI is permitting educational system

Primary Data collection

The study gathers primary data through Google form survey of 150 respondents, comprising educators, students, and other stakeholders. A convenience sampling approach was employed for data collection, without random selection. This dataset facilitates an in-depth critical analysis of the research, providing valuable insights into the phenomenon under investigation.

A concise presentation of data is as followed

One of the key ethical concerns regarding AI in education is:	Students data privacy 20%	Digital divide 50%	Diminishing human involvement 30%		
What are your primary concerns regarding AI in education?	Algorithmic bias 30%	Data privacy and consent 60%	Over reliance on technology 50%	Lack of equitable access 40%	Loss of teacher autonomy 30%
To what extent NEP 2020 addresses the issue of fairness in AI-driven educational tools?	1 (lowest) 50%	2 30%	3 10%	4 10%	5(highest) 0%
Which group is most at risk of being left behind due to AI in education?	Urban students	Students from rural areas and marginalised	Teachers		

	20%	community 70%	10%		
What do you think are the long-term impacts of AI on education in India?	Improved personalized learning 10%	Increased inequality 40%	Automation of administrative tasks 10%	Loss of human interaction in teaching 40%	
Does government provides enough training and resources for educators to navigate AI-driven education under NEP 2020?	Yes 10%	No 70%	May be 20%		
How should policymakers address the ethical challenges of AI in education?	Ensure data privacy and security 20%	Develop fair and unbiased AI system 40%	Increase access to technology for all students 30%	Offer AI related teacher training 10%	

Limitations

The study's focus on NEP 2020 may limit its applicability to broader, evolving ethical standards in AI and education. Given the rapid evolution of AI technology, the findings may quickly become outdated as new developments emerge.

Conclusion

The integration of AI in education is envisioned in NEP 2020, presents both opportunities and deep ethical issues. Several notable gaps exist in the policy's ethical considerations, as this analysis indicates. This analysis confirms NEP 2020's AI integration in education is ethically deficient, lacking guidelines on algorithmic bias (H1), data privacy (H2), and human agency (H3), compromising equity, privacy, and autonomy. With the growing influence of AI in shaping the future of education, it is crucial to embed ethical frameworks into policy so that AI usage can be responsible, equitable and inclusive.

Suggestions

To make NEP 2020 more effective and robust future research should focus on developing practical solutions, such as ethical guidelines for algorithm development, data privacy protections, and maintaining human oversight in AI-driven education. Thus, policymakers need to involve different stakeholders like ethicists, technologists, educators and marginalized groups so that AI can be used fairly and transparently. By emphasizing social justice, openness and inclusion within its education system India can establish itself as a forerunner of an AI oriented education that engages everyone.

References

1. Beauchamp, T. L., & Childress, J. F. (1989). Principles of biomedical ethics. Oxford University Press.
2. Floridi, L. (2019). The ethics of artificial intelligence. Oxford University Press.
3. Kraemer, F., van Overveld, C., & Peterson, M. (2011). Is there an ethics of algorithms? Ethics and Information Technology, 13(3), 251–260. https://doi.org/10.1007/s10676-010-9233-7
4. MHRD (2020). National education policy 2020. Government of India.
5. Selwyn, N. (2021). AI and education: Understanding the rise of artificial intelligence and its implications for education. Learning, Media and Technology, 46(1), 1–14. https://doi.org/10.1080/17439884.2020.1866646
6. Williamson, B. (2020). The datafication of education: AI, algorithms, and the future of learning. Routledge.
7. James Madison University. (n.d.). AI in education: Ethics. https://guides.lib.jmu.edu/AI-in-education/ethics
8. Googleformhttps://docs.google.com/forms/d/e/1FAIpQLSfXuI6NZc1bN97G4bamqZYDfhn0U5wLG9Wmpb690_tkHg_xEQ/viewform?usp=sf_link

AI in Adaptive Learning for Slow Learner Students: Enhancing Educational Outcomes Through Personalized Technologies

Ms. Kajal Jaiswal
Assistant Professor, Department of Commerce, Claras College of Commerce

1.Abstract: -

This research paper explores the application of artificial intelligence (AI) in adaptive learning systems designed to support slow learner students. The study examines how personalized technologies can enhance educational outcomes for this specific group of learners. By analysing current AI-driven adaptive learning platforms, their effectiveness, and potential areas for improvement, this paper aims to contribute to the ongoing discussion on inclusive education and the role of technology in addressing diverse learning needs.

Keywords: - Artificial Intelligence, Slow Learner Students, Adaptive Learning, Educational Technology.

2.Introduction: -

The rapid advancement of artificial intelligence is growing day by day in every sector which is helping everyone to get more information. In education sector artificial intelligence is playing a vital role by addressing the diverse needs of learners who faced many challenges in their day-to-day life while studying. Education systems globally run to cater all the varying learning speeds and styles for students that they all should have one size fit all approaches often they fail to address the need of an individual student. In traditional classroom teaching, the slow learner students are not able to understand the concept within the limited time, they need additional time to understand concepts, which is not likely to be possible every time due to time constraint. In most cases, it is observed that the slow learner students hesitate to ask questions during the lecture conducted in classroom. They are worried that other students might make fun of them, as they are slow to grasp concepts taught in class. This lowers their self-confidence, increase their hesitation and impact their academic performance.

In recent era advancement of AI has bring more new opportunities to address these challenges through adaptive learning technologies. Through AI, students can seek reply for their questions online without any hesitation. It plays a significant role in adaptive learning like Data-Driven Insights, Real Time Feedback and Support, Personalized Learning Paths, Accessibility Features, Engaging Content and Pacing Control. Furthermore AI-driven adaptive learning systems provide teachers with valuable understandings into student progress, allowing targeted interventions and personalized instructional policies.

AI tools used by slow learners for educational purpose are Gemini, ChatGPT, Google Classroom, Microsoft Copilot, DALL-E, Smart Sparrow, Microsoft Teams which help them to learn and understand various concept in better way. Not just learning but these tools also give them instant feedback about their performances which help them to improve their area of weakness and make them work harder on those things

3. Objectives: -

1. To assess the efficiency of AI-based adaptive learning systems in supporting slow learners.
2. To identify the specific topographies and functionalities of adaptive learning technologies that are most helpful for these students.
3. To analyse factor impact of personalized learning on academic performance, engagement, and motivation among slow learners.
4. To provide suggestion for teachers and representatives on the incorporation of AI technologies into educational practices to better support slow learners.

4. Statement Of The Problem: -

The slow learners face many challenges in every field be it education or anywhere else. As they require additional time and personalized support to achieve academic success. Due to time constraints, traditional teaching methods sometimes doesn't help them which results in lack of understanding in concepts. Even the education institutions brought certain uniform curricular but than too it fails to fulfil the needs of the slow learner which result in reduced educational outcomes reduced self-efficacy and lower overall academic engagement.

5. Literature Review: -

❖Hassan et al., (2023) it emphasizes that this research bridges the gap between academic research and practical applications in interactive mobile technologies. The adaptable learning-oriented usability model presented in this paper offers a framework for supporting slow learners, emphasizing its essential components and their interactions to enhance the learning outcomes for this user group.

❖M.Dharani et al., (2023) it has emphasized that AI education allows all students to acquire a high-quality education and customizes learning. Although every student's learning style is unique, generally they are divided into three categories based on learning: Passive learners, Slow learners, Quick Learners. The main goal of this work is to determine how artificial intelligence affects teaching for slow learners and also provided different AI methods to teach slow learners.

❖Guangju Li (2023) It has investigated that the HCFM's predictive capabilities are further demonstrated through a detailed analysis of individual instances, highlighting its effectiveness in tailoring predictions to the unique characteristics of learners. The results suggest that the HCFM holds promise as a powerful tool for personalized education, paving the way for more adaptive and tailored learning environments. The paper concludes by discussing potential avenues for future research, emphasizing the importance of further validation and exploration of the model's applicability in diverse educational settings.

❖ Sheetalrani R Kawale et al., (2022) it has stated that this research project offers a useful methodology for creating a customised e-learning system. In order to enhance the effectiveness of the online learning system, artificial intelligence-based systems adapt to the demands of each student individually. This is an adaptable e-learning system that operates in accordance with the learner's many learning aspects. An interactive, customised e-learning system is being developed via research that combines data mining methods, artificial neural networks, fuzzy logic, and adaptive neurofuzzy systems.

❖K.Palanivel (2020) it has analysis the objective of this research is to study the emerging technologies that are used to design smart education system. With these emerging technologies, education is becoming an intelligent, institutive and ubiquitous. The emerging technologies increase the effectiveness and enhancing the efficiency of smart education.

6. Research Methodology: -

The research paper is exploratory in nature, employing snowball sampling as a non-probability sampling strategy to gather data from a diverse range of participants. This study used survey technique with the help of questionnaire. Around 200 samples were collected from different educational institution with different sections i.e. Primary, Secondary, Higher Secondary and Degree. Graphical representation tool used in research to analysis the demographical and Predictive Model used in this study. Furthermore, this study used various secondary resources like articles, journals, books etc.

Table 1: Demographical Profile = 200

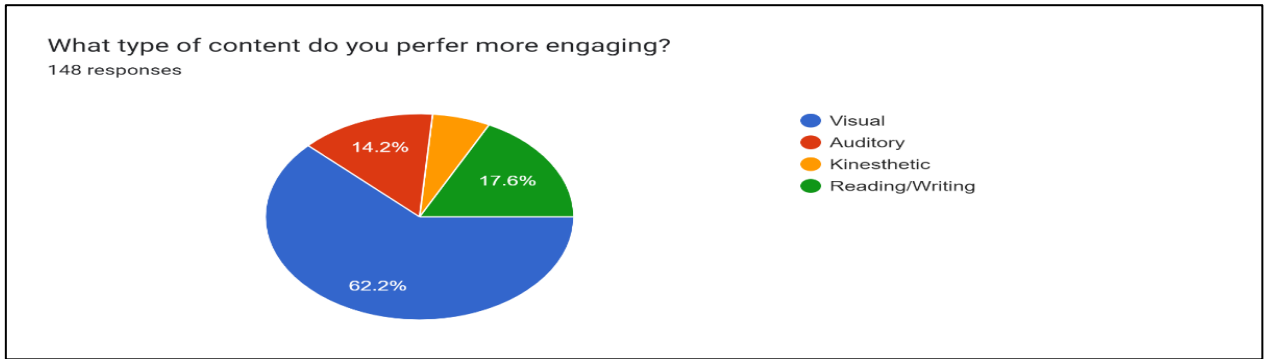
Age	Total No. of Students	No. of the Students Percentage
11-14	55	27.9
14-16	30	15
17-20	59	29.3

21- above	56	27.9
Gender		
Male	97	48.3
Female	103	51.7
Grade Level		
Primary Section	63	31.3
Secondary Section	50	25.2
Junior Section	15	7.5
Degree section	72	36.1

The above table gives the entire demographical profile of the research paper where age of the students is bifurcated into 4 age groups. Starting from 11 to 14 years of age which has 27.9% of the respondent whereas 14 to 16 years of age have 15% response, 17 to 20 years of the age group have 29.3% and 21 years above age group have 27.9%. In case of data gender-wise , male are 48.3% whereas female are 51.7% students. Furthermore, grade level is divided on the basis of primary section having 31.3%, secondary section having 25.2%, higher secondary section are 7.5% and degree section have 36.1% of the response.

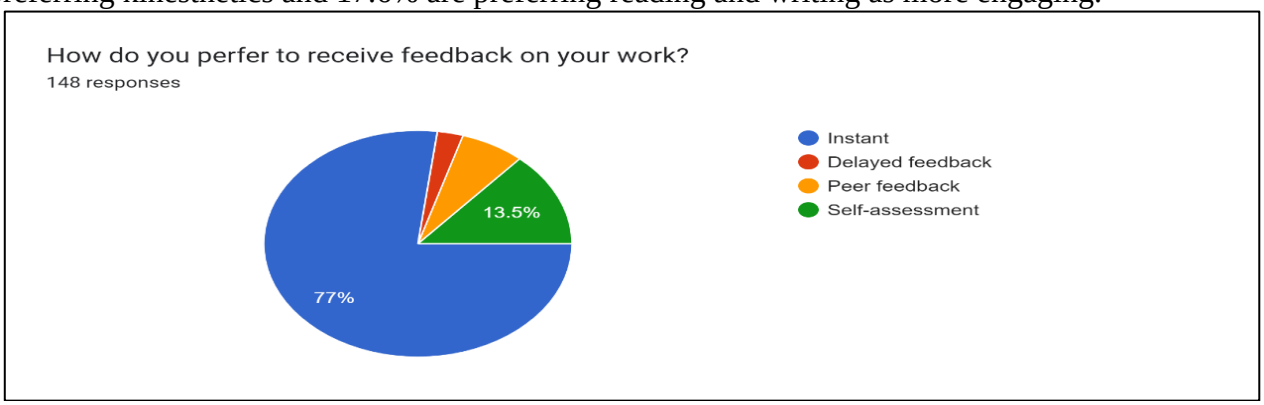
7. Result And Discussion: -

The application of predictive theory in AI-driven adaptive learning for slow learners enhances educational outcomes by forecasting individual learning trajectories and personalizing experiences. By analysing past performance and learning patterns, these technologies can anticipate challenges and deliver tailored content and feedback, fostering engagement and improving retention. This approach empowers slow learners to progress at their own pace, boosting both their confidence and motivation.



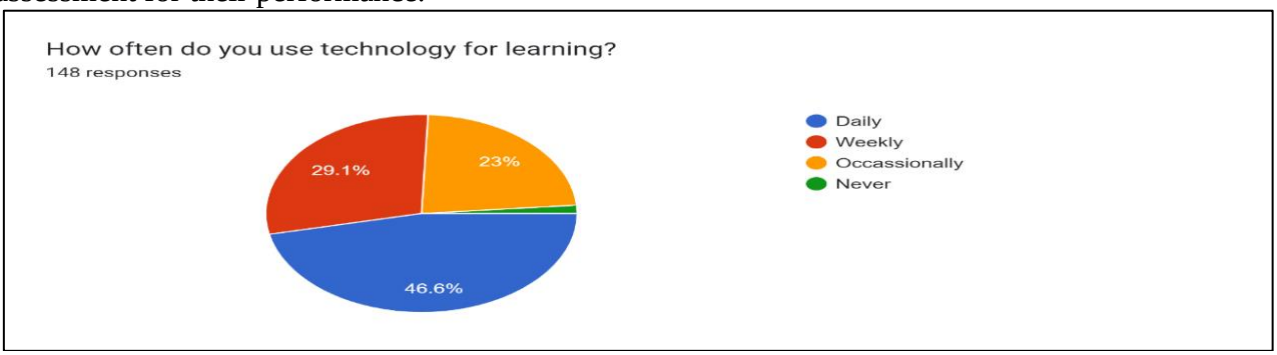
Graph 1

The above data interprets that out of total slow learner students, 62.2% students prefer visual type of learning as engaging whereas 14.2% prefer auditory type of learning followed by 6.1% preferring kinesthetics and 17.6% are preferring reading and writing as more engaging.



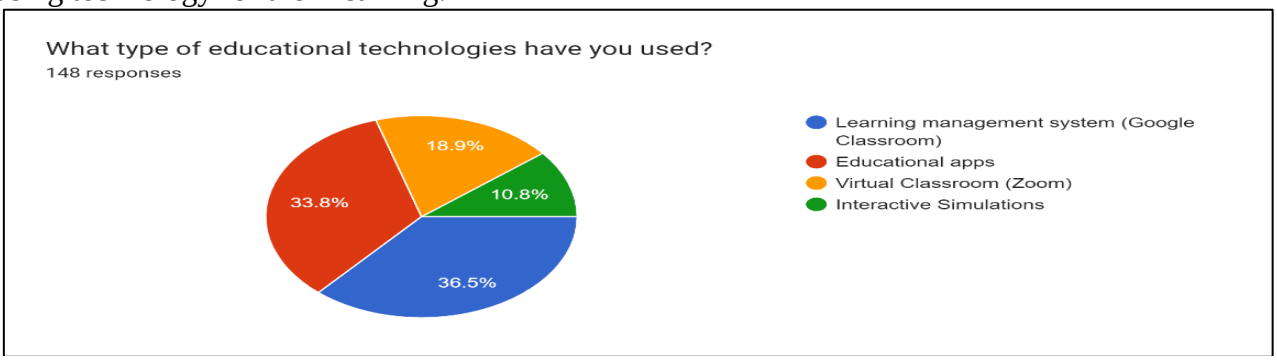
Graph 2

The above pie chart indicates that majority slow learner students i.e. 77% needs instant feedback related to their work whereas every few students which is 2.7% are comfortable with delayed feedback and 6.8% goes with peer feedback. However, 13.5% students want self-assessment for their performance.



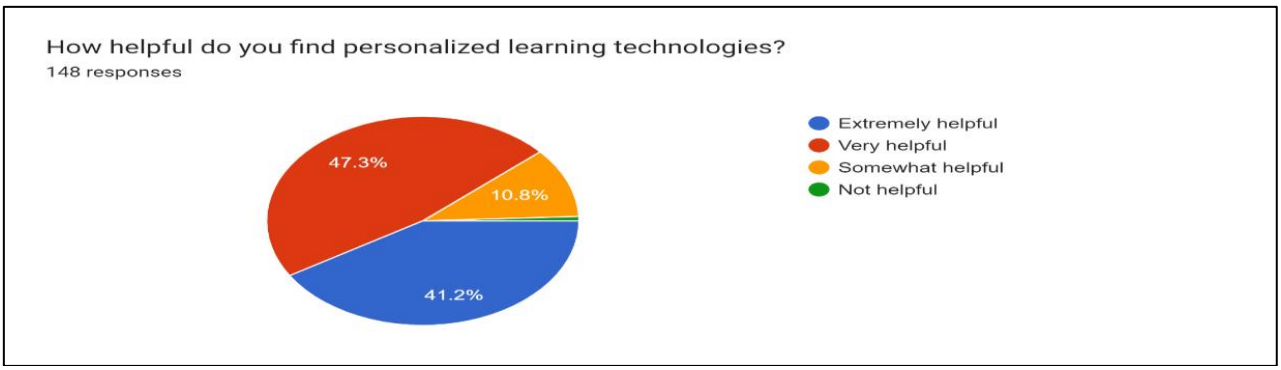
Graph 3

The above diagram shows the frequency of technology used by slow learner students. As we can see, 46.6% students use technology on daily basis whereas 29.1% students use technology on weekly basis. However, 23% students occasionally make use of technology for their learning i.e. when they face any complication during their study time but least number of students never prefer using technology for their learning.



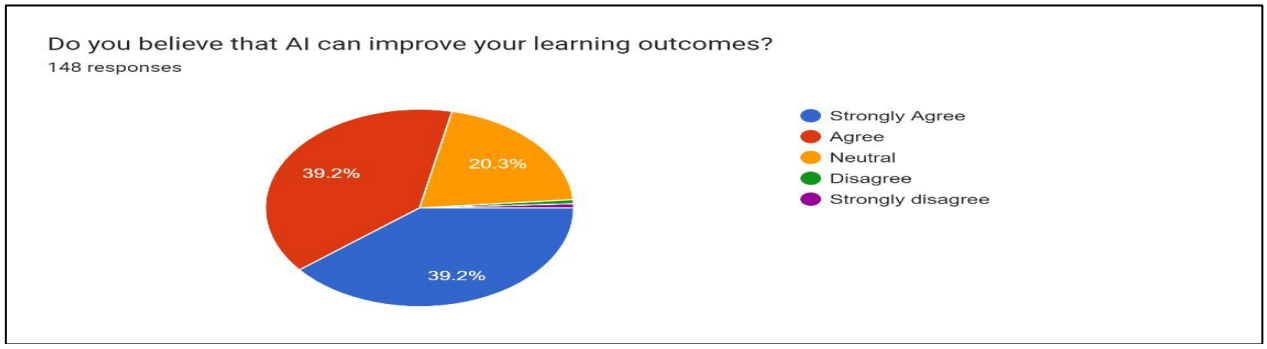
Graph 4

The above data shows that there are different types of educational technologies for the students where majority of the slow learner students i.e. 36.5% prefer the learning management system. Somewhat 33.8% students always use the educational app for their studies. But 18.9% students use virtual classroom and 10.8% students use interactive simulations.



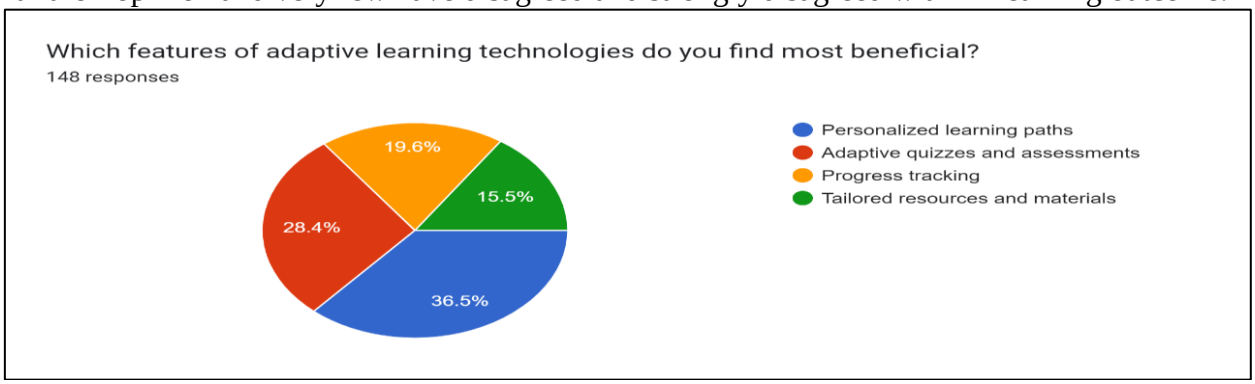
Graph 5

In the above data we can see that 41.2% students find technology has extremely helpful for their personalized learning. But more students i.e. 47.3% think that it is very helpful for them whereas 10.8% says that it is somewhat helpful for them and very few suggest that it is not helpful for them.



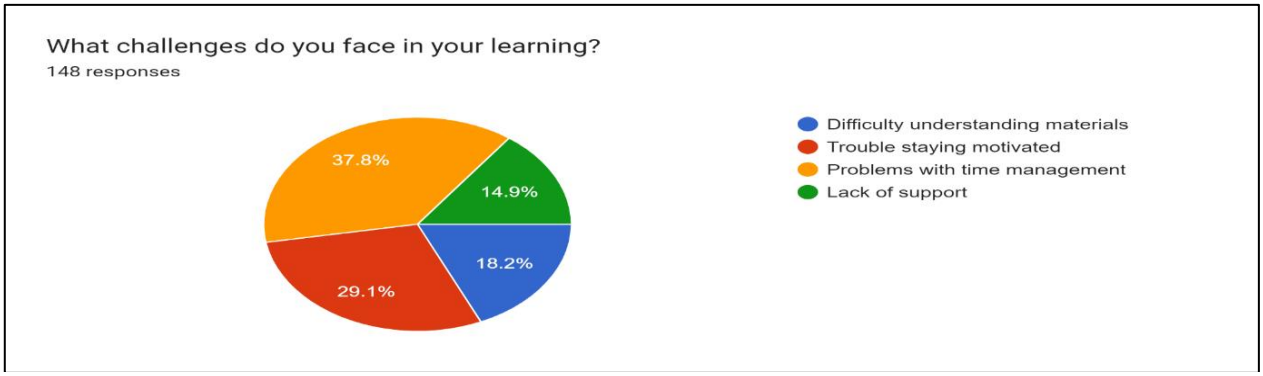
Graph 6

In the above data we can see that 39.2% students have agreed and the same percentage has also strongly agreed that AI can definitely improve the learning outcomes. Also, 20.3% are neutral with their opinion and very few have disagreed and strongly disagreed with AI learning outcome.



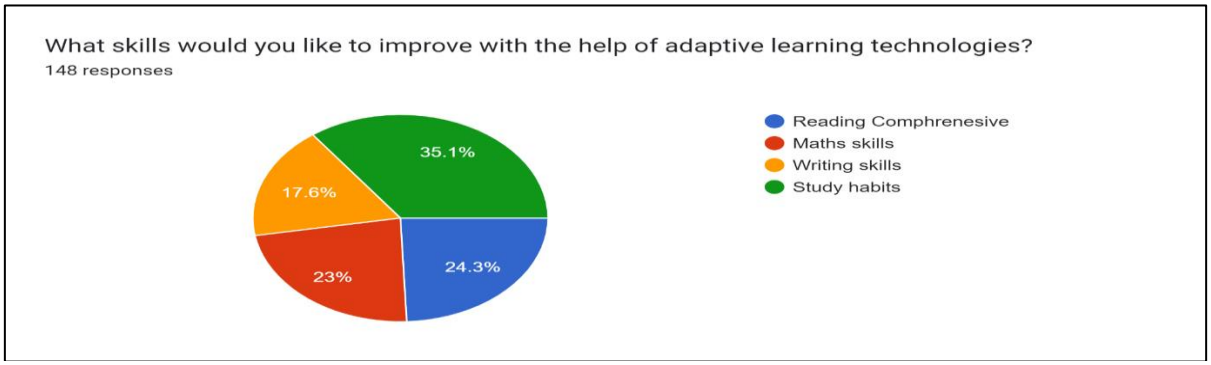
Graph 7

From the above pie-chart it is visible that the majority percentage i.e. 36.5% have chosen personalized learning path feature as most beneficial feature of adaptive learning. 28.4% have selected adaptive quizzes and assessments. 19.6 % went with progress tracking and 15.5% has selected tailored resources and materials.



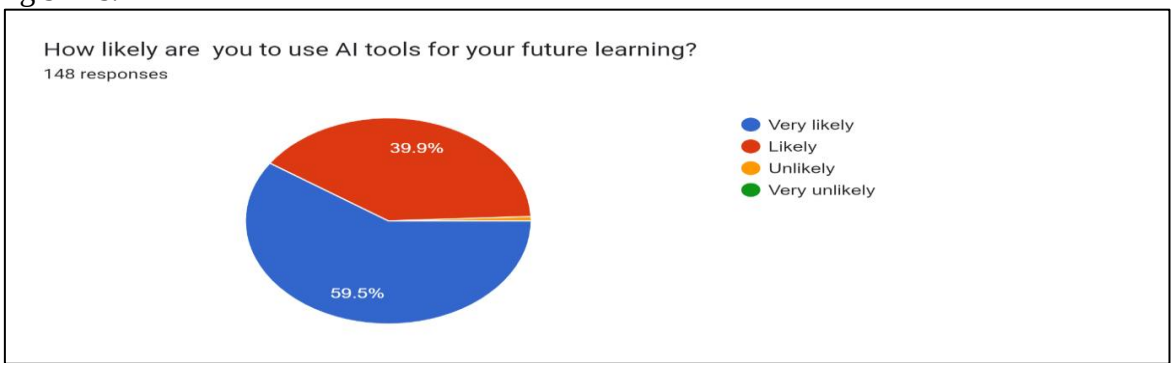
Graph 8

In the above diagram indicate that students face many problems from there learning where 18.2% are facing difficulty with understanding materials however 29.1% students are trouble staying motivated but majority of the students i.e. 37.9% are facing problem with time management. Where as every few students i.e. 14.9% are facing lack of support.



Graph 9

From the above diagram it is visible that majority of the students i.e. 35.1% have selected Study habits. 24.3% wants to improve their reading comprehensive whereas 23% students need to improve their maths skills with adaptive learning technologies and students of 17.6% improve there writing skills.



Graph 10

The above data is all about the usage of AI tools for future learning by students. As per the shown analysis 59.5% have selected that they want to use AI tools in there future learning however 39.9% will use AI tools likely in their future learning.

8. Conclusion: -

In conclusion the finding of the study confirm that the use of AI driven platforms allows for real time data analysis that students strength and weakness so that they can facilitates the targeted intervention. But AI not only supports the academic achievement but also, they boost the student's engagement and motivation.

In conclusion, the integration of AI in adaptive learning presents a transformative opportunity for enhancing educational outcomes for slow learner students. By leveraging personalized technologies, educators can tailor learning experiences to meet individual needs, thereby fostering a more inclusive and effective learning environment. The use of AI-driven platforms allows for real-time data analysis, enabling the identification of student strengths and weaknesses, which in turn facilitates targeted interventions.

Moreover, the incorporation of adaptive learning strategies not only supports academic achievement but also boosts student engagement and motivation. Through personalized feedback and learning paths, slow learners are empowered to progress at their own pace, gaining confidence in their abilities. In future, ongoing research and collaboration among educators, technologists, and policymakers will be crucial in refining these tools and practices.

Ultimately, AI in adaptive learning, can create a more equitable educational landscape where slow learners receive the tailored support they need to thrive, paving the way for improved educational outcomes and lifelong success.

9. Recommendation: -

Based on the findings, several recommendations are proposed to AI in Adaptive Learning for Slow Learner Students: Enhancing Educational Outcomes Through Personalized Technologies

- Students' quiz responses should be tracked to monitor the time taken to answer each question. This data can help them identify areas for improvement, allowing them to focus their efforts on reducing their response times for better performance.
- The concepts should be taught more clearly through the use of case studies and practical examples, enabling students to grasp the material more effectively.
- Incorporating student feedback can help educators continuously refine their teaching methods and approaches, making them more effective for slow learners.

References: -

1. Khan, A. (2024). The Impact of AI-driven Interventions on Academic Outcomes for Slow Learners. *As the editors of Transforming Learning: The Power of Educational*, 28.
2. Baltezarević, R., & Baltezarević, I. (2024). Students' Attitudes on The Role of Artificial Intelligence (Ai) In Personalized Learning. *International Journal of Cognitive Research in Science, Engineering and Education*, *12*(2), 387-397.
3. Li, G. (2023). E-Learning Intelligence Model with Artificial Intelligence to Improve Learning Performance of Students. *Journal of Computer Allied Intelligence*, *1*(01), 14-26.
4. Hassan, J. U., Saad Missen, M. M., Firdous, A., Maham, A., & Ikram, A. (2023). An Adaptive M-Learning Usability Model for Facilitating M-Learning for Slow Learners. *International Journal of Interactive Mobile Technologies*, *17*(19).
5. Dharani, M., Chakravarthi, D. S., Varghese, V., Ali, B. M., & Nagendra, K. V. (2022). Influence of Artificial Intelligence Technology on Teaching Slow Learners. *International Journal of Early Childhood Special Education*, *14*(4).
6. Arun Kumar, U., Mahendran, G., & Gobhinath, S. (2022). A review on artificial intelligence-based E-learning system. *Pervasive Computing and Social Networking: Proceedings of ICPCSN 2022*, 659-671.
7. Zang, J., Gowthami, J., & Anilkumar, C. (2022). Adaptive Artificial Intelligent Technique to Improve Acquisition of Knowledge in the Educational Environment. *Journal of Interconnection Networks*, *22*(Supp02), 2143013.
8. Kawale, S. R., Laxmi, M. P. D., Shekhar, R., Sarma, P., Lingeshwaran, N., & Rao, B. K. (2022). Development of an e-learning system based on artificial intelligence. *Journal of Positive School Psychology*, *6*(8), 4038-4049.
9. Palanivel, K. (2020). Emerging technologies to smart education. *Int. J. Comput. Trends Technol*, *68*(2), 5-16.
10. Kolchenko, V. (2018). Can modern AI replace teachers? Not so fast! Artificial intelligence and adaptive learning: Personalized education in the AI age. *HAPS educator*, *22*(3), 249-252.

The Role of Artificial Intelligence in the Development of Historical Thinking Skills

Mrs. Anuradha A. Madhale
Research Scholar, Education Department
Shivaji University, Kolhapur.

Dr. Chetna P. Sonkamble
Head, Department of Education
Shivaji University, Kolhapur.

Abstract

Integrating Artificial Intelligence (AI) into Skill Development in an Educational Setting. As educational institutions increasingly adopt AI technologies, it is important to understand their impact on the learning process, student engagement, and overall skill acquisition. Artificial intelligence (AI) can enhance the development of historical thinking skills within academic settings. Historical thinking skills, such as analyzing sources, interpreting and synthesis, and formulating arguments, are essential for humanities students. By examining existing literature, AI applications, and pedagogical approaches, this study aims to identify how AI can help teachers develop these critical skills. The rapid advancement of Artificial Intelligence technology has transformed various fields including education. With increasing demand for workforce-ready skills, educational institutions are leveraging Artificial Intelligence to enhance skill development among students. With the help of Artificial Intelligence, we can facilitate personalized learning, and improve teaching methods and strategies.

Keywords- Artificial Intelligence. Historical Thinking Skills.

Introduction-

The concept of artificial intelligence was first proposed between 1940 and 1956, but the term 'artificial intelligence' (AI) was coined in 1956 at a conference held at Dartmouth College. The period 1956-1974 is considered the golden years. Artificial intelligence is generally understood as human intelligence displayed by smart machines. Systems powered by AI can predict, automate, simulate and ultimately improve human thinking. Now, machines and systems are getting smarter as AI helps computer systems, robots, and humanoids process data to perform intelligent tasks of humans, i.e. thinking and perceiving, imagining and acting, understanding language, reasoning and making decisions etc. Many of our everyday services are already leveraged by AI to improve user experience. E-commerce sites like Amazon use machine learning to recommend products based on a user's search. Microsoft's Alexa, Apple's Siri, etc. use AI in their speech-to-text conversations and customization. Our email and SMS services also use AI to filter spam (Behera, Biswabhusan & Gaur, Mamta & Asif, Mohammad. (2023)).

Artificial Intelligence Technology in Academia

Artificial intelligence encompasses a variety of technologies, including machine learning, natural language processing, and adaptive learning systems. Key applications in education include:

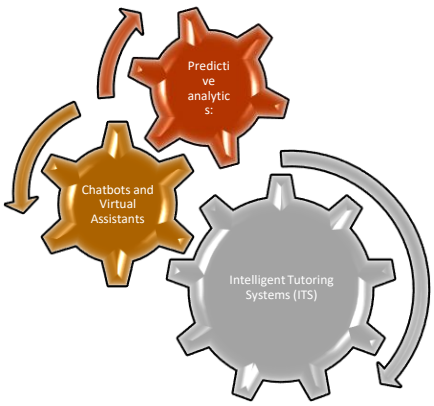


Fig. No. 1 Artificial Intelligence Key Application in Education
https://www.leewayhertz.com/ai-use-cases-in-education

Chatbots and Virtual Assistants: These tools provide real-time support for students, helping them with academic inquiries and administrative tasks.

Intelligent Tutoring Systems (ITS): These systems provide students with personalized feedback and resources based on their learning style and progress.

Predictive analytics: Organizations use data analytics to identify at-risk students and implement timely interventions.

AI can play a significant role in enhancing historical thinking skills for students by providing personalized learning experiences, interactive resources, and engaging tools. Here are some ways AI can be leveraged:

National Education Policy 2020 –

The National Education Policy 2020 introduces several initiatives aiming at fostering and enhancing critical thinking skills midst students of India and these initiatives have been taken to shift the focus from practices of mere rote learning to a more holistic and inquiry-based approach.

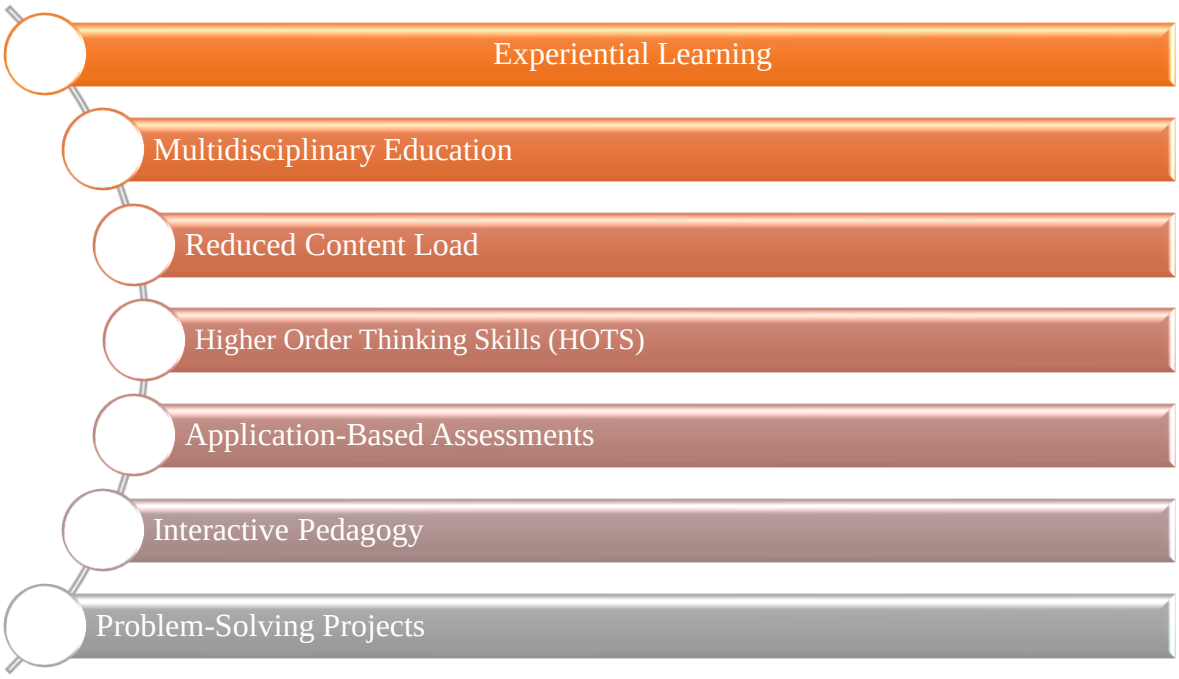


Fig. No. 2 Key Initiatives of NEP 2020

NEP 2020 strongly emphasizes critical thinking as this policy encourages students to question, analyze, and evaluate information rather than simply memorize facts and create a generation of learners who can think deeply and independently.

Historical Thinking Skill -

"Thinking Like Historian"

Historical Thinking Skills (HTS) are generally defined as the process of using historical information with perspectives, context, viewpoints, and facts to understand the past. The practice of thinking about history, or the use of the phrase "thinking history," can refer to critical thinking skills or higher-order thinking skills in the context of the process of using history. Other researchers in the field have interpreted the term "historical thinking" to mean simply "thinking like historians" (Seixas, 2017b; Lévesque & Clark, 2018; van Boxtel & van Drie, 2018).

This definition refers to one's ability to place historical information or historical documents with interpretation, meaning, and context within the social environment in which they were created. Professional historians use the process of objectivity, defining value, source, bias, and content when evaluating and interpreting historical information or primary source documents.

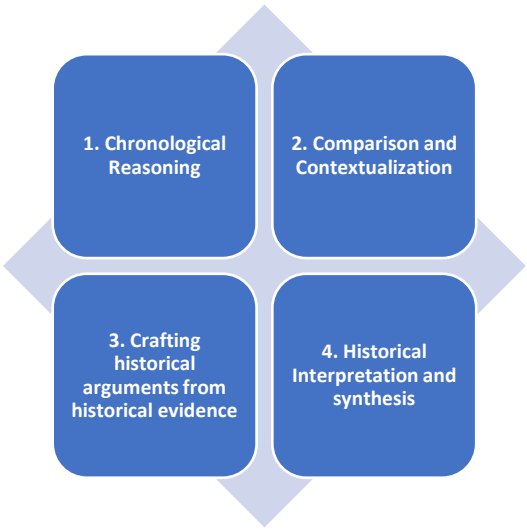


Fig. No. 3 Historical Thinking Skills (AP U.S., 2015, p. 12)

The historical thinking framework described by The Historical Thinking revolves around four historical thinking concepts: Chronological Reasoning, Comparison and Contextualization, Crafting historical arguments from historical evidence, Historical Interpretation, and synthesis.

Importance of Historical Thinking Skills in Education-

NEP 2020 focused on thinking skill development in academia. Historical Thinking Skill plays a significant role in history education for several reasons. History provides opportunities to teach processing skills, such as critical thinking, data analysis, detecting bias, generalizing, and identifying different perspectives. Developing these skills through history education will help students develop processing skills that will allow them to engage in higher-order thinking skills. Historical thinking is emphasized to help students better understand historical content by understanding the historical context. Providing opportunities for students to develop these higher-level thinking skills prepares them to understand more about the past, but also increases awareness of their own perceptions and cultures and increases their understanding of others (Weinberg, 2004; Yeager and Foster, 2001).

Historical thinking skills are important for students to engage critically and analytically with the past. As educational institutions integrate AI technologies, it is important to explore their potential to facilitate historical inquiry and critical thinking. This paper discusses AI's potential to advance historical thinking, the challenges it faces, and future implications.

AI Technologies Relevant to Historical Thinking

Several AI technologies can be applied to the development of students Historical Thinking Skills:

- **Natural Language Processing (NLP)**: These tools can help students analyze historical texts, enabling students to extract key themes, arguments, and biases.
- **Machine Learning**: Algorithms technology can categorize and interpret vast datasets of sources like historical documents, assisting students in recognizing historical patterns and trends.
- **Virtual Reality (VR) and Augmented Reality (AR)**: VR and AR technologies can create immersive historical experiences, allowing students to engage with contexts and events dynamically.

Benefits of AI in Developing Historical Thinking Skills

AI offers numerous advantages for enhancing historical thinking skills:

- **Source Analysis**: AI tools can help students assess the credibility of sources by identifying biases, authorship, and contextual factors.
- **Contextual Understanding**: AI can provide contextual information about historical events, enhancing students' ability to understand complex narratives.

- **Argument Construction**: AI can assist students in organizing their thoughts and constructing coherent arguments through tools that suggest logical structures based on their inputs.

To maximize the benefits of AI in historical thinking skills development, the following strategies can be considered:

- **Curriculum Integration**: With the help of AI we can develop curricula that seamlessly integrate AI tools with historical inquiry, ensuring that students gain both technological and analytical skills.
- **Collaboration with AI Experts**: We can engage AI specialists to create customize tools that meet the specific needs of history educators and students.
- **Ethical Frameworks**: Establish guidelines for the ethical use of AI in history education, focusing on inclusivity and diverse perspectives.
- **Argument Mapping**: AI tools can help students visualize arguments and counterarguments in historical debates, enhancing their ability to critically analyze different viewpoints.
- **Question Generation**: AI can pose provocative questions that challenge students to think deeply about historical events and their implications.
- **Assessment and Feedback**: AI can provide timely feedback on assignments, helping students understand areas for improvement.
- **Formative Assessments**: Ongoing assessments powered by AI can track progress and adapt to ensure mastery of historical thinking skills.

Conclusion

Integrating AI into history education can change the way students develop historical thinking skills, making learning more engaging, personalized and effective. By adopting these techniques, teachers can better prepare students to critically analyze the past and understand its relevance to the present. AI holds significant promise for developing historical thinking skills in education. By facilitating source analysis, context understanding, and argument construction, AI tools can enrich students' engagement with historical inquiry. However, effective implementation requires addressing ethical issues and ensuring data quality. Going forward, collaboration between educators, historians, and AI technologists will be critical to realizing the full potential of AI in history education.

References

1. Arora, R., & Chhadwani, M. (2019, Jan - Mar). Analysing the impact of Skill India as a tool for reshaping Indian economy. International Journal of Research and Analytical Reviews, 6(1), 392–39
2. Behera, Biswabhusan & Gaur, Mamta & Asif, Mohammad. (2023). Impact of Artificial Intelligence on Skill Development Training in India.
3. Wineburg, S. (2001). Historical Thinking and Other Unnatural Acts: Charting the Future of Teaching the Past. Temple University Press.
4. Seixas, P., & Morton, T. (2013). The Big Six Historical Thinking Concepts. Nelson Education.
5. Resnick, D. (2020). AI in Education: The Ethical Challenges of Teaching with Artificial Intelligence. *Educational Philosophy and Theory*.
6. Cohen, L. (2016). Digital History: A Guide to Gathering, Preserving, and Presenting the Past on the Web. *University of Pennsylvania Press*.

A Study of Teachers' Attitudes Towards Artificial Intelligence (AI) Integration in English Language Learning in Mumbai State Board Schools

Khan Sartaj Ali Shafi Ali Research Scholar

Dr. Chavan Chetan Uttamrao Professor

Gokhale Education Society's, College of Education and Research, Parel, Mumbai -400012

Abstract

This study investigates educators' attitudes toward AI in education, particularly in teaching the English language, specifically focusing on Mumbai State Board Schools. The researchers designed A self-made questionnaire to collect quantitative data, allowing for a comprehensive analysis of teachers' perceptions and readiness to integrate AI into their English language teaching practices. The research emphasises the need for both theoretical training and practical guidance for teachers in designing educational activities that incorporate AI, prepare students for an AI-driven future, and address the challenges that may arise. Along with the quantitative data, a theoretical overview is provided to support the results, highlighting key concepts and models relevant to the integration of AI in education. The findings will inform recommendations for professional development programs aimed at fostering positive attitudes towards AI in education and improving instructional strategies in the English language classroom.

Keywords: *AI, English Language Education, Teacher Attitudes, Artificial Intelligence*

Introduction

Artificial Intelligence (AI) has emerged as a transformative tool across various domains, with its potential to enhance educational practices gaining increasing attention. In language education, particularly in teaching English, AI offers innovative solutions that have the power to revolutionize traditional classroom settings. By providing personalized learning experiences, real-time feedback, and interactive tools, AI can cater to diverse student needs, making the process of language acquisition more effective and engaging.

The integration of AI in English language teaching aligns with the objectives of India's National Education Policy 2020 (NEP-2020), which emphasizes the importance of a technology-driven education to prepare learners for a rapidly evolving world. Through AI-powered tools such as **Grammarly, Duolingo, Elsa Speak, and Microsoft Immersive Reader**, English language learners can receive customized instruction and practice opportunities tailored to their proficiency levels and learning styles. These tools leverage features like adaptive learning, speech recognition, grammar correction, pronunciation practice, and vocabulary building, providing students with more engaging and interactive language learning experiences.

AI-driven methods not only support students in developing language skills but also assist teachers in designing more efficient lesson plans, assessing student progress, and addressing individual learning challenges. For instance, chatbots can facilitate conversational practice, while voice recognition tools can help students improve their speaking skills.

However, the successful adoption of AI in English language education requires educators to possess a positive attitude toward technology integration and a willingness to adapt to new teaching methodologies. This study aims to explore the attitudes and perceptions of teachers in Mumbai State Board Schools regarding the use of AI in English language teaching. By examining their readiness to incorporate AI-based tools and understanding the potential benefits and challenges, this research will provide valuable insights for developing professional development programs that support teachers in utilizing AI to enhance English language learning outcomes.

Rationale Of The Study

As a resident of Mumbai, the researcher has observed a growing interest in integrating technology into education, especially in the context of the National Education Policy 2020 (NEP-2020). While schools in Mumbai have started adopting AI tools and technologies, particularly in secondary education, there remains a critical gap in teachers' readiness and attitudes toward effectively implementing AI in the classroom. Teachers play a pivotal role in ensuring the success of educational reforms, and their attitudes toward AI can either accelerate or hinder the technology's adoption.

Despite the increasing focus on AI in education, teachers face several challenges in using AI to teach subjects like English. These challenges include insufficient training on AI tools, limited access to technological resources, and uncertainty about how to integrate AI within a rigid curriculum. Many teachers feel unprepared to navigate these new tools and unsure of how AI can complement traditional teaching methods to enhance student learning outcomes.

Given the significant role of teachers in shaping classroom dynamics, this study aims to investigate their attitudes toward AI in English language education. Understanding these attitudes is essential for identifying barriers that hinder AI adoption and for developing strategies to empower teachers with the necessary skills and resources.

Therefore, the rationale for this study depicts the urgent need to equip teachers in Mumbai's State Board Schools with the knowledge, skills, and positive mindset required to effectively integrate AI into English language teaching. This study will contribute to a broader understanding of how AI can transform language education and prepare both educators and students for future challenges in an increasingly technology-driven world.

Aims And Objectives Of The Study

Aims

"To study the attitudes of secondary school teachers toward the integration of Artificial Intelligence (AI) in English language teaching, focusing on various dimensions such as availability, usefulness, readiness, perceived impact, and challenges."

Objectives

1. To evaluate the availability and accessibility of AI resources in secondary schools for English language teaching.
2. To analyse teachers' perceptions of the usefulness of AI in enhancing English language learning.
3. To assess the readiness of secondary school teachers to adopt AI tools in their English language teaching practices.
4. To investigate teachers' perceptions of the impact of AI on students' learning outcomes in English language education.
5. To identify the challenges teachers, face in integrating AI into English language teaching and propose strategies to address these challenges.

Research Methodology

Research Design

The study will adopt a descriptive survey research design to explore the attitudes of secondary school teachers toward integrating AI into English language teaching. This design allows for collecting quantitative data on teachers' attitudes, perceptions, and challenges related to AI adoption.

Data Collection

The survey of the study was conducted in the schools of Mumbai where the respondents were Approached by emails and WhatsApp. A total of 70 secondary school English teachers were approached out of which 37 had responded successfully. The respondents were selected by convenience sampling technique based on the author's connection and colleague circle.

Tool (Questionnaire): A self-constructed questionnaire will be developed based on the identified dimensions (availability and accessibility of AI, usefulness of AI, readiness to use AI, perception of

AI's impact on learning outcomes, and challenges of AI integration). The questionnaire will use a Likert scale (e.g., 1 = Strongly Disagree to 5 = Strongly Agree) to measure teachers' attitudes toward AI.

Findings Of The Study

Below are findings from all five dimensions of AI integration in English language teaching as considered in the study:

Availability and Accessibility of AI in Schools

Approximately 32% of teachers strongly agree that AI tools and resources are readily available and accessible in their schools, while 68% of teachers believe that resources are not yet sufficiently accessible for effective AI integration in the classroom.

Nearly 70% of teachers strongly agree that schools lack the necessary infrastructure (e.g., adequate internet, devices) to implement AI in language teaching effectively, whereas 30% of teachers think that the infrastructure is adequate for AI use

2. Usefulness of AI in English Language Learning

About 62% of teachers strongly agree that AI tools can significantly enhance student engagement and improve learning outcomes in English language education, while 38% of teachers do not perceive AI to be particularly useful in this regard.

3. Readiness of Using AI

Teacher Training, Skill Development and Confidence in Adopting AI:

Approximately 60% of teachers strongly agree that they require specialized training and skills to effectively incorporate AI into English language teaching, while 40% of teachers agree that additional training is needed but believe they can manage with existing skills. Around 65% of teachers strongly agree that they are not fully confident or ready to independently use AI tools in their teaching without external support, while 35% of teachers believe that they are sufficiently prepared to implement AI tools in the classroom.

4. Perception of AI's Impact on Learning Outcomes

Positive Impact on Student Learning:

About 70% of teachers strongly agree that AI has the potential to improve learning outcomes, particularly in enhancing students' English language skills such as grammar, vocabulary, and pronunciation. Meanwhile, 30% of teachers are more sceptical of AI's impact on learning outcomes.

5. Challenges of AI in English Language Learning

Approximately 70% of teachers strongly agree that the integration of AI in English language teaching faces significant challenges, including lack of resources, insufficient training, and unclear guidelines for AI use in the curriculum. In contrast, 30% of teachers believe these challenges can be overcome with the right support.

6. Overall Attitude Toward AI Integration

A significant portion of teachers (approximately 55-65%) recognize the potential benefits of AI in enhancing student engagement and improving English language skills. They agree that AI can offer innovative teaching methods and support diverse learning needs. However, about 35-45% of teachers are hesitant or sceptical about AI integration due to challenges such as inadequate availability of AI tools, lack of training, insufficient technological infrastructure, and unclear guidelines for curriculum adaptation. They believe that the successful implementation of AI would require substantial support, resources, and professional development.

Conclusion

Data showed that while there is an understanding of the potential of AI tools, there is a lack of adequate resources and infrastructure in schools to fully support AI integration.

The majority of teachers acknowledge the usefulness of AI in enhancing English language learning. However, some teachers remain hesitant about its effectiveness due to limited exposure and experience with AI-driven tools.

There is a mixed level of readiness among teachers regarding the use of AI in their teaching practices. While some are enthusiastic about incorporating AI tools, others feel unprepared due to a lack of proper training and understanding of how to integrate AI into their lessons.

Teachers have a positive perception of AI's potential impact on learning outcomes, with many believing that AI can enhance students' language proficiency, engagement, and motivation.

Several challenges were identified, including insufficient training, limited resources, and concerns about the adaptability of AI tools to different learning environments.

Recommendations

1. Schools and the government should invest in technological infrastructure, providing grants and funding to ensure AI tools are available and accessible.
2. Organize workshops and seminars to demonstrate AI's benefits in English language teaching and build teachers' confidence in using these tools.
3. Offer training programs and certification courses to help teachers integrate AI tools like **Grammarly, Duolingo, Elsa Speak, and Microsoft Immersive Reader** into their lessons.
4. Develop structured frameworks to measure AI's impact on learning outcomes, allowing teachers to track student progress effectively.
5. Establish support networks for teachers and adapt the curriculum to incorporate AI-driven teaching methods.

References

1. Bergdahl, Nina, and Jalal Nouri. "Covid-19 and crisis prompted distance education in Sweden." Technology, Knowledge and Learning 26, no. 3 (2021): 443-459.
2. Vadivel, B., Namaziandost, E., & Saeedian, A. (2021, November). Progress in English language teaching through continuous professional development—teachers' self-awareness, perception, and feedback. In Frontiers in Education (Vol. 6, p. 757285). Frontiers.
3. Liu, F., Vadivel, B., Mazaheri, F., Rezvani, E., & Namaziandost, E. (2021). Using games to promote EFL learners' willingness to communicate (WTC): potential effects and teachers' attitude in focus. Frontiers in Psychology, 12, 4526.
4. Johnson, Nicole, George Veletsianos, and Jeff Seaman. "US Faculty and Administrators' Experiences and Approaches in the Early Weeks of the COVID-19 Pandemic." Online Learning 24, no.2 (2020): 6-21.

Holistic Approach Towards Role of Nep 2020 in Application of AI in Education Sector"

Mr. Sunder Singh
DTSS College of Commerce (Autonomous), Mumbai.

Abstract

India's National Education Policy (NEP) 2020 is a significant policy to transform and restructure the Indian education system. It sketches an inclusive vision for transforming the educational landscape and that too with a holistic approach. The NEP 2020 is helping in inculcating knowledge through different experiential methods for a better career of the students and ultimately the development of our nation.

NEP is approaching the promotion of Indian culture, heritage, language with the integrating of technology in the education system. The education policy highlights the importance of Artificial Intelligence and integrates AI education at all schools as well as at college level. Due to fast development, Artificial Intelligence (AI) has created new opportunities across various sectors (like industries, teaching, Administration).

Within the NEP-2020 framework, this research study seeks to assess the merits and drawbacks of adopting AI in education. The Education policy 2020 has taken a very serious approach about the revolutionary of technology in the field of education and its applications such as e-learning, online resources and the use of digital tools for both- the teacher as well as the learner.

However, the first education policy of the 21st century recognizes the wider role of AI. It should be implemented at all primary and secondary levels of education which can transform India into a knowledge superpower. AI in education requires careful planning, infrastructure development, and monitoring from time to time to ensure that it aligns with the goals and principles outlined in the National Education Policy.

The study highlights how NEP will use AI and might improve academic performance and student engagement. This study helps to find a Holistic approach of NEP 2020 in application of AI in the Education.

Keywords: Artificial intelligence, Education, Government policy, Holistic, India, NEP 2020.

Introduction

India has a long tradition of holistic and multidisciplinary learning, from universities such as Vikram Shila University, Mithila University, Vallabhi University, Takshashila, Nalanda, etc. to the extensive literatures of India combining subjects across various fields. All branches of Education bring out the creative human endeavor, including mathematics, science, vocational subjects, professional subjects, and soft skills. National education policy (NEP) 2020 is an exhaustive document that aims at providing a holistic and multidisciplinary approach to education thus improving the education sector in India.

Ministry of Human Resource Development:

This source from government department has informed the purpose of the education system is to develop good human being capable of rational thought and action, possessing compassion and empathy, courage also resilience and scientific temper with sound ethical values. After implementing and transparency it will be an asset for our nation to develop the economic and social environment here. This policy focused on recognizing, identifying and fostering the unique capabilities of each student to achieving foundational literary, numeracy, flexibility and holistic education across science, social science and sports so on. It can ensure the integrity and unity of all knowledge, respect for diversity. It should be focused on regular formation assessment for learning.

A brief about NEP 2020:

The National Education Policy (NEP) 2020 emphasis on the overall development of students along with building in them a great potential to explore new variations in syllabus and pattern of

studying. The government of India and Indian society knows that rich heritage of ancient and eternal Indian knowledge and thoughts have been a guiding light for this Policy and it helps in giving significant value to the education sector. The New Education policy (NEP) 2020 is a major policy that is framed by the Indian government to makes more flexible, holistic, inclusive and innovative educational system in India.

This policy emphasis on reducing rote learning but promoting critical thinking and encouraging creativity. The NEP 2020 is founded on Five guiding pillars. To be specific, they are - Access, Equity, Quality, Affordability and Accountability. These pillars will help to develop the Vision of India that is becoming a developed nation. It helps youth to upgrade knowledge and freely take decision regarding the courses and further study. It will prepare our youth to meet the diverse national and global challenges of the present and the future and through this policy's vocational program, the percentage of unemployment will reduce, which is a feature included in NEP 2020. It includes Education to all students without any dissemination on the basis of race and caste. A significant change in NEP 2020 is the proposal to set up the Higher Education Commission of India, as an umbrella body for higher education, excluding medical and legal education.

School structure under NEP 2020: The NEP 2020 replaces the 10+2 pattern with a 5+3+3+4 structure that caters to different age groups. This structure includes a foundational stage for children aged 3–8, a preparatory stage for children aged 8–11, a middle stage for children aged 11–14, and a secondary stage for children aged 14–18.

Application of AI in National Education Policy:

AI (Artificial Intelligence) is a type of advanced technology that enables machine to think, learn and take decision like human. Therefore, AI used in New Education policy will be transforming the way of teaching-learning at educational institutions. Due to rapid development of Artificial intelligence, there is creation of opportunity in the field of education sector. AI is making learning much effective, personalized and accessible. For example- AI tools in Google Classroom helps teachers to organize assignments, access of class notes and provide instant feedback to students. Socratic by Google is helping students to solve homework problems by providing lecture/ video and step by step solution in easy way and Quizlet helps students study by creating customized quizzes.

The Policy says that there must be less documented content and more reliability towards learning to think critically and solving problems by being an initiator and how to be innovative and adapting / absorb new materials in the field. This would allow a person to think in many aspects.

Implementation of New Education Policy:

A well-defined implementation plan with the following steps in mind is required for an efficient implementation. There should be better research conducted on disruptive technology and the existing state of ICT deployment in Schools and teacher education institutes, as well as the development of E- Contents, strategies, and training modules on content-ICT-pedagogy integration, as recommended in NEP 2020. Continual adaptation of the architecture of national digital education platforms, including portals, apps and Laboratories, in response to changing educational demands is a must.

Design, development, and implementation of MOOCs for students and teachers, including policy evaluation, Certification, and credit transfer are some new plots involved in NEP. Collaboration and co-ordination with national and state-level entities to ensure that efforts are put in the same direction is also discussed. As per the policy document it is expected that in the decade of 2030-40, the entire policy will be in an operational Mode, following which another comprehensive review will be undertaken.

Literature Review

Dr. Kotra Balayogi (2020) in his paper, found that the New Education Policy is a comprehensive and inclusive document that seek to transform India into a knowledge superpower and current education system is backward as per timetable and really it fails to meet the needs of

today's students. Only through transparency in education system. After introducing NEP 2020 by government of India and updating with new technology like Artificial intelligence application are using in digital education concept. Also, the Government of India emphasis on improve to access quality education and introduce innovative teaching methods that focus on critical thinking and problem solving.

Darling-Hammond et al. (2017) discuss the importance of teacher professional development programs to enhance technological skills and pedagogical practices. They emphasize the need for ongoing support and training to ensure teachers can effectively utilize AI tools and adapt to evolving educational landscapes.

Pavithra Subramanian in her paper conclude that Government has more responsibility towards Education system in India and development in this sector. Because this sector is crucial for others and in 21st century evolution of education transformed from teacher centered approach to learner centered approach. Even the holistic approach is directly helpful to child to understand any problem of life taking as whole or in togetherness. At the end she said that the implementation of New Education Policy 2020 is the new Era in the history and helps country to become developed country in coming years.

Blikstein (2018) explores the promises and challenges of using AI systems in educational settings. The author emphasizes that AI-powered tools can enhance student engagement, motivation, and learning outcomes.

Luckin et al. (2016) present a comprehensive review of AI in education and highlight its potential in transforming traditional instructional practices. They discuss the positive impact of AI on student achievement, knowledge retention, and critical thinking skills

Anurag Vaishnav, CNBC, Aug 7, 2020, in his article analyzed the role of New Education Policy to improvement in Gross Enrollment Ratio of learning of male and female. It studied about how much public spending on education, role of digital education in medical, IT, administration and in another field. It focused on the NEP notes that the higher education ecosystem in the country is severely fragmented.

Research Methodology

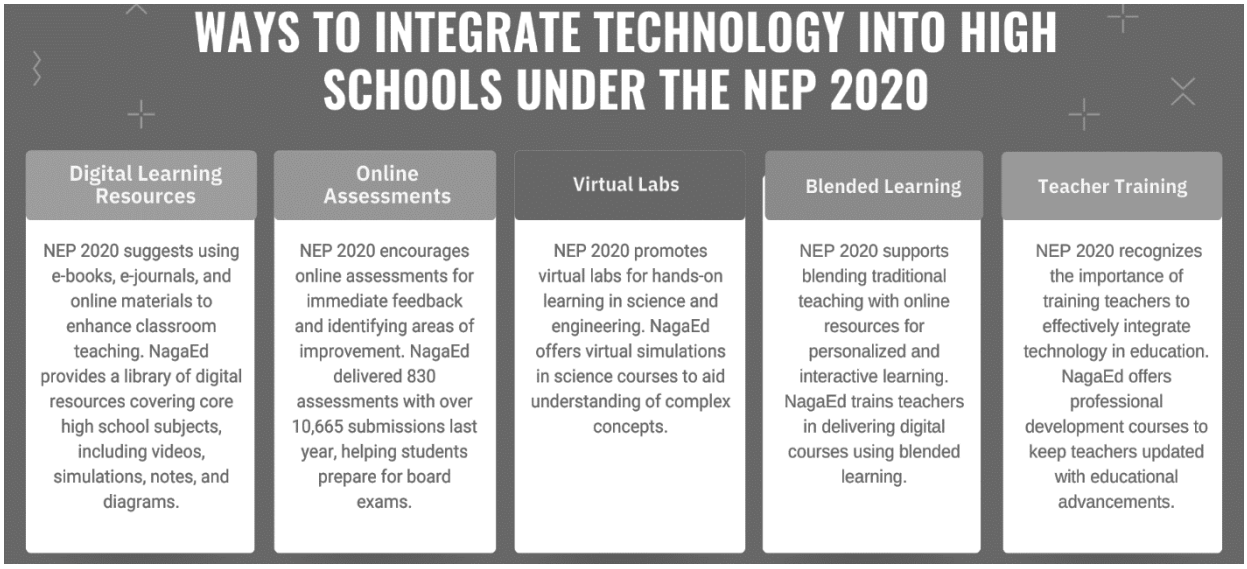
Objective Of The Study:

1) To understand the holistic view of the New Education Policy 2020 Framework.
2) To find out the technology-based (AI) education models.
3) To study the evolution of Education Policy in India.
4) To examine the benefits and opportunities offered by AI in enhancing teaching and learning practices, student engagement, and administrative efficiency.

Data Collection: The study is based on Secondary Data which is collected from websites, article, online research papers.

Findings Of The Study

After referring many texts, articles and reports related to government policy, below are some findings of the study:



1) There are various comprehensive literatures that are conducted to establish a theoretical framework and explore existing research articles, reports and policy document of government available on website related to AI in education and the holistic approach of NEP 2020.
2) Through different sources, it was found that the New Education Policy is a landmark policy document in India that sets the mission, vision and direction for transforming the education system in a 360-degree angle. It emphasizes the integration of AI to enhance teaching and learning practice, to improve educational pattern and access equity among students with good skills also necessary as per 21st century.
3) The NEP envisions a holistic and learner centric approach towards education which helps to focus on the development cognitive ability, social and vocational skills. It is also using integration of AI and resources across all levels of education.
4) This education policy will be helpful to backward class people too and special emphasis will be given to Socially and Economically Disadvantaged Groups (SDG), including gender, sociocultural and geographical disabilities.
5) Recently most of states of India are implementing this education policy to create good environment of overall development. For instance, Maharashtra government implemented new education policy in some colleges to get a review on the working of this policy and how effective it is. It should be implemented in all schools and colleges all over in a sooner time period in India.
6) According to this policy, it was recognized that a teacher plays a critical role in implementing teacher driven pedagogical practices because they are direct initiator and guide students. But there has been a paradigm shift in this too. Learning is changing from being teacher-centric to student-centric.
7) There is a need for integration of technology in education, the NEP implement for the establishment of a robust digital infrastructure including e- learning, e- library, advance computer labs, fast internet connectivity and access to other digital devices like Diksha portal.
8) The policy even highlights the importance of developing digital content in lock language and encourage to provide open education resources to enhance education accessibility and inclusivity.
9) Other than that, the NEP considered as the transforming role of AI education and the Government of India need to look on the challenges and barrier associated with the implementation of AI in education sector under the NEP:2020 including ethical concern, Data privacy, equity and infrastructure limitations.
10) It recommends that the curriculum load in each subject should be reduced to its 'core essential' content by making space for holistic, discussion and analysis-based learning. It also proposes the

revision and revamping of all aspects of the education structure, including the school regulation and governance, to create a new system in educational sector. Further the NEP emphasis on development of teacher training and professional development which utilizes effective education.

Conclusion

NEP 2020 is definitely a landmark policy that has the potential to play a key role in the nation's future growth and development. The aim of this policy has a multidisciplinary approach to covering students learning, digital education, advance teacher training and various objectives set through this policy. The policy is prominent in providing various skills and contribution such as music, art, instruments, vocational courses, which are not emphasized in the NEP 1986. But here some of the criticisms for the new education policy are "it is extremely theoretical" and in reality, may be different to implement. There is no doubt, implementation of NEP is going to be time consuming, and challenging and the point of concern is there are numerous government schools where students do not have required such number of teachers also good infrastructure some even lack the proper sanitation facilities. If Government, teachers and the media also other key stakeholders will really help to implement this policy in educational sectors, it may be a huge success for our Educational Policies till date. The key to the success of ambitious NEP 2020 for transforming India as a Knowledge hub lies with the proper implementation, transparency and accountability of the Same.

Bibliography: Secondary Data

1. https://www.researchgate.net/publication/377437769_The_Role_of_Artificial_Intelligence_in_Implementing_the_National_Education_Policy-2020_Challenges_and_Opportunities
2. https://www.dailypioneer.com/2024/state-editions/integration-of-ai-in-nat-l-edu-policy-2020.html
3. https://www.education.gov.in/nep/about-nep
4. https://www.clearias.com/national-education-policy-2020/
5. https://timesofindia.indiatimes.com/education/online-schooling/how-did-the-nep-incorporate-ai-into-the-regular-study-curriculum/articleshow/94221017.cms
6. https://pib.gov.in/PressReleaseIframePage.aspx?PRID=1704878
7. https://www.researchgate.net/publication/379597341_Holistic_Multidisciplinary_Education

Artificial Intelligence in Research and Innovation: A Comprehensive Study

Dr. Rupali Wadkar
Assistant Professor
Nirmala Memorial Foundation College of Education, Kandivali

Abstract:
Artificial Intelligence (AI) is reshaping research and innovation across multiple fields, from accelerating scientific discovery to driving creativity. This paper delves into AI's transformative role in enhancing research methodologies, fostering innovation, and addressing the challenges faced in integrating AI within research ecosystems. It presents case studies spanning diverse disciplines, evaluates AI's impact on innovation cycles, and offers insights into the future trajectory of AI-driven research initiatives.

Keywords: Artificial Intelligence, Research, Innovation

1. Introduction

Artificial Intelligence (AI) has evolved from a theoretical concept to a transformative technology with applications in nearly every field of research and innovation. By leveraging machine learning (ML), neural networks, and natural language processing (NLP), AI now plays a pivotal role in shaping scientific discovery, product development, and creative fields.

This paper examines the role AI plays in enhancing research methodologies and fostering innovation across various sectors. It also discusses the challenges associated with integrating AI into traditional research environments and explores AI's ethical implications. The future trajectory of AI in research and innovation is considered, with attention to new developments and interdisciplinary collaboration.

2. The Role of AI in Research

2.1 Enhancing Research Methodologies

One of AI's primary contributions to research lies in its ability to enhance traditional methodologies. By automating tasks such as data collection, analysis, and hypothesis testing, AI increases efficiency and allows researchers to focus on more complex problem-solving tasks.

Data Mining and Predictive Analytics: Machine learning algorithms can sift through large datasets, identifying trends and correlations that might otherwise go unnoticed. AI's predictive capabilities are particularly useful in fields such as genomics, epidemiology, and climate science, where large datasets are the norm.

Hypothesis Generation: AI systems can automatically generate hypotheses based on data patterns, allowing researchers to test more theories simultaneously and optimize research direction.

2.2 Automating Time-Intensive Tasks

The ability of AI to automate repetitive, labor-intensive tasks is revolutionizing the research process. In fields like literature review and data collection, AI tools drastically reduce the time needed to process large amounts of information.

Natural Language Processing (NLP): AI-powered NLP tools can scan through academic literature, providing concise summaries and extracting key insights. This allows researchers to stay updated on the latest developments in their field with less effort.

Data Cleaning and Preparation: Preparing raw data for analysis is often time-consuming. AI tools can streamline this process by automating tasks such as data cleaning, formatting, and variable identification.

2.3 AI-Driven Simulations

AI's role in running simulations is revolutionizing scientific research, particularly in fields like physics, chemistry, and engineering. Through neural networks and advanced computational

models, AI can simulate complex real-world phenomena, providing researchers with actionable insights.

Virtual Experimentation: AI simulations enable researchers to test hypotheses in virtual environments, reducing the cost, time, and risks associated with real-world experimentation. For instance, AI is used in molecular simulations to predict how drugs interact with the human body.

Improving Accuracy: AI simulations often provide more accurate results due to their ability to model interactions at a level of detail that would be difficult or impossible for traditional methods.

2.4 Facilitating Interdisciplinary Collaboration

AI has become a facilitator for collaboration, breaking down traditional barriers between disciplines. By connecting researchers through AI-powered platforms, interdisciplinary research is becoming more accessible.

Collaboration Tools: AI-driven platforms enhance communication and project management, enabling global teams to work more cohesively. These tools often feature automatic transcription, translation, and scheduling capabilities, fostering seamless collaboration.

Cross-Disciplinary Knowledge Sharing: AI systems are increasingly designed to identify overlapping research themes, facilitating the exchange of knowledge between fields that may not traditionally collaborate.

3. AI in Innovation

3.1 Accelerating Innovation Cycles

AI's predictive capabilities make it an essential tool in speeding up the innovation process. It enables organizations and researchers to anticipate market trends, technological developments, and potential disruptions, optimizing the entire innovation pipeline.

Market Forecasting: AI models can predict consumer behavior, helping businesses identify opportunities for new products or services. By forecasting demand and pinpointing future needs, AI shortens the time from idea generation to market-ready product.

Risk Mitigation: In industries such as pharmaceuticals and automotive manufacturing, AI helps identify potential risks earlier in the innovation process. This reduces development costs and improves the likelihood of successful product launches.

3.2 AI in Product Development

AI is revolutionizing product development, particularly in sectors like pharmaceuticals, engineering, and technology. Through advanced computational models and simulations, AI accelerates the process of designing and refining new products.

Pharmaceutical Research: AI algorithms are now widely used in drug discovery. By analyzing the molecular properties of potential compounds, AI helps researchers identify promising drug candidates much faster than traditional laboratory methods.

AI is used to optimize product designs by running simulations of different **Engineering:** configurations and providing real-time feedback. This reduces the time and resources needed for prototyping and testing.

3.3 Fostering Creativity

AI is increasingly playing a role in fields traditionally viewed as purely creative, such as art, literature, and music. By generating novel ideas and outputs based on user inputs, AI is expanding the possibilities for creativity and opening new frontiers for innovation.

Generative Algorithms: AI-driven generative models can create new visual art, music compositions, or written content based on a set of parameters. This not only enhances human creativity but also opens up new business models in industries like entertainment and media.

AI-Augmented Design: In fields like fashion, architecture, and industrial design, AI is used to generate new patterns and forms, fostering innovation by offering alternative perspectives

4. Case Studies in AI-Driven Research and Innovation

4.1 AI in Healthcare Research

AI's application in healthcare has led to significant advancements in diagnostics, personalized medicine, and treatment planning. By processing large amounts of medical data, AI systems assist doctors in diagnosing conditions earlier and more accurately.

Personalized Treatment Plans: AI algorithms analyze patient data to recommend personalized treatment strategies based on factors like genetics, medical history, and lifestyle.

Predictive Diagnostics: Deep learning models are capable of identifying disease markers in imaging data, helping to diagnose conditions such as cancer and Alzheimer's in their early stages.

4.2 AI in Environmental Research

In environmental science, AI is employed to model climate change scenarios, predict natural disasters, and design sustainable solutions.

Climate Modeling: AI tools analyze vast datasets of environmental variables to provide more accurate climate models, which help policymakers in planning for climate adaptation and mitigation strategies.

Disaster Prediction: AI's ability to process real-time data allows for better predictions of natural disasters, such as hurricanes and floods, aiding in disaster preparedness efforts.

4.3 AI in Materials Science

AI has revolutionized materials science by predicting the properties of new materials, accelerating discoveries in industries such as aerospace, electronics, and energy.

Materials Discovery: AI models predict the behavior of new materials before they are synthesized in the lab, speeding up the discovery of materials with novel properties for applications like energy storage or flexible electronics.

5. Challenges in AI Integration

5.1 Ethical Considerations

As AI becomes more embedded in research and innovation, ethical concerns around bias, transparency, and privacy are becoming increasingly critical.

Algorithmic Bias: AI models trained on biased datasets can lead to skewed results and discriminatory practices, especially in sensitive fields like healthcare and criminal justice.

Transparency and Accountability: It is crucial to ensure that AI systems are explainable and transparent, particularly in areas like medicine or law, where decisions have high stakes.

5.2 Data Privacy and Security

AI often requires vast datasets, raising concerns around privacy and data security. Researchers must navigate the ethical complexities of using sensitive personal information while ensuring compliance with regulations like GDPR.

6. Future Directions

As AI continues to evolve, several areas of research are likely to emerge as focal points:

Interpretable AI: The development of AI models that provide clear, interpretable outputs will be critical for increasing trust and ensuring ethical decision-making in high-stakes fields.

Interdisciplinary Collaboration: More collaboration between AI experts and domain specialists will be necessary to maximize the potential of AI in research. This includes fostering partnerships between universities, industry, and government.

Regulatory Frameworks: Governments and organizations will need to establish robust regulatory frameworks to govern AI's use in research, ensuring ethical practices while fostering innovation.

7. Conclusion

AI is reshaping research and innovation by automating tasks, accelerating discoveries, and augmenting human creativity. While the challenges of ethical concerns, transparency, and interdisciplinary collaboration remain, the potential benefits of AI-driven research are vast. As AI technologies continue to evolve, they will play an increasingly critical role in shaping the future of scientific discovery and innovation across all sectors.

References

1. Russell, S., & Norvig, P. (2021). *Artificial Intelligence: A Modern Approach.* Pearson.
2. Silver, D., et al. (2016). "Mastering the game of Go with deep neural networks and tree search". *Nature*, 529(7587), 484-489.
3. Marcus, G., & Davis, E. (2020). *Rebooting AI: Building Artificial Intelligence We Can Trust.* Pantheon Books.
4. Shneiderman, B. (2020). *Human-Centered AI.* Oxford University Press.

Human-AI Collaboration: Exploring Ways AI Can Complement Human Work, Improve Productivity, and Enable Collaborative Environments

Sagar Tripathi
Research Scholar
Santali Mahavidyalaya, Nagpur.

Dr. Prachi Rode
Professor & Research Guide
Santaji Mahavidyalaya, Nagpur.

Abstract

The integration of artificial intelligence (AI) into the workforce has now become a reality rather than a futuristic concept. Human-AI collaboration has the great potential to enhance creativity, productivity, and decision-making in various sectors. This research paper explores the role of AI and how it can help human labor in various ways, like increasing productivity, accuracy, and running error-free operations, etc., and finds out the various ways where AI enables the development of collaborative environments where AI systems and humans work together collectively. After looking into the many case studies and examining theoretical frameworks, this paper aims to highlight the transformative potential of human-AI collaboration and outline strategies for its effective implementation.

1. Introduction

As AI technologies continue to evolve, their role in enhancing human capabilities has become more and more evident. Rather than replacing human labor, AI systems are now being designed to complement human skills, automate routine tasks, and improve decision-making. Human-AI collaboration provides an opportunity to foster a more productive and creative working environment, where machines and humans bring their unique strengths to the table. This paper seeks to examine how AI can complement human work, improve overall productivity, and facilitate the creation of collaborative environments.

1.1 Problem Statement

While much attention has been given to the potential of AI to displace the human workforce, less emphasis has been placed on how humans and AI can collaborate effectively. This study bridges the gap by focusing on the positive impact of AI on human work and exploring the benefits of human-AI collaboration.

1.2 Research Objectives

1. To identify the different ways, AI can complement human work.
2. To explore how AI can improve productivity in various industries.
3. To examine collaborative environments where AI and humans work together synergistically.

2. The Role of AI as a Complement to Human Work

Artificial intelligence (AI) systems are designed to process large amounts of data, perform repetitive tasks, and provide insights that may not be immediately available to humans. Though the use of these capabilities complements human work in several ways:

2.1 Enhancing Human Decision-Making

AI provides powerful data-driven insights that can facilitate better human decisions. In sectors like healthcare, finance, and marketing, AI systems can analyze large amount of data to identify trends, forecast outcomes, and recommend courses of action. These insights help decision-makers to make more informed and timely choices, ultimately improving the quality of outcomes.

2.2 Automating Routine Tasks

Automation is one of AI's most significant contributions to the workforce. By automating repetitive and time-consuming tasks, such as data entry, scheduling, and basic customer service, AI leverages human workers to focus on higher-order cognitive tasks, problem-solving, and innovation. For example, in the legal profession, AI can be used for creating legal documents quickly, allowing lawyers to dedicate more time to case strategy.

2.3 Offering Creativity

AI is increasingly being used as a tool for creativity. In fields like art, music, and design, AI can assist humans in generating new ideas and creating original content. AI-driven tools can help artists on novel design suggestions or musicians in composing original pieces by analyzing patterns in existing music.

3. Improving Productivity through Human-AI Collaboration

Human-AI collaboration has the potential to significantly increase productivity across a variety of industries. This section explores the key areas where AI has already demonstrated its ability to boost productivity.

3.1 AI in Healthcare

In the healthcare sector, the use of AI technologies has been widely increasing. AI-powered diagnostic tools, such as image recognition systems, can analyze medical scans more quickly and accurately than human doctors, leading to faster diagnoses. By augmenting the capabilities of healthcare professionals, AI enables them to serve more patients in less time while maintaining a high standard of care.

3.2 AI in Manufacturing

In the manufacturing sector, AI systems improve and boost production processes by monitoring equipment performance and predicting maintenance requirements, which reduces downtime, increases efficiency, and improves product quality. In this AI dominated environment, human workers are responsible for managing AI systems, solving complex problems, and making changes based on AI feedback.

3.3 AI in Finance and Other Sector

In sectors like finance and law, AI-driven systems can handle complex data analysis and reporting tasks, drastically reducing the time needed for human workers to gather insights. By streamlining these processes, AI allows human workers to focus on interpreting results and making strategic decisions.

4. Enabling Collaborative Environments for Human-AI Synergy

Creating environments where humans and AI can work together effectively requires a careful balance of technology and human input. Several strategies can be implemented to foster a harmonious Human-AI partnership:

4.1 Designing User-Friendly AI Systems

For successful collaboration, AI systems must be designed with the end user in mind. Intuitive interfaces, clear outputs, and explainable AI models ensure that humans can easily interpret AI recommendations and make informed decisions based on them. User-friendly designs also reduce the cognitive load on workers, enhancing overall productivity.

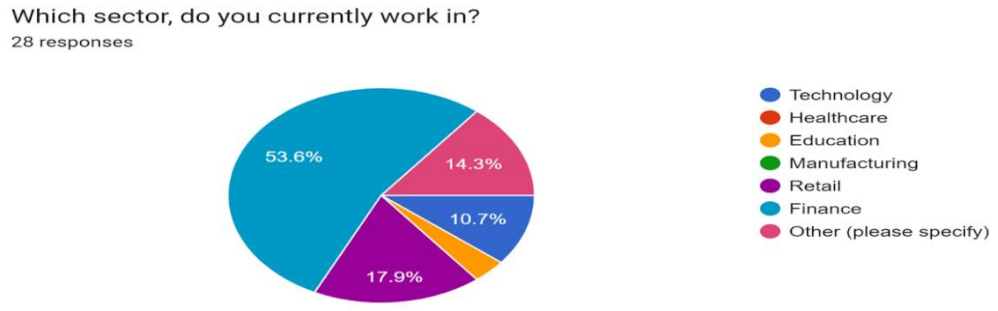
4.2 Building Trust Between Humans and AI

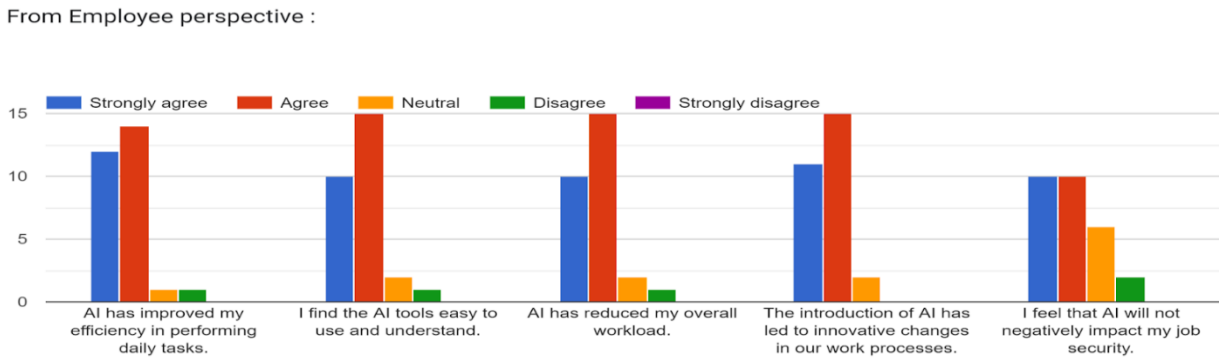
Trust is a critical component of any collaborative environment, and it is especially important in Human-AI collaboration. To build trust, AI systems need to be transparent about how they arrive at their conclusions. Explainable AI (XAI) initiatives aim to make AI decision-making more understandable to human users, fostering trust and increasing reliance on AI systems.

4.3 Continuous Learning and Adaptation

Both humans and AI systems need to continuously learn and adapt to new challenges in collaborative environments. AI systems must be able to improve based on feedback from human workers, while humans should develop new skills to work effectively with AI. Continuous learning programs that focus on upskilling human workers are essential for maintaining a productive collaboration.

The following survey has been conducted among 30 employees of different sectors to know their opinion about the usage of AI in their workplace and how much they are being benefited from this.





5. Challenges in Human-AI Collaboration

Despite its potential, Human-AI collaboration has several challenges that need to be addressed:

5.1 Ethical and Privacy Concerns

The widespread adoption of AI in the workplace raises ethical concerns about privacy, surveillance, and bias. AI systems, when not properly regulated, can worsen inequality or violate workers' rights. It is crucial to establish ethical guidelines and ensure transparency in AI operations.

5.2 Skill Gaps

The shift toward modern workplace wherein Human-AI collaboration demands new skills from workers, particularly in AI literacy. Employees may need to learn how to interpret AI insights, interact with AI systems, and troubleshoot AI-related problems. Upskilling the workforce to handle these demands is a significant challenge for many organizations and involve huge cost in order build up AI driven infrastructure where they can be trained and learn such skills.

5.3 Over-Reliance on AI

There is a risk that human workers may become dependent on AI, which could reduce their own problem-solving and critical-thinking abilities. Organizations must ensure that there should be balance between automation and human involvement so that that human workers retain essential skills.

6. Conclusion

Human-AI collaboration has the potential to transform the today's workplace into modern workplace by enhancing human skills, improving productivity, and enabling more creative and strategic With the help of AI systems that are user-friendly, fostering trust, and ensuring continuous learning, organizations can create collaborative environments where both humans and AI can work together. However, there are some challenges such as ethical concerns, skill gaps, and over-reliance on AI will be crucial to the success of Human-AI partnerships. The future of work is one where AI and humans co-exist, and each contributing uniquely to the workforce of tomorrow.

References

1. Brynjolfsson, E., & McAfee, A. (2017). *Machine, Platform, Crowd: Harnessing Our Digital Future*. W.W. Norton & Company.
2. Ford, M. (2015). *Rise of the Robots: Technology and the Threat of a Jobless Future*. Basic Books.
3. Doshi-Velez, F., & Kim, B. (2017). *Towards a rigorous science of interpretable machine learning*. arXiv preprint arXiv:1702.08608.
4. Pasquale, F. (2015). *The Black Box Society: The Secret Algorithms That Control Money and Information*. Harvard University Press.

Use Of Ai In Promoting Sustainable Development Goal's

Ms. Induja Esakkimuthu
Name of Institute: D.T.S.S College of Commerce (Autonomous)

Abstract

This research examines the role of Artificial Intelligence (AI) in advancing the United Nations Sustainable Development Goals (SDGs), focusing specifically on Goal 3: Good Health and Well-Being, and Goal 4: Quality Education. By analyzing secondary data, including studies and reports, this study highlights the various applications of AI in these areas. In the context of Quality Education, AI is utilized to create personalized learning experiences that cater to individual student needs, helping to improve engagement and academic performance. In healthcare, AI enhances the ability to detect diseases early through data analysis and predictive algorithms, enabling timely interventions that significantly improve patient outcomes. Additionally, AI-driven solutions, such as telemedicine, expand access to healthcare services, particularly in underserved areas.These findings demonstrate that AI not only supports the achievement of SDGs but also addresses critical challenges in education and healthcare. The research underscores the potential of AI as a transformative tool for creating more effective and accessible systems, ultimately contributing to a sustainable future.

Keywords: Artificial Intelligence (AI), Sustainable Development Goals (SDGs), Good Health and Well-Being, Quality Education, Personalized Learning, Early Disease Detection, Telemedicine.

Introduction

Artificial Intelligence (AI) is a branch of computer science focused on creating machines that can think and act like humans. This involves tasks like interpreting language, identifying patterns, and making decisions. AI uses various techniques to learn from data, allowing it to improve over time. AI is a part of many areas of our everyday lives. For example, it powers virtual assistants like Siri and Google Assistant, helps in recommending movies on streaming services, and assists doctors in diagnosing diseases. As AI technology develops, it has the potential to transform industries, making processes faster and more efficient. However, it also brings challenges, such as ethical questions about privacy and job displacement. Understanding AI is essential as it continues to shape our future.

The Sustainable Development Goals (SDGs) are a universal call to action adopted by the United Nations in September 2015. They build on decades of work by countries and the UN to improve the lives of people around the world. The goals are designed to address global challenges and promote sustainable development across various dimensions, including economic, social, and environmental aspects.

17 Sustainable Development Goals

1. **No Poverty**
2. **Zero Hunger**
3. **Good Health and Well-being**
4. **Quality Education**.
5. **Gender Equality**
6. **Clean Water and Sanitation**
7. **Affordable and Clean Energy**
8. **Decent Work and Economic Growth**.
9. **Industry, Innovation, and Infrastructure**
10. **Reduced Inequalities**
11. **Sustainable Cities and Communities**
12. **Responsible Consumption and Production**
13. **Climate Action**
14. **Life Below Water**

15. **Life on Land**
16. **Peace, Justice, and Strong Institutions**
17. **Partnerships for the Goals**

Importance of the SDGs - Sustainable Development Goal 3 focuses on ensuring good health and well-being for all individuals throughout their lives. This goal emphasizes the importance of access to quality healthcare services, making sure that everyone can receive routine check-ups, vaccinations, and treatment for illnesses without financial burden. A significant aspect of Goal 3 is improving maternal and child health, aiming to reduce maternal and infant mortality rates by enhancing prenatal and postnatal care. Mental health is also a crucial component, as promoting mental well-being and providing support for those facing mental health challenges is essential for a healthy society. Additionally, the goal addresses the need to combat diseases such as AIDS, tuberculosis, and malaria through effective prevention strategies, education, and access to treatment. Overall, investing in health not only leads to better quality of life but also strengthens communities and economies. In parallel, Sustainable Development Goal 4 emphasizes the importance of quality education for all individuals, regardless of their background. This goal aims to ensure universal access to free primary and secondary education, highlighting the necessity of making education available to marginalized groups. It also stresses the significance of early childhood education, which lays a strong foundation for lifelong learning. Moreover, Goal 4 promotes the idea of lifelong learning opportunities, allowing individuals to continually acquire knowledge and skills throughout their lives. Teaching relevant skills that align with the job market is essential for enabling individuals to find decent work and contribute to the economy. Quality education empowers individuals and communities, reduces inequalities, and fosters social and economic development, ultimately enabling people to lead fulfilling lives. Together, Goals 3 and 4 are interconnected; good health supports better learning, while quality education equips individuals to make informed health choices, contributing to a more equitable and sustainable world.

Review Of Literature

Milad Shahvaroughi Farahani and Ghazal Ghasemi (2024) in their research paper titled how artificial intelligence play a role in achieving sustainable development goals conclude that AI plays a crucial role in tackling global issues and promoting sustainable development in various sectors. AI-driven solutions are transforming fields such as precision agriculture, healthcare, environmental conservation, climate change response, smart cities, and disaster management, all of which contribute to advancing SDGs. We emphasized the need to harness technology, innovation, and data science to accelerate progress toward achieving SDGs. Additionally, strengthening infrastructure is essential for these efforts.

Rapeerat Thanyawatpornku (2024) in their article conclude that AI technologies have greatly improved how we tackle global challenges like climate change, inequality, healthcare, food security, and more. Its advanced forecasting helps predict climate change (SDGs 7 and 13) and enhances renewable energy production. In addressing inequality, AI improves welfare targeting and promotes financial inclusion. It has also transformed healthcare by enabling early disease detection and faster drug discovery. In agriculture, AI boosts food production with fewer resources, ensuring global food security. AI aids in conserving biodiversity (SDG 15) and better managing water resources. Additionally, AI expands access to education and helps prevent violence by predicting conflicts.

David Jungwirth and Daniela Haluza (2023) in their research paper conclude that The growing use of AI comes with concerns about its impact on sustainable development. The United Nations created 17 Sustainable Development Goals (SDGs) to fight poverty, protect the environment, and promote prosperity for everyone. AI has the potential to significantly help in achieving many of these goals, especially within the societal aspects of the SDGs. However, to ensure AI's positive contribution, it is essential to have clear regulations for its safe, transparent, and ethical use. A global, science-based discussion is needed to establish shared principles and laws among nations.

Research Methodology

(I) Objective Of The Study

1. To understand about Aritificial intelligence
2. To study about Sustainable development goal 3(Good health and well being)
3. To study about Sustainable development goal 4(Quality Education)
4. To understand the use of AI in Hospital and College

(II) Data Collection

1. Secondary data is collected from website and online research paper.

Findings Of The Study

After referring many articles and reports related to use of ai in sustainable development goal. Below are some findings of the study.These secondary data collection and analysis technique providing a holistic understanding of Use of AI in SDG'S

Use of AI in Hospital

1. **AI for Medical Imaging**: Machines like IBM Watson Health and Zebra Medical Vision are used in hospitals to analyze medical images such as X-rays and MRIs. These AI systems help doctors detect problems like early signs of cancer, enabling timely treatment for patients.
2. **Robotic Surgery Machines**: The da Vinci Surgical System is a robotic surgical machine that assists doctors in performing surgeries with greater precision. It allows for very accurate movements, making it particularly useful in delicate surgeries, such as heart operations, which can lead to less pain and faster recovery for patients.
3. **Patient Monitoring Systems**: Devices like Philips IntelliVue continuously monitor patients' vital signs, including heart rate and blood pressure. If there are any alarming changes, these systems alert the medical staff immediately, which is crucial for timely intervention in emergencies.
4. **Predictive Analytics Tools**: Software such as Epic Systems analyzes a patient's health history and current data to predict future health outcomes. This tool can warn doctors if a patient is at risk of becoming sicker after surgery, allowing for early preventive measures.
5. **AI in Personalized Medicine**: Tools like Tempus utilize genetic information to recommend personalized treatment options for patients. This is particularly beneficial for cancer patients, as tailored therapies can significantly improve treatment effectiveness.
6. **Automated Drug Dispensing Systems**: Machines such as Omnicell are employed in hospital pharmacies to dispense medications accurately. These systems ensure that patients receive the correct dosages at the right times, reducing the chances of medication errors.
7. **Telemedicine Platforms**: Services like Teladoc enable patients to consult with healthcare providers via video calls. AI enhances these platforms by collecting and analyzing patient information before the consultation, making the virtual visit more efficient.
8. **Chatbots for Mental Health**: Applications like Woebot provide mental health support through chatbots that engage with patients. They offer advice and coping strategies, and if necessary, connect users with human therapists for further assistance.
9. **AI for Administrative Tasks**: Tools such as Olive help hospitals streamline administrative processes like scheduling appointments, managing patient records, and handling billing. By automating these tasks, hospital staff can focus more on patient care.
10. **Speech Recognition Software**: Programs like Dragon Medical One allow doctors to dictate notes instead of typing. This speech recognition technology converts spoken words into written text quickly, facilitating efficient documentation of patient information.

USE OF AI IN COLLEGES/INSTITUTIONS

1. Personalized Learning-App: BYJU'S Usage: Offers personalized learning experiences with adaptive assessments and tailored lessons for students in various subjects**.**

2. Intelligent Tutoring Systems-App: Khan Academy Usage: Provides a free online learning platform that adapts to students' learning speeds, especially in math and science**.**
3. Automated Grading-App: Moodle Usage: An open-source learning platform used by many colleges for course management, including automated grading for quizzes and assignments.
4. Predictive Analytics-App: Civitas Learning (used by some Indian universities) Usage: Analyzes student data to identify at-risk students and recommend interventions. Some Indian institutions customize their analytics tools for similar purposes**.**
5. Virtual Learning Environments-App: Google Classroom Usage: Widely used in Indian colleges for creating and managing online classes, distributing assignments, and providing feedback**.**
6. Chatbots for Student Support-App: TARS Usage: A chatbot platform that several Indian institutions use to handle student inquiries regarding admissions, course details, and general support.
7. Language Learning- App: Duolingo Usage: Popular among students for learning English and other languages through gamified lessons.
8. Content Creation and Curation-App: Canva Usage: Used by educators to create visually appealing presentations, infographics, and educational materials.
9. Enhancing Research-App: Google Scholar Usage: A key resource for students and researchers in India to access academic papers and research articles across disciplines**.**
10. Career Guidance -App: Internshala Usage: Provides internship and job opportunities specifically for students, helping them find relevant positions based on their skills and interest

Conclusion

AI is playing an important role in helping the world achieve the United Nations' Sustainable Development Goals, especially in the areas of Good Health (Goal 3) and Quality Education (Goal 4). In healthcare, AI tools like early disease detection systems and telemedicine make it easier for people to get timely and effective medical care. These tools can catch illnesses earlier and provide faster treatments, improving patient health and saving lives. In education, AI helps students learn better by creating personalized lessons that match their learning styles. This makes learning more interesting and effective, allowing students to perform better in school. Overall, AI is not just about technology; it’s about solving real-world problems. It helps make healthcare and education more available and fair to everyone. By using AI, we can make great progress in creating a healthier, smarter, and more equal world for everyone.

Webliography

Secondary Data : Data retrieved

6. https://www.researchgate.net/publication/379839359_How_artificial_intelligence_plays_a_role_in_achieving_sustainable_development_goals
7. https://www.nature.com/articles/s41467-019-14108-y
8. https://www.sciencedirect.com/science/article/pii/S2210670724003251
9. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4376842

Artificial Intelligence in Inclusive Education: Enhancing Accessibility and Equity

Dr. Vinayak Shinde
Assistant Professor, Oriental College of Education and Research, Andheri

Abstract

The advent of Artificial Intelligence (AI) has introduced transformative opportunities across various sectors, including education. In the context of inclusive education, AI presents significant potential to address learning disparities, enhance accessibility, and provide personalized learning experiences. This research paper explores how AI can support inclusive education by addressing the diverse needs of learners, specifically those with disabilities and learning difficulties. It discusses the current applications, benefits, challenges, and ethical considerations of integrating AI into inclusive education systems, ultimately highlighting the need for balanced approaches to technology-driven educational equity.

Keywords: Artificial Intelligence, Inclusive Education, Accessibility, Personalized Learning, Learning Disabilities, Assistive Technology.

1. Introduction

Inclusive education aims to ensure that all students, regardless of their physical, cognitive, or socio-emotional differences, have access to high-quality learning opportunities. However, achieving this goal can be challenging due to varying learning styles, disabilities, and access barriers faced by students. Artificial Intelligence (AI), with its ability to personalize and optimize learning experiences, has emerged as a key player in promoting inclusion in education.

This paper investigates the role of AI in enhancing inclusive education by providing accessible learning solutions for students with diverse needs. It examines the impact of AI-driven assistive technologies and adaptive learning platforms, while also considering the ethical and logistical challenges of AI integration in education systems.

2. Background of Inclusive Education

Inclusive education promotes the right of all students, regardless of their abilities, to learn together in the same environment. The Salamanca Statement (UNESCO, 1994) reinforced the importance of inclusive schools that accommodate all children, including those with disabilities. Despite international frameworks, many educational systems still struggle to meet the needs of students with disabilities due to a lack of resources, trained personnel, and adaptable teaching methods.

3. AI in Education: Overview

AI in education refers to the use of intelligent algorithms and technologies to enhance learning, assessment, and administration. These technologies include machine learning, natural language processing, robotics, and speech recognition systems, among others. AI's potential to analyze large datasets, recognize patterns, and personalize content has made it a valuable tool for educational innovation.

4. AI Applications in Inclusive Education

AI's application in inclusive education is manifold, with systems designed to cater to specific needs, support diverse learners, and enhance overall accessibility.

4.1 AI-driven Assistive Technologies

AI-driven assistive technologies have been instrumental in supporting students with physical and cognitive disabilities. These include:

Text-to-Speech (TTS) and Speech-to-Text (STT): Students with visual impairments, reading difficulties, or physical disabilities benefit from TTS tools that read text aloud or STT tools that transcribe spoken language into text.

AI-based Screen Readers: These tools enable visually impaired students to navigate digital platforms using auditory feedback.

Autism Support Systems: AI-based platforms, such as "robot tutors," can help children with autism improve their social and communication skills through interactive learning sessions.
AI-Powered Hearing Aids: AI enhances hearing aids' ability to filter background noise and improve sound quality, helping students with hearing impairments in classroom settings.

4.2 Personalized Learning Platforms

AI systems can personalize education by adapting lessons to each student's strengths, weaknesses, and learning pace:
Adaptive Learning Platforms: AI-driven adaptive learning platforms, such as DreamBox and Knewton, use machine learning algorithms to assess student performance and provide tailored lessons.
Real-time Feedback Systems: These systems allow for instant assessment of a student's progress and recommend additional resources or exercises to improve learning outcomes

4.3 AI for Cognitive and Learning Disabilities

AI has proven valuable in assisting students with cognitive and learning disabilities such as dyslexia, dyscalculia, and ADHD. These tools provide:
Cognitive Skill Training: AI applications offer exercises that develop cognitive skills such as memory, attention, and problem-solving.
Writing and Reading Tools: AI-based applications like Grammarly and Read&Write help students with writing disabilities by providing grammar, spelling, and contextual suggestions.

4.4 AI for Physical Disabilities

Students with physical disabilities often face challenges accessing traditional educational materials. AI offers solutions such as:
Robotic Assistance: AI-powered robots can assist students with mobility issues in performing tasks such as typing, writing, and note-taking.
Voice Control Systems: AI-based voice assistants like Siri, Alexa, and Google Assistant allow physically disabled students to control devices and access educational content using voice commands.

5. Benefits of AI in Inclusive Education

AI's integration into inclusive education has several benefits that make learning more equitable and accessible:

5.1 Enhanced Accessibility

AI tools like speech recognition, TTS, and adaptive learning systems make learning resources accessible to students with disabilities, ensuring they have the same educational opportunities as their peers.

5.2 Personalized Learning Experience

AI's ability to tailor learning experiences to individual students' needs ensures that students receive personalized support, enhancing engagement and retention.

5.3 Efficient Resource Management

AI-powered systems can help educators manage resources more efficiently, enabling them to focus on students who require more direct intervention.

5.4 Data-Driven Insights

AI systems collect and analyze data on student performance, helping educators identify learning gaps, track progress, and design effective intervention strategies.

6. Challenges and Limitations

Despite the many benefits of AI in inclusive education, several challenges must be addressed for successful integration:

6.1 Cost and Accessibility

AI-driven tools and technologies can be expensive to implement, especially in low-resource settings. Educational institutions may struggle to afford the necessary infrastructure and training to use these tools effectively.

6.2 Data Privacy Concerns

AI systems collect large amounts of data on students, raising concerns about data security and privacy. Safeguarding sensitive information is crucial to maintaining trust in AI systems.

6.3 Ethical Considerations

AI-based systems may inadvertently reinforce biases or discriminate against certain groups of students. For example, algorithms may reflect biases present in training data, leading to inaccurate or inequitable outcomes for marginalized groups.

6.4 Teacher Training

Teachers need to be properly trained to effectively use AI in the classroom. Without adequate training, AI tools may not be utilized to their full potential, and teachers may feel overwhelmed by the technology.

7. Ethical Implications

AI's role in education raises important ethical questions related to equity, transparency, and fairness. It is essential to design AI systems that do not perpetuate existing inequalities or exclude certain students. Furthermore, clear policies are needed to protect students' data and ensure that AI tools are used ethically and responsibly in educational environments.

8. Conclusion

AI has the potential to revolutionize inclusive education by providing tools that cater to the diverse needs of learners. From assistive technologies to personalized learning platforms, AI can help bridge learning gaps and promote accessibility. However, challenges related to cost, teacher training, data privacy, and ethical considerations must be carefully navigated to ensure equitable outcomes. A balanced approach that emphasizes both technological innovation and human oversight is essential for AI to truly enhance inclusive education.

9. Recommendations

1. **Investment in AI Infrastructure**: Governments and educational institutions should invest in AI infrastructure and training to ensure that all schools, especially those in underprivileged areas, can benefit from AI tools.
2. **Data Privacy Protocols**: Strict data privacy regulations should be implemented to protect students' sensitive information.
3. **Inclusive AI Design**: AI systems should be designed with inclusivity in mind, ensuring that they cater to diverse student needs and avoid biases.
4. **Teacher Training Programs**: Teachers should receive comprehensive training on how to effectively integrate AI into their classrooms to maximize its potential in fostering inclusive education.

References

1. UNESCO. (1994). The Salamanca Statement and Framework for Action on Special Needs Education.
2. Anderson, R. C., & Freebody, P. (1983). Reading comprehension and the assessment and acquisition of knowledge. American Educational Research Journal.
3. Luckin, R. (2017). AI and education: Where are we now? Where are we heading? Pearson.

Teachers Training in the AI Era

Assistant Professor Mrs.Neha Vipin Singh
R.R.Educational Trust's B.Ed College,Mumbai

Abstract-

The objective of artificial intelligence (AI) is to establish intelligent machines that are able to carry out tasks that have historically required human intelligence. Due of its rapid expansion, its incorporation into the sphere of education offers both benefits and obstacles. Since education is not static, preparing teachers for this quickly evolving advancement in technology is critical to their success. The methodology used in this position paper is a synthesis of the body of research on creative approaches to incorporating AI into the training of future teachers. This study created the idea of Teachers of the Future and addressed worries about AI's ability to supplant teachers. The study acknowledged the crucial responsibilities that educators play in cultivating students' critical thinking capacities by providing them emotional and spiritual encouragement.

The implications of AI for effective integration in the processes of teaching and learning was further examined. The cultivation of AI literacy, taking into account AI into teacher training courses, encouraging collaborative learning among teacher candidates, providing ways to receive continuing education, and cultivating a positive attitude toward AI utilization are some of the strategies to get ready educators of the Future in the Era of AI that can be realized by drawing on the synthesis of literature gathered from the review of related works. One of the recommendations made in the study was that teacher education programs given by teacher training institutions should give Teachers of the Future fundamental training in AI application for educational processes.

Keywords Include- Innovative Strategies, AI Inclusion, Future Teachers, Teacher Training, Computer Vision

Introduction: In computer science, artificial intelligence (AI) is the study of constructing intelligent machines that may execute tasks that typically get done by people.

Algorithms and statistical models are used by AI systems to analyze data, spot trends, and make predictions [1, 3]. Intelligent automation is commonly split into two types: weak or narrow AI and powerful or global AI. General AI seeks to emulate human awareness and intellect, while narrow AI is tailored to do certain tasks [3,25]. Machine learning, natural language processing, computer vision, robotics, and other subfields are all included in the broad category of artificial intelligence [12,17, 20]. With the help of experience, gadgets can learn and hone their skills through machine learning, a subfield of computational intelligence that negates the need for explicit programming instructions [17].

The goal of the natural language processing process is to instruct machines how to comprehend and react to language like a human. Robotics is the field which builds smart gadgets that can interact with their surroundings, whereas computer vision focuses with enabling machines to read and analyze visual data [7]. AI technology is becoming increasingly woven into a variety of sectors, including manufacturing, entertainment, finance, healthcare, telecommunications, transportation, agriculture, and education. This is due to its rapid advancement. By enabling tailored learning experiences, enhanced grading and assessment, and more student engagement, the integration of AI into education has the potential to completely alter teaching and learning.

Related Works - AI's Role in Teacher Education In recent years, the importance of incorporating AI into teacher education has grown. With the capability to provide personalized learning experiences, more effective grading and evaluation, and increased student engagement, artificial intellect (AI) has the potential to completely change the way teachers educate and how students learn. Because of this, there is now more focus on training upcoming educators to effectively incorporate AI into their lesson plans. The significance of AI in teacher education has also been established by recent studies.

As an illustration, a study by [18] found that embedding AI into instructor preparation can enhance instructors' capacity to tailor lessons, develop more accurate assessments, and engage students in deeper and more meaningful ways. A comparable result were found in another study by [24], which showed that AI can assist educators in identifying difficult children early on, offering focused interventions, and eventually boosting outcomes for pupils.Furthermore, [39] claims that AI is crucial in helping to solve the problems brought on by the COVID-19 epidemic. The shift to remote learning has raised attention to the need for creative solutions that will enable educators to provide exceptional training in a virtual environment. Personalized support for students and remote learning can be enabled via AI-powered solutions like chatbots and adaptive educational websites [11]. Personalized learning experiences for individual students are one of the advantages of AI in teacher education.

AI technology can be used to evaluate student data and offer individualized suggestions and criticism to help students in meeting their goals for studying [29].

Teachers can design tailored educational pathways for their pupils by utilizing AI-powered innovations that take into thought their distinctive educational tastes and prerequisites. The effectiveness and precision of evaluation and grading can also be increased with the use of AI. Grading mechanisms driven by artificial intelligence (AI) have the capacity to produce grades that are more consistent, efficient, and accurate than those produced by human graders [6,33]. Teachers can provide high-quality instruction while saving time by automating grading procedures. Additionally, by providing engaging and in-depth learning opportunities, AI can boost engagement among learners.

VR technology, for example, can be utilized to create immersive learning environments, and AI-driven chatbots might offer students with personalized assistance and guidance [11,18]. Teachers with competence deploying artificial intelligence (AI) technologies are also in greater demand. Teachers with expertise in AI can aid in closing the educational gap between 21st century skills—the abilities that employers are currently looking for—and the subjects that are being taught in schools. AI skills grow increasingly essential in the workforce[22, 35, 40].

Could AI Take Over as a Teacher? Within teacher education, there is controversy about whether AI will eventually take the role of teachers. Some contend that artificial intelligence (AI) can enhance the learning procedure, while others express concerns about how AI may affect teachers as a career. The possibility for AI to customize students' educational experiences is one reason in its favor. Users can benefit from more efficient and enjoyable learning experiences when AI-powered educational systems are able to adapt to their specific needs and provide tailored feedback [12, 26].

Inquiries concerning the drawbacks of AI in education are generated by this, including the function of instructors in the classroom and their capacity to offer the human touch and compassion that AI might not be able to recreate [19, 32]. Furthermore, possible biases and errors in AI algorithms are a source of concern. If not carefully constructed and closely supervised, AI-powered learning platforms have the potential to reinforce prejudices related to socioeconomic class, gender, and race [29]. Furthermore, imaginative and analytical abilities that are required of instruction may not be recreated by AI [26].

The possible loss of interpersonal and mental interactions between educators and students is another issue with AI taking over the job of teachers. Students liked their relationship with teachers and valued the assistance and direction they received from them, as shown in a study by [38]. Moreover, AI might not be able to recognize and handle student mental health difficulties; teachers are vital in this regard [10]. The quality of the material being taught is an additional concern that is brought up by the application of AI in education.

Personalized learning experiences can be given through AI, but there's a chance that pupils will just learn the basics and develop shallow cognition and poor analytical skills [16].

Given these worries, it's reasonable to say that while AI won't likely entirely supplant teachers in the classroom, it will certainly complement and improve their jobs. In order to make optimal use of the advantages of AI technology, it is crucial that administrators receive training in both its ethical and responsible deployments. AI can help teachers become more effective educators. For example, teachers can use analytics driven by AI to monitor student progress and modify the curriculum accordingly [41].

Future Instructors A new breed of teachers with a diverse skill set to handle the intricacies of modern instruction is embodied by the term "teachers of the future." According to [4], teachers of the future are essential intermediaries between the home, school, and pupils. They are also skilled at adopting cutting-edge technologies like artificial intelligence into their lesson plans. They fundamentally have a significant impact on how students define their existential personally in social and learning settings. Teachers of the Future are defined by their capacity to adapt to changing educational frameworks and their devotion to providing students with tailored learning experiences, as noted by the [23] and [28] as well as other researchers [e.g. 14, 20, 27]. Being able to utilize AI and other technologies to improve teaching efficacy and student engagement stems from their technological know-how. Teachers of the Future play an even bigger part than just being technically proficient, as stressed by [4]. They also have to concentrate on helping students become more emotionally intelligent and use technology to foster compassion, metacognition, and other critical psychological abilities. The Teacher of the Future has to navigate emerging possibilities and challenges in a society that is becoming more interconnected and technologically advanced [5]. They must therefore be adept at handling the nexus of education and technology while acting as supporters of the social and emotional growth of their students. The educational experiences and results of future generations are capable of being influenced by Teachers of the Future by embracing their obligations as mentors, instructors, and learning facilitators.

OUTCOME AND DISCUSSION- Creative Techniques for Including AI in Teacher Education to Prepare Future Teachers Many methods for training Teachers of the Future in the AI Era evolved from the synthesis of data from the evaluation of similar materials. Developing AI Literacy is one of these tactics. Future teachers will graduate with a fundamental understanding of AI ideas and applications in education if AI literacy components are completely incorporated into the teacher training curriculum.

The combination of AI ethics, AI-enhanced pedagogy, and ethical AI tool use can be implemented through specialized courses, modules, or workshops. Aspiring educators can become proficient in utilizing AI-powered tools for instructing by include practical, hands-on experiences with AI technology in their teacher training curricular [4,7].

This could entail debates, case studies, or personal reflections that ask educators to ponder the pedagogical, ethical, and social aspects of integrating AI into education.

Including AI in Courses for Teacher Training To guarantee that AI concepts are integrated into the curriculum rather than being treated as stand-alone matters AI content will be incorporated into currently available teacher training courses. This method enables aspiring teachers to understand how intelligent technology pertains to various facets of education, including classroom management, curriculum development, and evaluation [34]. Establishing specialist modules or practicums with an emphasis on AI integration gives potential teachers the chance of applying AI concepts in real-world instructional settings.

Promoting Collaborative Education in Teacher Education Potential teachers might share ideas, resources, and experiences about AI integration in a friendly setting when peer learning communities are established inside teacher training programs [9,27]. These communities might be professional learning networks with a specific focus on artificial intelligence in education, study groups or forums on the internet. Teacher trainees can benefit greatly from mentorship and assistance when they are paired with experienced instructors who have knowledge in utilizing AI.

Staying Alive Providing workshops and seminars on AI integration as part of continuing education enables working teachers to stay up to date on the most recent advancements in AI pedagogy and technology [9,34]. Emerging AI tools, data analytics in education, and ethical issues surrounding the use of AI in the classroom are a few themes that these courses might cover. Building online learning communities for professional educators makes it easier for them to share specialization and collaborate on ongoing AI integration projects. These organizations could connect recruits and practicing instructors from various geographic regions and enable peer-to-peer support by using online platforms, live webinars, and discussion forums [30].

Creating an Optimistic View on the Application of AI In order to successfully apply AI technologies in the classroom, instructors are encouraged to accept change, take sensible risks, and modify their teaching methods by offering professional development opportunities that foster a growth mentality toward the technology. [4], [34], and [9] suggest that these possibilities could take the form of online courses, workshops, or seminars that emphasize growing a growth mindset along with being open to trying out new technology. Others may be encouraged to follow suit by praising and honoring academics who use cutting-edge AI integration tactics.

Advice for Putting Into Practice Here are a couple suggestions for educating Teachers of the Future for the AI era, based on the summarized review of pertinent articles in this paper: To give educators the information and abilities they will need in the future, it is crucial to give them an elementary foundation in artificial intelligence.

Highlight the value of teacher-training-focused workshops and seminars that cover AI ideas like its potential, bounds, and legal implications. highlight the value of teacher-training-focused workshops and seminars that cover AI ideas like its potential, bounds, and ethical ramifications. In-depth knowledge of AI's applications in education and how it could boost instruction are the main goals of these workshops. Furthermore, trainees' learning experiences are enhanced by the viewpoints from real-world situations and the encouragement of critical thinking regarding the applications of AI in education that guest presenters provide [27]. 2. In order to prepare trainers for the incorporation of AI into their future classrooms, training programs for educators are crucial. Curricula for teacher education must include specific modules on AI [28].Promoting creativity and teamwork in education requires teacher candidates to have a positive attitude toward artificial intelligence.

To guarantee that teacher candidates are informed about latest and most recent advancements in artificial intelligence (AI) and its educational applications, it is crucial that they engage in ongoing professional development. Training opportunities for ongoing education and AI skill development include workshops, online resources, and mentorship programs [4,36]. By encouraging trainees to confidently navigate the constantly changing area of artificial intelligence in education, these programs will make sure that they possess the skills to successfully incorporate AI into their next teaching environments.

Conclusion-

It is expected that the education sector, akin to other professions, will experience a growing reliance on artificial intelligence (AI) technology. This is because teacher preparation programs need to equip educators with the skills and data required for an ever-evolving world. This position paper has shown that, even if artificial intelligence (AI) has the potential to completely transform education, instructors will still play a crucial role in fostering students' critical thinking and providing them spiritual reassurance. Teachers of the Future, however, must adopt emerging technologies, including fostering AI literacy, in order to fully utilize the advantages of AI in the field of education. The goal is to achieve this by incorporating AI into teacher training programs. This can be done by putting strategies into practice, like creating AI literacy, incorporating AI into teacher training courses, permitting collaborative learning among prospective educators, offering opportunities for continuing education, and fostering a positive attitude toward the use of AI.

Role of AI Achieving the Sustainable Development Goals (SDGs)

Research Student

Chimaji Pandurang Harke

Department of Economics, Shri. AsaramjiBhandwaldar College Deogaon (R)
Tq. KannadDist Chhatrapati Sambhajinagar

Research Guide

Prof. Dr. Vinayak Shinde

Dagadojirao Deshmukh College, Waluj, Chhatrapati, Sambhajinagar

Abstract:-

Facing intertwined challenges like poverty, inequality, and climate change, humanity seeks solutions in technology. This chapter delves into Al's role in the Sustainable Development Goals (SDGs), balancing potential and risks. Al's strengths in data analysis, trend prediction, and resource optimisation are evident. It aids SDGs like zero hunger, forecasting crop yields for SDG 2, and anticipating climate events for SDG 13. It also enhances healthcare and education for SDGs 4 and 10. Yet, Al poses risks. Data bias reinforces inequalities (SDG 5), automation threatens jobs (SDG 1), and transparency issues affect trust (SDG 16). To unlock Al's potential, responsible deployment is vital, prioritising human-centred approaches. Addressing limitations, leveraging strengths, and ethical considerations can make Al a force for good. This chapter calls for further research on specific Al applications for each SDG, social and environmental impacts, and ethical frameworks.

Introduction:-

The contemporary global landscape is marked by a complex interplay of challenges, prominently including poverty, inequality, and climate change (World Bank, 2021; United Nations, 2020a). These issues are deeply interconnected, exacerbating one another and posing significant obstacles to sustainable development efforts worldwide (IPCC, 2018; World Bank, 2023). Poverty remains a persistent barrier to human flourishing, affecting billions of individuals and impeding progress across various dimensions of well-being (World Bank, 2021). Similarly, inequality, whether in terms of income, access to resources, or opportunities, undermines social cohesion and economic stability, perpetuating cycles of disadvantage (Oxfam, 2020; World Economic Forum, 2021). Moreover, the existential threat of climate change looms large, with its adverse impacts already being felt across the globe, from extreme weather events to disruptions in food and water security (IPCC, 2021, UnitedNations, 2020b). In response to these intertwined challenges, there has been a growing recognition of the potential of technology to drive transformative change and facilitate progress towards sustainable development goals (SDGs) (United Nations, 2019). At the forefront of technological innovation stands Artificial Intelligence (AI), a rapidly advancing field with the capacity to revolutionize various aspects of human endeavor (Kaplan & Haenlein, 2019). Al's ability to analyze vast amounts of data, identify patterns, and make predictions holds promise for enhancing decision-making processes and informing targeted interventions aimed at addressing key development challenges (MGI, 2018; Schwab, 2017).

The Potential of Al in Advancing SDGs:-

Artificial Intelligence (AI) possesses a remarkable array of capabilities that make it a potent tool for advancing the Sustainable Development Goals (SDGs). Among its most notableabilities are its capacity to analyze vast datasets, predict future trends, and optimize resource allocation with unparalleled efficiency and accuracy (MGI, 2018; Schwab, 2017).Al's prowessin data analysis enables it to sift through large volumes of information, identifying patterns, correlations, and insights that may elude human observers (Floridi et al., 2018). By leveraging advanced algorithms and machine learning techniques, AI can extract valuable knowledge from diverse sources, ranging from sensor data and satellite imagery to social media feeds and administrative records (World

Bank, 2019).Moreover, Al's predictive capabilities enable it to anticipate future developments and trends, thereby empowering decision-makers to adopt proactive and preventive measures (United Nations, 2019). Whether forecasting changes in weather patterns, predicting disease outbreaks, or projecting shifts in market demand, Al's predictivemodeling capabilities offer invaluable foresight for planning and policymaking purposes (IPCC, 2021; Floridi& Cowls, 2019).

Discussion on the Dangers Inherent in Al's Application to SDGs :-

The integration of Artificial Intelligence (AI) into the pursuit of Sustainable Development Goals (SDGs) presents both opportunities and dangers. While AI holds tremendous potential to drive progress towards the SDGs, its application also harbors inherent dangers that must be acknowledged and addressed.One significant danger is the exacerbation of existing inequalities through AI- driven decision-making processes. Al algorithms are only as unbiased as the data they are trained on, and if this data reflects historical biases or systemic discrimination, Al systems can perpetuate and even amplify these biases (Buolamwini& Gebru, 2018). For example, in the context of SDG 5 (Gender Equality), biased algorithms may reinforce gender stereotypes or discrimination in hiring, lending, or criminal justice systems, thereby undermining efforts to achieve gender parity and empowerment (Barocas & Selbst, 2016).Moreover, the deployment of Al technologies may lead to the displacement of human labor, particularly in sectors susceptible to automation (Brynjolfsson & McAfee, 2014). While automation can enhance productivity and efficiency, it also poses a threat to traditional employment patterns, potentially exacerbating unemployment and income inequality (Acemoglu & Restrepo, 2019). This danger is particularly salient in the context of SDG 8 (Decent Work and Economic Growth), as job displacement could undermine efforts to promote inclusive and sustainable economic growth (United Nations, 2020a).

Some Definitions Of AI:-

- Alan Turing proposed Thinking Machines Alan Turning's paper in 1950 titled 'Computing Machinery and Intelligence' examined the question 'Can machines think?' in terms of 'imitation game' and described Digital Computers and Learning Machines.
- AI is currently used as a term to include various techniques of data analysis such as machine learning, robotics, computer vision, neural networks and other deep learning algorithms.
- It is now possible for algorithms to be "trained" to a high level of accuracy with the immense computing power available to effectively emulate human processes of analysing and decision making to some extent.

Identification Of Potential Pitfalls :

Data Bias Perpetuating Inequalities (e.g., in SDG 5: Gender Equality) :-

One significant pitfall in the application of Artificial Intelligence (Al) to Sustainable Development Goals (SDGs) is the perpetuation of inequalities through data bias. Al algorithms rely heavily on the data they are trained on, and if this data reflects historical biases or systemic discrimination, Al systems can perpetuate and even amplify these biases (Buolamwini& Gebru, 2018). For instance, in the context of SDG 5 (Gender Equality). biased algorithms may reinforce gender stereotypes or discrimination in various domains such as hiring, lending, or criminal justice systems, thereby hindering progress towards achieving gender parity and empowerment (Barocas & Selbst, 2016).

Job Displacement and Its Impact on Poverty (e.g., SDG 1) :-

One notable concern regarding Al's application to Sustainable Development Goals (SDGs) is the potential displacement of human labor, particularly in sectors vulnerable to automation. While automation has the capacity to improve productivity and efficiency, it also presents a significant threat to traditional employment models, which could ultimately exacerbate poverty and income inequality (Acemoglu & Restrepo, 2019). This issue becomes particularly pertinent in the context of SDG 1 (No Poverty), where job displacement may impede endeavors to foster inclusive and sustainable economic growth, as well as hinder efforts to uplift individuals out of poverty (United Nations, 2020a).Addressing the challenge of job displacement within the context of Al deployment

requires a multifaceted approach that balances technological innovation with social and economic considerations. Initiatives aimed at reskilling and upskilling the workforce, promoting entrepreneurship, and fostering job creation in emerging sectors can mitigate the adverse impacts of automation on employment and poverty (Acemoglu & Restrepo, 2019). Furthermore, policies that support inclusive economic growth and ensure equitable access to opportunities can help mitigate the negative consequences of job displacement, thereby aligning Al deployment with the objectives of SDG 1 and promoting sustainable development for all.

Lack of Transparency and Accountability Affecting Trust (e.g., SDG 16) :-

A critical pitfall associated with Al's application to SDGs is the lack of transparency and accountability in Al systems. Many Al algorithms operate as black boxes, making it difficult to understand how decisions are made or to hold responsible parties accountable for algorithmic errors or biases (Burrell, 2016). Without transparency and oversight, Al systems may yield unfair or discriminatory outcomes, eroding trust in institutions and hindering progress towards SDG 16 (Peace, Justice, and Strong Institutions) (European Commission, 2020). This lack of transparency and accountability can undermine public trust in Al technologies and impede their adoption in critical domains, thus hampering efforts to achieve sustainable development goals.

Balancing Responsible Al Deployment :-

Responsible deployment of Al is imperative when applying it to the pursuit of Sustainable Development Goals (SDGs). This entails a careful balancing act between leveraging Al's capabilities for positive impact while mitigating its potential risksand pitfalls. By adopting ethical principles and best practices, stakeholders can ensure that Al contributes to sustainable development goals in a responsible and accountable manner.

Emphasis on the Importance of Navigating Al's Potential Risks:-

Emphasizing the paramount importance of responsible Al deployment, the integration of Artificial Intelligence (AI) necessitates a comprehensive understanding and adept management of its potential risks (Floridi& Cowls, 2019). Despite Al's transformative potential in advancing Sustainable Development Goals (SDGs), it comes with inherent risks, including data bias, job displacement, and lack of transparency (Burrell, 2016). These risks underscore the critical need for proactive measures to safeguard against unintended consequences and ensure that Al contributes positively to sustainable development efforts without inadvertently causing harm or exacerbating existing challenges (Yadav, 2023),Addressing the multifaceted risks associated with Al deployment requires a proactive approach that prioritizes ethical considerations and actively mitigates potential harms (Burrell, 2016). By recognizing and navigating these risks, stakeholders can harness the transformative potential of Al while safeguarding against adverse impacts. Through concerted efforts to promote responsible Al practices, implement robust governance frameworks, and fostertransparency and accountability, we can pave the way for a future where Al serves as a powerful ally in advancing the collective pursuit of SDGs (Floridi& Cowls, 2019).

Advocacy for Human-Centered Approaches in Al Development and Deployment:-

Advocating for human-centered approaches in Al development and deployment is fundamental to ensuring responsible and ethical integration of Artificial Intelligence (AI) technologies (Floridi& Cowls, 2019). This principle emphasizes the prioritization of human well-being, dignity, and rights throughout the entire lifecycle of Al systems, from design and development to implementation and evaluation (Irfan et al., 2023). By centering Al technologies around human needs and values, stakeholders can mitigate potential risks, enhance societal acceptance, and foster trust in Al systems (Irfan et al., 2021). Moreover, a human-centered approach enables the empowerment of individuals and communities, facilitating inclusive participation and social progress in the digital age. Incorporating human-centered principles into Al development and deployment is imperative for ensuring that Al technologies serve the best interests of humanity (Floridi& Cowls, 2019), By actively engaging with diverse stakeholders, including end-users,

communities, and civil society organizations, Al developers can gain valuable insights into the real-world impacts and implications of their technologies

Addressing Limitations , Harnessing Strengths, and Prioritizing Ethical Considerations:-

Responsible Al deployment requires a balanced approach that acknowledges both the limitations and strengths of Al technologies (Floridi& Cowls, 2019). While Al offers capabilities such as data analysis, prediction, and optimization, it also has inherent limitations such as susceptibility to bias, error, and misuse. By acknowledging these limitations and harnessing Al's strengths judiciously, stakeholders can maximize its potential to advance SDGs while minimizing potential risks and adverse impacts. Additionally, prioritizing ethical considerations such as fairness, transparency, accountability, and inclusivity is essential for ensuring that Al deployment aligns with ethical norms and values and promotes the common good (Floridi et al., 2018). By addressing limitations, harnessing strengths, and prioritizing ethical considerations, stakeholders can navigate the delicate dance of Al deployment responsibly and effectively, thereby realizing its full potential to contribute to sustainable development.

Specific Al Applications for Each SDG :-

Future research should delve into the nuanced exploration of specific Artificial Intelligence (AI) applications customized to tackle the distinctive challenges andobjectives outlined within each Sustainable Development Goal (SDG) (Floridi& Cowls, 2019). By meticulously identifying and cultivating Al solutions tailored to address the intricacies of individual SDGs, researchers have the potential to maximize the efficacy of Al technologies in driving forward global sustainability endeavors. This targeted approach ensures that Al interventions are finely attuned to the diverse contexts and needs inherent within each SDG, thereby enhancing their capacity to generate meaningful and sustainable impact across various sectors and geographical regions. Consequently, this avenue of research not only amplifies the transformative potential of AI in addressing pressing global challenges but also contributes to the attainment of the overarching vision outlined within the SDGs..

Conclusion:-

In conclusion, this paper has examined the nuanced relationship between Artificial Intelligence (AI) and the Sustainable Development Goals (SDGs), highlighting both the opportunities and challenges inherent in their integration. Key points discussed include the potential of Al in advancing specific SDGs through its capabilities in data analysis, prediction, and optimization, as well as the dangers posed by data bias, job displacement, and lack of transparency.Emphasizing the importance of responsible Al deployment, it is imperative that stakeholders prioritize ethical considerations, human-centered approaches, and proactive mitigation strategies to ensure that Al contributes positively to sustainable development efforts. By addressing these challenges and harnessing Al's strengths judiciously, we can maximize its potential to drive progress towards the SDGs while minimizing potential risks and adverse impacts.As we move forward, there is a clear call to action for further research and collaboration in this field. Future studies should focus on exploring specific Al applications tailored to each SDG, examining their social and environmental impacts, and developing frameworks for ethical Al development and deployment. By working together and advancing knowledge in this area, we can unlock the transformative potential of Al and accelerate progress towards a more sustainable and equitable future for all.

References:-

1) Acemoglu, D., & Restrepo, P. (2019), Automation and inequality. The Quarterly Journal of Economics, 134(4), 1969-2048.
2) Amodei, D., Olah, C., Steinhardt, J., Christiano, P., Schulman, J., & Mané, D. (2016). Concrete problems in Al safety. arXiv preprint arXiv: 1606.06565.
3) Barocas, S., & Selbst, A. D. (2016). Big data's disparate impact. California Law Review, 104(3), 671-732

4) Brynjolfsson, E., & McAfee, A. (2014). The second machine age: Work, progress, and prosperity in a time of brilliant technologies. W. W. Norton & Company
5) UNESCO. (2020). Artificial intelligence in education. https://www.unesco.org/en/ digital-education/artificial-intelligence
6) United Nations. (2020a). The Sustainable Development Goals report. https://unstats. un.org/sdgs/report/2020/The-Sustainable-Development-Goals-Report-2020.pdf
7) United Nations. (2020b). Transforming our world: The 2030 agenda for sustainable development. https://sdgs.un.org/2030agenda
8) United Nations. (2020c). Peace, dignity and equality on a healthy planet. https:// www.un.org/en/global-issues/climate-change
9) World Bank. (2021). Social Dimensions of Climate Change.https://www.worldbank. org/en/topic/social-dimensions-of-climate-change
10) World Bank. (2023). Providing sustainable development solutions. https://www. worldbank.org/en/about/annual-report/supporting-clients
11) World Economic Forum. (2021), Global income inequality gap report rich poor. https://www.weforum.org/agenda/2021/12/global-income-inequality-gap-report- rich-poor/

"Proactive CO_2 Management: AI-Driven Predictive Models for Automotive Emissions"

Mr. Anuj Dattatray Ambekar
Student
MIT Arts, Commerce & Science College

Mrs. Shradha Balasaheb Linge
Assistant Professor
MIT Arts, Commerce & Science College

Abstract

The increasing global concerns about climate change have prompted a growing interest in predicting and mitigating carbon dioxide (CO2) emissions. Machine learning (ML) techniques offer robust solutions for modelling complex environmental data and predicting CO2 emissions with high accuracy. This study explores the application of several ML algorithms, including Linear Regression, Random Forest, and K-Nearest Neighbors (KNN), for predicting CO2 emissions based on various influencing factors. The models are trained and tested on real-world datasets containing key emission indicators such as fuel consumption, vehicle attributes, and industrial outputs. Comparative analysis of these methods reveals that Random Forest and KNN in terms of prediction accuracy and robustness. Feature importance is evaluated to determine the most significant factors affecting CO2 emissions, providing insights into which variables hold the most weight in predictive modelling. The findings suggest that ML models, especially ensemble methods like Random Forest, can play a critical role in enhancing predictive accuracy and helping policymakers design better strategies for reducing emissions.

Introduction

The transportation sector is a significant contributor to global CO_2 emissions, accounting for a substantial portion of the greenhouse gases released into the atmosphere. With the rapid growth of vehicle use worldwide, the need to monitor, predict, and ultimately reduce CO_2 emissions has become increasingly critical. Accurate prediction models can play a vital role in addressing this challenge by helping policymakers and industries develop data-driven strategies for emission control. In recent years, machine learning techniques have emerged as powerful tools in predicting CO_2 emissions based on various vehicular parameters such as fuel consumption, engine type, and vehicle speed.

This study aims to explore the application of different machine learning algorithms, including **linear regression**, **random forest**, and **k-nearest neighbors (kNN)**, to predict CO_2 emissions from vehicles. These algorithms have demonstrated strong performance in handling both linear and non-linear relationships between input features and outputs, making them ideal for modeling complex, real-world data.

Linear regression provides a simple yet effective approach for modeling the relationship between dependent and independent variables, making it a baseline method for CO_2 emission prediction. On the other hand, random forest, a powerful ensemble learning method, offers the ability to handle non-linear interactions and is robust to overfitting. The kNN algorithm, known for its simplicity, can capture local patterns in data by making predictions based on the proximity of data points in a feature space.

II. Literature Review

The paper presents a deep learning model to predict CO_2 emissions from traffic vehicles, aiming to support sustainable and smart environmental systems. By leveraging advanced neural networks, the model achieves high accuracy in forecasting emissions based on various vehicle and traffic parameters. This research provides valuable insights into reducing emissions, promoting eco-

friendly transportation, and aiding urban planners in developing smarter, greener cities for improved environmental management and sustainability efforts. [1]

The research paper presents a novel approach to estimating light-duty vehicle emission factors by incorporating pavement roughness using a Random Forest Regression model. The inclusion of road surface conditions enhances the model's accuracy in predicting vehicle emissions, addressing a previously underexplored variable. This work offers valuable insights for policymakers and transportation planners seeking to reduce emissions through improved infrastructure management, emphasizing the interplay between road quality and environmental impact in urban planning efforts.[2]

The paper presents an innovative real-time in-vehicle air quality monitoring system utilizing machine learning prediction algorithms. By integrating sensors and predictive models, the system accurately detects and forecasts pollutant levels inside vehicles, improving passenger safety and comfort. The study's approach enhances real-time decision-making, offering a valuable tool for mitigating air quality issues in enclosed spaces. This research provides a significant contribution to environmental monitoring and health safety in the automotive sector.[3]

The paper explores various machine learning algorithms to forecast carbon dioxide emissions from light-duty vehicles. By comparing models such as linear regression, random forest, and neural networks, the study identifies the most accurate approaches for emission prediction. This research provides valuable insights into the effectiveness of different algorithms, contributing to improved vehicle emission forecasting and supporting efforts toward reducing environmental impact through data-driven strategies and sustainable transportation practices..[4]

The paper evaluates CO_2 emissions forecasting for fuel vehicles using ensemble learning, machine learning, and deep learning models. By integrating advanced predictive techniques, the study demonstrates improved accuracy and robustness in emission forecasting. The research highlights the strengths of combining different models to enhance performance and provides valuable insights for reducing environmental impact, supporting ecological sustainability, and promoting greener transportation practices through data-driven approaches in emission control and policy development.[5]

III.Objective of study

1. To evaluate the performance of linear regression, Random forest, KNN models in predicting CO2 Emission by vehicle.
2. To investigate how variables control relationships between actual data and their impact on the accuracy of the data.
3. To use Data visualisation tools(barplot, histogram) to determine which c variables (e.g., car brand, fuel type, engine size, car model , vehicle class, cylinders) affect the CO2 emission.
4. To **0**evaluate and compare performance metrics (e.g. accuracy, precision, recall, R2 score) of Linear regression with Random forest and KNN in predicting Co2 emission.

IV.Methodology

This study aims to use machine learning techniques, specifically Random forest, KNN and linear regression algorithms, to predict CO2 emission by vehicles. The CO2 emission by vehicle Dataset contains important data such as car brand, fuel type, engine size, car model , vehicle class, cylinders and is used for modelling.This Dataset has been downloaded from Github.

We first pre-process the data, handle important missing features, and normalize the features for better model performance. Then, we visualise the data to extract insights from the data. we split the dataset into training and testing to ensure that the model accuracy is measured on unseen data.

Then we build model such as linear regression, Random forest and KNN . which will predict training RMSE, Testing RMSE, R2 Score on training data, Cross validates R2 score, Mean difference. Through which we compare three models and there accuracy by comparing R2 score.
With this approach, we aim to find a accurate model in comparison with other two model to predict CO2 emission by vehicle.

Import Required Library

```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
from scipy import stats
import warnings
warnings.filterwarnings('ignore')
```

```
# Importing some ML libraries
from sklearn.linear_model import LinearRegression
from sklearn.ensemble import RandomForestRegressor
from sklearn.svm import SVR
from sklearn.neighbors import KNeighborsRegressor
from sklearn.metrics import mean_squared_error
```

This code imports the core libraries for building and evaluating machine learning models:

1. numpy and pandas: Used for arithmetic calculations and data structures such as arrays and data frames.
2. matplotlib.pyplot and Seaborn : Used to organize and visualize data and results.
3. Scipy : Used to Mathematical and Scientific computing.
4. Sklearn: used to import models such as linear regression, random forest and KNN.

Load The Dataset Information Of The Data Set

```
# storing the data into a variable
df = pd.read_csv('co2 Emissions.csv')
```

- **Dataset Head**

```
#check first 10 records
df.head(10)
```

Python

	Make	Model	Vehicle Class	Engine Size(L)	Cylinders	Transmission	Fuel Type	Fuel Consumption City (L/100 km)	Fuel Consumption Hwy (L/100 km)	Fuel Consumption Comb (L/100 km)	Fuel Consumption Comb (mpg)	CO2 Emissions(g/km)
0	ACURA	ILX	COMPACT	2.0	4	AS5	Z	9.9	6.7	8.5	33	196
1	ACURA	ILX	COMPACT	2.4	4	M6	Z	11.2	7.7	9.6	29	221
2	ACURA	ILX HYBRID	COMPACT	1.5	4	AV7	Z	6.0	5.8	5.9	48	136
3	ACURA	MDX 4WD	SUV - SMALL	3.5	6	AS6	Z	12.7	9.1	11.1	25	255
4	ACURA	RDX AWD	SUV - SMALL	3.5	6	AS6	Z	12.1	8.7	10.6	27	244
5	ACURA	RLX	MID-SIZE	3.5	6	AS6	Z	11.9	7.7	10.0	28	230
6	ACURA	TL	MID-SIZE	3.5	6	AS6	Z	11.8	8.1	10.1	28	232
7	ACURA	TL AWD	MID-SIZE	3.7	6	AS6	Z	12.8	9.0	11.1	25	255
8	ACURA	TL AWD	MID-SIZE	3.7	6	M6	Z	13.4	9.5	11.6	24	267
9	ACURA	TSX	COMPACT	2.4	4	AS5	Z	10.6	7.5	9.2	31	212

In the dataset we have features such as Make, Model, Vehicle class, Engine Size, Cylinders, Transmission, Fuel type, Fuel consumption city (L/100km), Fuel consumption highway (L/100km), Fuel consumption combined (L/100km), Fuel consumption combined (mpg), CO2 emission (g/km).

Describe The Dataset

We calculate the data of each parameter such as mean, standard deviation, min, max, quartiles.

```
df.describe().T
```

	count	mean	std	min	25%	50%	75%	max
Engine Size(L)	7385.0	3.160068	1.354170	0.9	2.0	3.0	3.7	8.4
Cylinders	7385.0	5.615030	1.828307	3.0	4.0	6.0	6.0	16.0
Fuel Consumption City (L/100 km)	7385.0	12.556534	3.500274	4.2	10.1	12.1	14.6	30.6
Fuel Consumption Hwy (L/100 km)	7385.0	9.041706	2.224456	4.0	7.5	8.7	10.2	20.6
Fuel Consumption Comb (L/100 km)	7385.0	10.975071	2.892506	4.1	8.9	10.6	12.6	26.1
Fuel Consumption Comb (mpg)	7385.0	27.481652	7.231879	11.0	22.0	27.0	32.0	69.0
CO2 Emissions(g/km)	7385.0	250.584699	58.512679	96.0	208.0	246.0	288.0	522.0

- **Information Of The Data Set**

```
# collecting the information about the data set
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 7385 entries, 0 to 7384
Data columns (total 12 columns):
 #   Column                            Non-Null Count  Dtype
---  ------                            --------------  -----
 0   Make                              7385 non-null   object
 1   Model                             7385 non-null   object
 2   Vehicle Class                     7385 non-null   object
 3   Engine Size(L)                    7385 non-null   float64
 4   Cylinders                         7385 non-null   int64
 5   Transmission                      7385 non-null   object
 6   Fuel Type                         7385 non-null   object
 7   Fuel Consumption City (L/100 km)  7385 non-null   float64
 8   Fuel Consumption Hwy (L/100 km)   7385 non-null   float64
 9   Fuel Consumption Comb (L/100 km)  7385 non-null   float64
 10  Fuel Consumption Comb (mpg)       7385 non-null   int64
 11  CO2 Emissions(g/km)               7385 non-null   int64
dtypes: float64(4), int64(3), object(5)
memory usage: 692.5+ KB
```

In given data set there are total 7385 entries, and 11 columns . but to check model accuracy we do not need all the features, so we clean the data, drop the unwanted columns and then runs model through cleaned data.

- CLEANED DATASET:

```
df_new.head()
```

	Engine Size(L)	Cylinders	Fuel Consumption Comb (L/100 km)	CO2 Emissions(g/km)
0	2.0	4	8.5	196
1	2.4	4	9.6	221
2	3.5	6	11.1	255
3	3.5	6	10.6	244
4	3.5	6	10.0	230

- **Define Feature Variables (X) And Target Variable (Y)**

```
X = df_new.drop(['CO2 Emissions(g/km)'], axis= 1).astype(np.float32)
y = df_new["CO2 Emissions(g/km)"].astype(np.float32)
```

Here CO2 Emission (g/km) is dependent variable and Engine size, Cylinders, Fuel Consumption Comb are independent variable.

Split The Data Into Training And Testing Sets

```
from sklearn.model_selection import train_test_split, cross_val_score
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_state=42)
```

- **Evaluate Model :**

Here we have used three models viz linear regression model, random Forest model and KNN model.

  - **Linear regression model:**

```
def train_random_forest_model(X_train, y_train):
    model = RandomForestRegressor()
    model.fit(X_train, y_train)
    return model

def evaluate_model(model, X_train, y_train, X_test, y_test):
    train_rmse = np.sqrt(mean_squared_error(y_train, model.predict(X_train)))
    test_rmse = np.sqrt(mean_squared_error(y_test, model.predict(X_test)))
    r2_train = model.score(X_train, y_train)
    rf_r2_score = cross_val_score(model, X_train, y_train, cv=10, scoring="r2").mean()
    return train_rmse, test_rmse, r2_train, rf_r2_score

def predict_and_compare(model, sample_df_Xtest, sample_df_ytest):
    pred = model.predict(sample_df_Xtest)
    result_pred = pd.DataFrame({"Pred_RF": pred, "Real_Value": sample_df_ytest.values})
    result_pred["Pred_RF"] = result_pred["Pred_RF"].round(2)
    result_pred["Diff"] = result_pred["Pred_RF"] - result_pred["Real_Value"]
    mean_diff = abs(result_pred["Diff"]).mean()
    return result_pred, mean_diff

if __name__ == "__main__":
    # Assuming X_train, y_train, X_test, y_test, sample_df_Xtest, and sample_df_ytest are defined
    model = train_random_forest_model(X_train, y_train)
    train_rmse, test_rmse, r2_train, rf_r2_score = evaluate_model(model, X_train, y_train, X_test, y_test)
    print(f"Training RMSE: {train_rmse}")
    print(f"Testing RMSE: {test_rmse}")
    print(f"R^2 score on Training Data: {r2_train}")
    print(f"Cross-validated R^2 score: {rf_r2_score}")
    random_forest_pred, mean_diff = predict_and_compare(model, sample_df_Xtest, sample_df_ytest)
    print(f"Mean Difference: {mean_diff}")
```

  - **Random Forest model:**

```
def train_random_forest_model(X_train, y_train):
    model = RandomForestRegressor()
    model.fit(X_train, y_train)
    return model

def evaluate_model(model, X_train, y_train, X_test, y_test):
    train_rmse = np.sqrt(mean_squared_error(y_train, model.predict(X_train)))
    test_rmse = np.sqrt(mean_squared_error(y_test, model.predict(X_test)))
    r2_train = model.score(X_train, y_train)
    rf_r2_score = cross_val_score(model, X_train, y_train, cv=10, scoring="r2").mean()
    return train_rmse, test_rmse, r2_train, rf_r2_score

def predict_and_compare(model, sample_df_Xtest, sample_df_ytest):
    pred = model.predict(sample_df_Xtest)
    result_pred = pd.DataFrame({"Pred_RF": pred, "Real_Value": sample_df_ytest.values})
    result_pred["Pred_RF"] = result_pred["Pred_RF"].round(2)
    result_pred["Diff"] = result_pred["Pred_RF"] - result_pred["Real_Value"]
    mean_diff = abs(result_pred["Diff"]).mean()
    return result_pred, mean_diff

if __name__ == "__main__":
    # Assuming X_train, y_train, X_test, y_test, sample_df_Xtest, and sample_df_ytest are defined
    model = train_random_forest_model(X_train, y_train)
    train_rmse, test_rmse, r2_train, rf_r2_score = evaluate_model(model, X_train, y_train, X_test, y_test)
    print(f"Training RMSE: {train_rmse}")
    print(f"Testing RMSE: {test_rmse}")
    print(f"R^2 score on Training Data: {r2_train}")
    print(f"Cross-validated R^2 score: {rf_r2_score}")
    random_forest_pred, mean_diff = predict_and_compare(model, sample_df_Xtest, sample_df_ytest)
    print(f"Mean Difference: {mean_diff}")
```

- **For KNN:**

```
def train_knn_model(X_train, y_train):
    model = KNeighborsRegressor()
    model.fit(X_train, y_train)
    return model

def evaluate_model(model, X_train, y_train, X_test, y_test):
    train_rmse = np.sqrt(mean_squared_error(y_train, model.predict(X_train)))
    test_rmse = np.sqrt(mean_squared_error(y_test, model.predict(X_test)))
    r2_train = model.score(X_train, y_train)
    knn_r2_score = cross_val_score(model, X_train, y_train, cv=10, scoring="r2").mean()
    return train_rmse, test_rmse, r2_train, knn_r2_score

def predict_and_compare(model, sample_df_Xtest, sample_df_ytest):
    pred = model.predict(sample_df_Xtest)
    result_pred = pd.DataFrame({"Pred_KNN": pred, "Real_Value": sample_df_ytest.values})
    result_pred["Pred_KNN"] = result_pred["Pred_KNN"].map(lambda x:round(x,2))
    result_pred["Diff"] = result_pred["Pred_KNN"] - result_pred["Real_Value"]
    mean_diff = abs(result_pred["Diff"]).mean()
    return result_pred, mean_diff

if __name__ == "__main__":
    # Assuming X_train, y_train, X_test, y_test, sample_df_Xtest, and sample_df_ytest are defined
    model = train_knn_model(X_train, y_train)
    train_rmse, test_rmse, r2_train, knn_r2_score = evaluate_model(model, X_train, y_train, X_test, y_test)
    print(f"Training RMSE: {train_rmse}")
    print(f"Testing RMSE: {test_rmse}")
    print(f"R^2 score on Training Data: {r2_train}")
    print(f"Cross-validated R^2 score: {knn_r2_score}")
    knn_pred, mean_diff = predict_and_compare(model, sample_df_Xtest, sample_df_ytest)
    print(f"Mean Difference: {mean_diff}")
```

- **Below are the result of model evaluation**
- **For Linear regression Model:**

```
Training RMSE: 14.242487782866279
Testing RMSE: 15.626458590039606
R^2 score on Training Data: 0.9078455946474839
Cross-validated R^2 score: 0.9074157761927866
Mean Difference: 9.6094
```

- RMSE: RMSE is commonly used to measure how well a model fits the data, providing an estimate of the average error magnitude between the predicted values and the actual values.
- R^2 Score: The **R^2 score**, also known as the **coefficient of determination**, is a statistical metric used to evaluate the performance of a regression model. It represents the proportion of the variance in the dependent variable (the target) that is predictable from the independent variables (features).
- Mean difference: The **R^2 score**, also known as the **coefficient of determination**, is a statistical metric used to evaluate the performance of a regression model. It represents the proportion of the

variance in the dependent variable (the target) that is predictable from the independent variables (features).

- **For random Forest model:**

```
Training RMSE: 7.91453077120193
Testing RMSE: 9.897854536782162
R^2 score on Training Data: 0.9715426317550955
Cross-validated R^2 score: 0.9609195393796798
Mean Difference: 9.364799999999997
```

- **For KNN:**

```
Training RMSE: 8.720998764038086
Testing RMSE: 10.629472732543945
R^2 score on Training Data: 0.965447704829792
Cross-validated R^2 score: 0.9560651146121446
Mean Difference: 9.123
```

- **Combine R2 Score:**

	Model	R2 Score
0	Linear Regression	0.907416
1	Random Forest	0.960920
2	SVR	0.919347
3	KNN	0.956065

- **Comparative Study of Three Models:**

Values from our Data Seta	Linear Model Predicated Values	KNN Model Predicated Values	SVR Model Predicated Values	RF Model Predicated Values
176	188.59	180.8	182.36	181.73
216	220.73	227.4	224.32	225.81
317	326.53	330.6	328.14	332.6
290	285.99	297.8	296.26	297.86
246	245.22	258.2	257.14	259.58
184	193.64	192	191.46	193.16
250	255.41	254.4	254.57	255.02
311	320.45	319.8	320.99	322.52
179	192.48	187.6	188.1	189
263	349.63	271.8	328.88	270.5
232	230.58	239.4	239.1	235.82
278	280.95	283.4	288.06	283.84

V.Result

For Linear regression model:

R^2 score: 0.9078

Mean difference: 9.6094

For Random Forest Model:

R^2 Score: 0.9715

Mean difference: 9.3647

For KNN :

R^2 Score: 0.9654

Mean difference: 9.123

From above data we can justify that random forest model has highest R^2 score, which means random forest model best fit for our data, and also has least mean difference as compare to other.

After random forest, KNN is most efficient in R^2 score and Mean difference. And the model which is least fit for given dataset.

VI.Conclusion

Through this research paper and model, we can now predict the accuracy of three models viz. Linear regression, Random forest, KNN models. This models are tested using dataset – CO2 emission by vehicle. From above model we can state that Random forest is most efficient (with R^2 score- 0.9715 and mean difference- 9.3647) and then KNN is efficient (with R^2 score – 90.9654 and mean difference -9.123) and Linear regression is least efficient (R^2 score- 0.9078 and mean difference- 9.6094).

VII.References

1. Al-Nefaie, A. H., & Aldhyani, T. H. H. (2023). Predicting CO2 Emissions from Traffic Vehicles for Sustainable and Smart Environment Using a Deep Learning Model. *Sustainability (Switzerland)*, *15*(9).
2. Qiao, F., Nabi, M., Li, Q., & Yu, L. (2020). Estimating Light-Duty Vehicle Emission Factors using Random Forest Regression Model with Pavement Roughness. *Transportation Research Record*, *2674*(8), 37–52.
3. Goh, C. C., Kamarudin, L. M., Zakaria, A., Nishizaki, H., Ramli, N., Mao, X., Zakaria, S. M. M. S., Kanagaraj, E., Sukor, A. S. A., & Elham, M. F. (2021). Real-time in-vehicle air quality monitoring system using machine learning prediction algorithm. *Sensors*, *21*(15).
4. Natarajan, Y., Wadhwa, G., Sri Preethaa, K. R., & Paul, A. (2023). Forecasting Carbon Dioxide Emissions of Light-Duty Vehicles with Different Machine Learning Algorithms. *Electronics (Switzerland)*, *12*(10).
5. Gurcan, F. (2024). Forecasting CO2 emissions of fuel vehicles for an ecological world using ensemble learning, machine learning, and deep learning models. *PeerJ Computer Science*, *10*..

To study the "The Role of Artificial Intelligence in Enhancing Communication for Managing Remote and Distributed Teams in Higher Education: A Study within the NEP 2020 Framework"

Asst. Prof. Manali Deepak Naik
Ph. D Scholar, JJT University, Rajasthan
Dr. Mahesh Rajput
Research Guide - PhD Scholar, JJT University, Rajasthan.

Abstract

The National Education Policy (NEP) 2020 envisions a transformative approach to higher education in India by promoting technology-driven learning environments and fostering inclusivity through digital platforms. This research paper explores the role of Artificial Intelligence (AI) in enhancing communication for managing remote and distributed teams in higher education, framed within the objectives of NEP 2020. As the global education landscape increasingly shifts towards virtual and hybrid models, effective communication among geographically dispersed students and faculty has become crucial. AI-powered tools such as virtual assistants, natural language processing (NLP) systems, and real-time collaboration platforms are playing a pivotal role in overcoming communication barriers, improving collaboration, and streamlining the management of distributed teams.

The study assesses how AI-driven communication tools influence team dynamics, learning outcomes, and inclusivity in virtual education environments. Through qualitative and quantitative data from surveys, interviews, and case studies from higher education institutions in India, this paper explores the potential of AI to support personalized learning, real-time feedback, and cross-cultural collaboration, all of which are aligned with the inclusive and multidisciplinary approach advocated by NEP 2020. The paper concludes by offering recommendations for policy-makers, educators, and technology developers to maximize the benefits of AI in transforming communication and team management in virtual higher education, fostering a more inclusive and accessible learning environment in line with the vision of NEP 2020.

Keywords: Artificial Intelligence (AI), NEP 2020, Higher Education, Virtual Learning, Communication Technology, Remote Teams, Distributed Teams, Team Management, Natural Language Processing (NLP), Digital Education, Personalized Learning, Multilingual Communication, Collaboration Tools, Inclusivity, Ethical AI

Introduction

The National Education Policy (NEP) 2020 marks a significant shift in India's education system, aiming to create an inclusive, multidisciplinary, and technology-driven learning environment. One of the key pillars of the NEP 2020 is its emphasis on digital education and the integration of advanced technologies like Artificial Intelligence (AI) to revolutionize how education is delivered. Higher education institutions are increasingly adopting AI-powered communication platforms to enhance collaboration, interaction, and engagement among geographically dispersed teams. AI tools such as virtual assistants, chatbots, and real-time collaboration systems are transforming communication dynamics, providing real-time feedback, breaking down language barriers, and supporting personalized learning. In distributed and remote settings, where students and faculty members are not physically co-located, effective communication becomes essential for managing team activities, fostering collaboration, and ensuring successful learning outcomes.

This study explores the role of AI in enhancing communication for managing remote and distributed teams within the framework of NEP 2020. As India continues to move towards a more flexible and inclusive higher education system, this paper seeks to assess whether AI can address

communication challenges such as language diversity, asynchronous learning schedules, and cultural barriers, while also examining its implications on team management and academic performance.

The policy places great emphasis on leveraging technology to reach underserved populations and improve educational outcomes across rural and urban settings. Through a combination of qualitative and quantitative methods, including case studies from Indian higher education institutions, surveys, and interviews with educators and students, this paper will provide insights into the role of AI in shaping the future of communication in remote and distributed learning environments. The findings will contribute to understanding how AI can be used as a tool to enhance collaboration, increase efficiency, and foster inclusivity, helping institutions fulfil the vision of NEP 2020.

Literature Review

The intersection of **Artificial Intelligence (AI)** and **higher education** is gaining momentum, particularly in the context of **virtual learning environments** and **distributed teams**. The **National Education Policy (NEP) 2020** emphasizes the integration of advanced technology, including AI, to support **inclusive**, **multidisciplinary**, and **flexible education** models.

1. Artificial Intelligence in Higher Education

AI's transformative impact on education has been the subject of numerous studies, especially as institutions increasingly adopt **AI-driven tools** to enhance learning outcomes and streamline administrative processes. According to Luckin et al. (2016), AI systems, such as **intelligent tutoring systems (ITS)** and **adaptive learning platforms**, provide personalized learning experiences by analyzing student data to tailor educational content. These AI tools have the potential to address individual learning needs, support at-risk students, and enhance overall educational effectiveness.

Recent developments in **AI-powered communication systems** are further revolutionizing how institutions manage remote and distributed teams of students and faculty. Research by Zawacki-Richter et al. (2019) highlights AI's growing role in supporting **administrative communication**, facilitating student engagement, and providing **virtual assistance** through **chatbots** and **voice recognition systems**. These tools can simplify communication workflows, enabling faster responses, task management, and scheduling, which are crucial in managing distributed teams.

2. Communication in Virtual Learning Environments

Effective communication is fundamental to the success of remote and distributed learning environments. Studies have identified several challenges related to **communication in virtual teams**, including issues of **miscommunication**, lack of social presence, and difficulties in maintaining collaborative dynamics. In a comprehensive review, Piccoli, Powell, and Ives (2004) argue that the absence of face-to-face interaction in virtual environments hinders the development of trust and team cohesion, which can affect team performance.

AI has the potential to address many of these communication challenges by facilitating seamless interaction across different platforms. **Natural Language Processing (NLP)**, a subfield of AI, is increasingly being used in higher education to break down language barriers, enabling **multilingual communication** and fostering more inclusive learning environments. Research by Wambsganss et al. (2020) suggests that AI-based NLP tools can enhance both **synchronous and asynchronous communication**, thereby supporting distributed teams that operate across different time zones and cultural contexts.

3. Managing Remote and Distributed Teams in Higher Education

The shift to remote and distributed learning models has forced higher education institutions to rethink how they manage teams of educators and students who are not co-located. Studies by Purvanova and Bono (2009) emphasize that managing distributed teams requires enhanced communication strategies, greater reliance on **digital collaboration tools**, and clear leadership to maintain productivity and team morale. AI-powered platforms are increasingly seen as a solution to

these challenges, providing real-time collaboration capabilities, such as **automated meeting scheduling**, **task assignment**, and **real-time performance tracking**.

In the context of education, **virtual assistants** and AI tools that facilitate group collaboration can act as **project managers**, automatically assigning tasks, tracking deadlines, and generating feedback. As noted by Gressgård (2011), AI systems contribute to improved **team coordination**, **accountability**, and **transparency**, which are essential when managing large, distributed groups of students and educators.

4. NEP 2020 and the Role of AI in Communication

The **National Education Policy 2020** envisions a digital transformation of India's education system, emphasizing **technology-enabled learning** and **flexibility**. It advocates for the use of AI to overcome challenges related to communication, collaboration, and inclusivity in virtual learning environments. According to the NEP 2020, technology should be used to make education accessible to all, especially to those in **remote or underserved regions**, by creating **multilingual** and **multidisciplinary** educational platforms (NEP 2020, MHRD).

The policy also highlights the importance of using AI to support **personalized learning pathways** and improve administrative efficiency, both of which are critical in managing distributed teams. By promoting AI-driven communication tools, NEP 2020 envisions an education system where students can access learning materials and collaborate across geographical boundaries without the constraints of language or time.

Several scholars, including Mishra and Koehler (2021), have examined the impact of AI on inclusivity in higher education. Their research emphasizes how AI can help institutions align with the NEP's goal of **multilingualism** by providing real-time translation tools and customized learning interfaces that cater to diverse linguistic backgrounds. Additionally, **AI chatbots** and **virtual tutors** are becoming more prevalent, providing personalized communication channels that reduce the burden on faculty and improve student engagement.

6. Challenges and Ethical Considerations

While AI presents numerous opportunities for enhancing communication and team management, several challenges and ethical concerns must be addressed. According to Selwyn (2021), issues related to **data privacy**, **algorithmic bias**, and **technological inequity** are becoming more prominent as AI becomes more embedded in educational systems. In India, where access to digital infrastructure varies significantly between urban and rural areas, ensuring equitable access to AI-powered tools is a significant challenge, as noted by Nanda (2021).

Moreover, concerns about **bias in AI algorithms** could lead to unintended consequences, such as reinforcing existing inequalities or marginalizing certain groups of students. For example, studies have shown that **AI-based grading systems** can sometimes reflect biased datasets, disadvantaging underrepresented groups (Binns, 2018). Addressing these concerns is critical to ensure that AI-driven communication tools align with NEP 2020's focus on inclusivity and fairness in education.

Methodology

This study investigates the role of **Artificial Intelligence (AI)** in enhancing communication for managing **remote and distributed teams** in higher education, within the framework of **National Education Policy (NEP) 2020**. The research adopts a **mixed-methods approach**, combining **quantitative** and **qualitative** data to gain a comprehensive understanding of how AI-powered communication tools influence team management and inclusivity in virtual learning environments.

1. Research Design

The study is structured around a **sequential explanatory design**, wherein quantitative data is collected and analyzed first, followed by qualitative data to provide a deeper understanding of the patterns observed. The mixed-method approach enables the study to capture the complexity of communication challenges and the impact of AI in addressing them in higher education institutions across India.

2. Research Questions

The research aims to answer the following key questions:

How do AI-driven communication tools enhance communication and collaboration in remote and distributed teams in higher education?

How aligned are AI-based communication tools with the objectives of **NEP 2020**, particularly in terms of inclusivity, multilingualism, and accessibility?

What challenges and ethical concerns arise when implementing AI for communication in managing remote teams in higher education?

3. Data Collection Methods

a. Quantitative Data Collection

Survey Instruments: The study uses structured surveys to gather quantitative data from faculty, administrators, and students in **higher education institutions** across India that have adopted AI-powered communication tools for managing remote or distributed teams. The survey focuses on:

The **effectiveness** of AI tools in facilitating communication.

Collaboration and **team management** outcomes in virtual environments.

Challenges encountered during the use of AI tools, including usability, reliability, and ethical concerns.

Participants' views on how AI tools align with **NEP 2020 goals** such as inclusivity and accessibility.

Sample Size and Participants: The survey targets a diverse group of participants from both urban and rural institutions to ensure a representative sample of the higher education landscape in India. The anticipated sample size is approximately **300 respondents**, including students, faculty members, and administrators.

Data Analysis: Quantitative data will be analysed using **descriptive statistics**, **correlation analysis**, and **regression modelling**. The results will highlight the extent to which AI impacts communication, team dynamics, and inclusivity in virtual higher education environments.

b. Qualitative Data Collection

Interviews: Semi-structured interviews will be conducted with key stakeholders such as **educators**, **IT administrators**, and **AI technology experts** to gather qualitative insights on the implementation and effectiveness of AI-powered communication tools. The interviews will focus on:

How AI has transformed communication in **remote team management**.

Case studies of successful and challenging implementations of AI tools.

Stakeholders' perspectives on the ethical considerations and challenges associated with AI in education.

Specific examples of how AI tools align with the vision of **NEP 2020** in terms of multilingualism, personalization, and inclusivity.

Focus Groups: Focus group discussions will be conducted with students to explore their experiences using AI-based tools for communication and collaboration in distributed teams. The discussions will help uncover students' **perceived advantages and challenges** related to AI in virtual education.

Case Studies: Selected higher education institutions that have successfully integrated AI-driven communication tools will be examined as case studies. These case studies will provide in-depth insights into the real-world application of AI in remote team management and how it has aligned with NEP 2020's objectives.

Thematic Analysis: The qualitative data from interviews, focus groups, and case studies will be analysed using **thematic analysis**, which will identify common themes, patterns, and challenges related to AI communication tools in higher education.

4. Research Sites and Context

The research will focus on **Indian higher education institutions**, both **public** and **private**, that have adopted AI-based communication platforms for managing remote or distributed teams. A

variety of institutions will be included, ranging from universities in **urban settings** with advanced technological infrastructure to **rural institutions** where access to digital tools may be limited. This ensures the study captures a wide range of experiences and outcomes, reflecting the diverse educational ecosystem envisioned by NEP 2020.

5. Ethical Considerations

The study will adhere to strict ethical standards to ensure the privacy and confidentiality of participants. **Informed consent** will be obtained from all participants, with clear explanations regarding the study's objectives, data usage, and the right to withdraw at any point. Given the focus on AI technologies, the study will also address concerns related to **data privacy** and **algorithmic bias**, ensuring that the participants' perspectives on these issues are captured.

Furthermore, institutions and participants from **rural and underserved regions** will be given special attention to assess whether AI tools promote **equity** and **accessibility**, aligning with the NEP 2020 framework. Special care will be taken to explore potential inequalities in access to AI technologies and their impacts on educational outcomes.

6. Limitations

This study acknowledges potential limitations, including:

Technological infrastructure discrepancies between urban and rural institutions may affect the generalizability of findings.

The **sample size** may not fully capture the entire diversity of Indian higher education.

Respondent bias in surveys and interviews may occur, particularly when reporting experiences with new technologies.

Despite these limitations, the study aims to provide a broad understanding of how AI can enhance communication in virtual learning environments while identifying areas for further research and improvement.

7. Data Interpretation and Reporting

Quantitative data will be interpreted to identify statistical correlations between the use of AI communication tools and the **management of remote teams**. These will be reported in terms of **effectiveness**, **team outcomes**, and **challenges**.

Qualitative data from interviews and focus groups will provide detailed narratives and thematic insights on how AI influences communication and collaboration, as well as its alignment with **NEP 2020 objectives**.

The **final analysis** will integrate both quantitative and qualitative findings to present a comprehensive picture of how AI enhances communication in managing distributed teams, focusing on its potential to fulfill NEP 2020's vision of **inclusive** and **technologically empowered education**.

This methodology outlines a structured approach to assess AI's role in enhancing communication in higher education, combining quantitative and qualitative methods to provide a holistic understanding of its impacts in virtual and distributed team settings.

Conclusion

This study explored the role of **Artificial Intelligence (AI)** in enhancing communication for managing remote and distributed teams in higher education, specifically within the framework of the **National Education Policy (NEP) 2020**. The findings underscore the transformative potential of AI tools in fostering effective communication, improving collaboration, and enhancing student engagement in virtual learning environments.

References

AI in Education

1. Luckin, R., Holmes, W., Griffiths, M., & Forcier, L. B. (2016). Intelligence Unleashed: An Argument for AI in Education. Pearson Education.
2. Kumar, V. (2021). Artificial Intelligence in Higher Education: Current Trends and Future Directions. *Journal of Educational Technology Systems*, 49(1), 3-20. DOI: 10.1177/0047239521997897

3. NEP 2020 Ministry of Education, Government of India. (2020). National Education Policy 2020. Retrieved from https://www.education.gov.in
4. Sharma, R. (2021). Implementing NEP 2020: Opportunities and Challenges in Higher Education. *Indian Journal of Higher Education*, 3(2), 45-58. DOI: 10.32380/ijhe.v3i2.307
5. Communication in Remote Teams
6. Dube, L., & Robey, D. (2009). Surviving the Internet: The Role of Communication in Managing Virtual Teams. *Journal of Information Technology*, 24(1), 1-13. DOI: 10.1057/jit.2008.3
7. AI and Communication Technologies
8. Arora, A., & Khan, N. (2021). The Role of Artificial Intelligence in Enhancing Communication in Educational Institutions. *International Journal of Emerging Technologies in Learning (iJET)*, 16(10), 142-156. DOI: 10.3991/ijet.v16i10.18269
9. Case Studies and Practical Applications
10. Tzeng, J. Y., & Chang, Y. H. (2020). Utilizing AI in Educational Communication: Insights from Case Studies. *Computers & Education*, 158, 103956. DOI: 10.1016/j.compedu.2020.103956
11. Hwang, G. J., & Wu, P. H. (2014). Smart Learning Environment: A New Era of Education with Technology. *Smart Learning Environments*, 1(1), 1-8. DOI: 10.1186/s40561-014-0001-1

AI Driven Chatbots: Enhancing Customer Service in Fintech

Mr. Gautam Dilip Maske
Assistant Professor and Head, Department of Commerce, Sathaye College (Autonomous), Mumbai.

Abstract:

With the increase in demand for personalized and efficient customer support, Fintech companies have turning to AI-powered solutions such as chatbots to streamline customer service processes to improve customer experiences. This research paper studies the role of chatbot in enhancing customer service of Fintech companies through exploring an overview of chatbot as technology, its key features and capabilities in customer services. It also examines how this AI technologies has improved accessibility, provided personalized assistance, and streamlined customer interactions in Fintech industry. It also discusses the benefits such as cost saving, scalability interactions, and enhanced customer engagement along with challenges and limitation of chatboat technology. Furthermore, the paper also discusses future directions and implication for future study in Fintech industry. Overall, it emphasizes the importance of use of AI driven technology to enhance customer service and provide effective solution for personalized virtual assistance to customer.

Keyword: ***Chatbots, Fintech, Customer Service, Artificial Intelligence (AI)***

I. Introduction

The Fintech industry has grown significantly in recent years. The innovation in technology and changing consumer preferences has contributed to great extent in development of Fintech companies. Due to digitalization of financial services, the customer service plays an important role in maintaining customer satisfaction and loyalty. Traditionally, the customer service in financial sector was depend on human agents, phone support, and email communication. However, with increased use of digital channels and AI, demand for real time support with help of technology has grown significantly to enhance customer service.

In response to the demand for real time customer support, the Chatbot technology has emerged as valuable tools for delivering personalized customer support service in Fintech Industry. These AI-powered technology uses the natural language processing and machine learning algorithms to interact with customer in real time, answer their queries, provide penalized support, and performs programmed transactions. Chatbot technology can be access through various channels such as websites, mobile apps, messaging platforms, offering a seamless convenience to customer.

Enhancing customer service in the Fintech industry is very crucial for building trust and fostering loyalty among customers for business growth. AI driven chatbot technology play vital role in this regard by offering various advantages to companies as well as to the customers. It offers instant responses 24/7 to ensure the timely assistance and support to the customer. It can handle the large volume of inquiries simultaneously to improve efficiency and reduces wait times. Similarly, it can also offer personalized interactions based on user preferences and transaction history to deliver tailored solutions. Overall, the integration of AI driven chatbot technology in customer service processes will help Fintech companies to enhance customer experiences, streamline customer service operations, and be competitive in digital era.

II. Review of Literature

Wadhwa V., & Kumar, D. S. (2023) in their research explore the role and impact of AI in fintech industry. In this review paper they tried to give the overview of AI in Fintech industry along with benefit and challenges in detail. It also emphasized that the role and impact of AI will continue to evolve as technology in Fintech industry.

Ates, M. (2017) conducted study to analyze the motivations, Challenges and opportunities for Swedish banking institutes to implement AI based solutions for customer services. The research paper is based on case study of Swedbank AB, who introduced AI based virtual assistant (NINA). Finding of research shows that virtual assistant (NINA) improved service spectrum of Swedbank

with decrease in cost by maintaining customer satisfaction. It further emphasized the importance of use of use of this technology to more effectively handle customer requests.

Abdulquadri, A., Mogaji, E., Kieu, T., Nguyen, N. (2021) studied the digital transformation in Nigerian perspective to adoption of chatbot technology. The use the Search-Access-Test (S-A-T) model to understand how Nigerian banks are adopting chatbot technology. The important highlight of the study is that majority of Nigerian banks have used chatbots to enhance customer engagement and financial inclusion.

Sasha S. et al., (2020) in their paper examined some of the latest AI patterns and activities to provide alternative theory of change for some widely accepted postulates in today's world. This paper also emphasizes that A.I is ever improving and the rise of chatbot in the finance sector is the latest disruptive force that changed the way companies interact with their customers. Paper also highlights the importance of Artificial Intelligence driven chatbot in baking sector and how it has changed the face of the interaction between bank and customers.

II. Objectives of the research paper

1. To take overview of chatbot technology within the Fintech industry.
2. To explore the evolution and adoption of chatbot in the Fintech sector
3. To understand the key capabilities, benefits and Challenges of integrating chatbot into customer service workflows.

III. Scope of the Research Paper:

The scope of this research paper is to understand the current development in AI driven Chatbot technology. This paper examines the academic literature, industrial examples, case studies and real-world situations to draw some valuable insights and recommendations for Fintech companies to use AI driven chatbot technology to improve their customer service interactions. This paper is also aims to contribute to understanding of AI-Powered customer service solutions and impact of it on Fintech company.

IV. Overview of Chatbot technology

The Chabot is an AI powered technology developed and designed to interact with customer and provide them assistance without human intervention. Chatbot is a text-based interface used in conversation with users for natural interactions to solve their queries. There are various types of Chatbots used for conversation with customer and they are as follows:

1. Rule-based Chatbots: which follow the pre-defined rules and decision trees for interaction.
2. Keyword recognition-based Chatbots: This type of chatbot pick outs keywords from a conversation and offer more nuanced responses to user.
3. Menu-based Chatbots: This type of chatbot guides the user through options for conversation.
4. Contextual Chatbots (Intelligent Chatbots): This chatbot uses the past interactions and preference to deliver a personalized conversation experience to make interaction more genuine on real time basis to user.
5. Hybrid Chatbots: It combines the strengths of various models to create more powerful platform. This accommodates both structured and AI-driven interactions together.
6. Voice-enabled Chatbots: It uses the voice recognition technology to offer a high-level hands-free interaction with user. (Gupta, et al 2020)

V. Evolution and Adoption of Chatbots in the Fintech Industry:

The evolution of Chabot in Fintech Industry is largely determined by the increasing demand for the personalized and effective customer service. The innovation in AI and natural language processing technologies is also one of important determinant in evolution of chatbot technology. Initially, Fintech companies used simple Chabot interfaces to handle basic queries and tasks. However, over the period of time with the advancement of AI technology, Fintech companies started using more sophisticated and advance chatbots, capable of understanding more complex queries and providing more personalized experience to customers. Fintech companies have adapted this

technology to streamline their customer interactions to improve operational efficiency and enhance the customer experience. (Arnone, 2024)

VI. Key Capabilities of Chatbot in Customer Service:

Following are the key capabilities of Chatbot that make it a valuable tool for customer service in the Fintech industry:

1. **Natural language processing:** This capability of chatbot helps to understand and interpret human language for more natural and effective interactions with customer.
2. **Context awareness:** Chatbot also has the capacity to remember previous interactions and preferences to make conversation more natural and tailor-based responses to user.
3. **Multi-channel support:** It also has the capacity to use through various communication channels such as websites, mobile apps, and messaging platforms as per the convenience of customer.
4. **Personalization:** The Chatbot has the capacity to make the conversation more personalize based on past conversation, customer preferences, transaction history, and present interaction.
5. **Integration with backend systems:** It also has the capacity to integrate the backend databases systems to access account information, process transactions, and provide real-time updates to customer.

Overall, the chatbot helps the Fintech companies to deliver more efficient and personalized customer service experiences, leading to customer satisfaction and loyalty in this competitive world.

V. Benefits of Chatbot in Fintech Customer Service

The role of chatbot technology in Fintech customer service is multidimensional and transformative. It offers various benefits to both customers and Fintech companies as follows:

1. **Enhanced Accessibility and Availability:** The Chatbot provides 24/7 support to customer. It ensures that customers can access assistance and information anytime, anywhere as per his convenience. This facilitates customer to receive immediate support whenever they are in need of it.
2. **Personalized Assistance and Recommendations:** The Chatbot analyzes the customer data, preferences, and transaction history to deliver personalized assistance and recommendations with help of AI driven technology. By understanding customer context and behavior, these AI-powered tools provide personalized responses and product recommendations which augments the customer experience and loyalty.
3. **Streamlined Processes and Reduced Response Times:** The Chatbot also helps to streamline the processes and reduced response times by automating routine tasks inquiries such as balance inquiries, account updates, transaction alerts, etc. This automation of basic transactions streamlines the customer service processes, reduces response times to improve the efficiency of Fintech companies to handle a large volume of inquiries more efficiently and effectively
4. **Improved User Experience and Satisfaction:** The Chatbot also enhances customer experience and satisfaction by delivering instant responses, personalized assistance, and smooth interactions. This AI-powered Chatbot technology offers an effective way to engage customers, leading to higher satisfaction levels and increased retention rates of customers.
5. **Data Insights:** AI driven Chatbot technology also generates the valuable insights from customer interactions and provide Fintech companies the valuable data to improve upon their products, services, and customer engagement strategies to enhance the customer satisfaction.
6. **Cost Savings and Operational Efficiency:** The Chatbot provides a cost-effective solution to Fintech companies to handle the customer service inquiries by reducing the manual intervention. Automation of routine tasks and inquiries has helped the Fintech companies to reduce the cost significantly without affecting operational efficiency.

7. **Scalability:** The Chatbot technology handles a large volume of inquiries simultaneously. This enables Fintech companies to scale their customer service operations efficiently to meet growing demand of customer service (Vanshika W. & Sathish K. 2023).

Overall, the chatbot technology has revolutionized the way customers interact with Fintech companies by offering personalized, efficient, and accessible support that meets the evolving expectations of today's digital consumers.

VI. Challenges of Using Chatbot in Fintech

Though Chabot offers various benefits, there are certain challenges to this technology. It can be understood with help of following points:

1. **Complexity of Inquiries:** While chatbot excel at handling routine inquiries, it may struggle with complex queries that require human expertise and intervention.
2. **Language Understanding:** Natural language processing algorithms used by chatbot may not always accurately interpret users queries which may leads to misunderstandings and frustration to users. (Singh, Singh, 2024)
3. **Integration Challenges:** Integrating chatbot with existing systems, databases, and platforms is a complex and time-consuming process which requires careful planning and technical expertise. (Singh, Singh, 2024)
4. **Data Security and Privacy Concerns:** Chatbot handles sensitive customer data which may increases the concerns about data security and privacy compliance, especially in highly regulated industries like Fintech.
5. **User Acceptance:** There are some users who hesitant or resistant to interact with chatbot due to lack of trust and confidence. So, they prefer human assistance or traditional customer service channels.
6. **Maintenance and Updates:** Chatbot technology requires regular maintenance and updates to optimize performance and accuracy of responses, which may lead to increasing cost of operation for Fintech companies.

By handling above challenges and leveraging the benefits of chatbot effectively, Fintech companies can enhance the customer service, improve the operational efficiency, and drive business growth and success in this digital era of AI.

VII. Recommendations for Fintech Companies

1. Fintech companies should quickly respond the technological change in area of customer services to be competitive in digital AI era.
2. The continuous feedback from customer should be taken to improve the chatbot platform for seamless interaction.
3. Chatbots should be integrated with emerging technologies such as augmented reality (AR) and Virtual Reality to offer interactive customer experiences.
4. Chatbots should use predicative analytics to anticipate the user needs and provide proactive assistance before users ask for it.
5. Fintech companies should work on integration of emotional intelligence capabilities of chatbot, helping it recognize and respond to user emotions.

VII. Recommendations for Future Research Directions:

1. Future research should focus on exploring innovative applications and use for chatbot beyond the traditional customer service to address the various challenges such data privacy, security, ethics and regulatory compliances etc.
2. Future research should be carried on how the collaboration between academia, industry, and regulatory bodies will help to develop the Chatbot technology to shape the future of customer service in Fintech in a responsible and sustainable manner.
3. Future research should be carried identify the areas of customer services which can be automated with help of AI driven Chatbot.

VIII. Conclusion

In conclusion, Chatbot technology plays an important role in revolutionizing customer service in the Fintech industry by providing benefits such as enhanced accessibility, personalized assistance, and cost savings and so on. The fintech companies need to continuously evolve the Chatbot technology to overcome the various challenges such as complexity of inquiries, language understanding, data privacy and so on. The chatbot technology is reshaping the future of customer service in Fintech by offering seamless, efficient, and personalized interactions that meet the evolving needs and expectations of customers. This AI-powered Chatbot technology enable Fintech companies to deliver superior customer experiences, enhance operational efficiency, and drive business growth in a rapidly evolving digital landscape.

References

1. Wadhwa V., & Kumar, D. S. (2023) ROLE AND IMPACT OF AI IN FINTECH INDUSTRY. *international journal of progressive research in engineering management and science (ijprems),* Vol.03, Issue 11, 219-225
2. Suhel, S. F., Shukla, V. K., Vyas, S., & Mishra, V. P. (2020, June). Conversation to automation in banking through chatbot using artificial machine intelligence language. In *2020 8th international conference on reliability, infocom technologies and optimization (trends and future directions) (ICRITO)* (pp. 611-618). IEEE.
3. Abdulquadri, A., Mogaji, E., Kieu, T. A., & Nguyen, N. P. (2021). Digital transformation in financial services provision: A Nigerian perspective to the adoption of chatbot. *Journal of Enterprising Communities: People and Places in the Global Economy*, *15*(2), 258-281.
4. Ates, M. (2017). Artificial intelligence in banking: A Case Study of the Introduction of a Virtual Assistant into Customer Service.
5. Arnone, G. (2024). *AI and Chatbots in FinTech: Revolutionizing Digital Experiences and Predictive Analytics*. Springer Nature.
6. Gupta, A., Hathwar, D., & Vijayakumar, A. (2020). Introduction to AI chatbots. *International Journal of Engineering Research and Technology*, *9*(7), 255-258.
7. Singh, R. R., & Singh, P. (2024). Chatbot: Chatbot Assistant. *Journal of Management and Service Science (JMSS)*, 1-19.

Comparison of Chat GPT Generated Questions with School Teachers Generated Questions

Prof. Dr. Vaishali Manoj Sawant
Professor Hansraj Jivandas College of Education
Dr. Madhuri Shah
Campus R.K. Mission Road, Junction of 16 and 17 Road, Khar West, Mumbai

Abstract

While acknowledging the transformative potential of AI technology, ChatGPT, it's crucial to balance its advantages with the preservation of academic integrity and the mitigation of potential risks. Traditionally, teachers have been solely responsible for framing questions tailored to specific learning outcomes and student needs. However, the emergence of ChatGPT raises questions about the role of automated question generation in educational settings. Exploring the similarities and differences between questions generated by ChatGPT and those generated by teachers can provide valuable insights into the potential benefits and limitations of AI integration in education.

Introduction

The integration of technology in education has revolutionized traditional teaching methods, opening avenues for innovative approaches to learning. ChatGPT, an artificial intelligence-based language model, has emerged as a powerful tool for generating content and facilitating learning interactions. ChatGPT offers numerous advantages, such as improved performance, motivation, and organization for students. For educators, it provides support in tasks like generating learning assessments, organizing research ideas, and even virtual tutoring services. This is reflected in studies conducted by Dempere J. et.al. (2023); Fütterer, T. et.al. (2023); Gill S. et.al.(2023); Zhang P. & Tur G. (2023) and Zhu. H (2024). These benefits signify a shift towards more efficient and effective educational practices.

Despite its advantages, concerns are raised regarding the responsible use of ChatGPT. Issues like academic integrity, biased evaluation, and the potential for students to outsource assignments are highlighted. Moreover, there are apprehensions about the lack of teacher training, data privacy, and equity issues in educational settings. The responsible integration of ChatGPT in education requires adherence to ethical guidelines and considerations. This is reflected in studies conducted by Futerrer T. et.al.(2023) and Sok. S and Heng. K. (2023)

In the context of school education in India, the comparison of ChatGPT generated questions with teacher generated questions for a specific topic presents an intriguing avenue for research. This study aims to investigate the effectiveness, relevance, and suitability of questions generated by ChatGPT in comparison to those generated by experienced teachers.

Objective of the study

To compare the quality of questions generated by ChatGPT with teacher generated questions for selected Science topics from the school curriculum.

Methodology

As the sample for the study, the questions were generated by teachers and by the researcher by providing appropriate prompts to CHATGPT for five lessons in Science. It took several days to generate questions for the five topics by teachers whereas ChatGPT took minimal time since AI technology works on fraction of seconds. These questions were analysed using an Evaluation rubric prepared by the researcher. Evaluation rubric was constructed by the researcher to grade the quality of questions asked by teachers and by ChatGPT for the same topics in the subject of Science. The rubric was used to evaluate question sets of five topics. The evaluation rubric has total eight criteria

of evaluation along with a systematic explanation for every criteria. The criteria considered were as follows: Clarity and Precision Cognitive Level, Relevance to Objectives, Engagement Factor, Appropriateness for Learners, Feedback Potential, Inclusivity and Diversity, Applicability to real world.

In the rubric, five levels were used to indicate the quality of questions, the gradations levels used were excellent, good, satisfactory, needs improvement and finally inadequate, each of which is provided with numbers from 5 to 1 respectively. These numbers proved helpful to manage statistical analysis for the quality of questions being examined for each of the five different topics individually.

The rating provided to the questions based on different criteria for the five topics are as follows:

Table 1 Score obtained on the criteria of evaluation rubric for the teacher generated and CHATGPT generated questions for the topic Grades of Organisation Subject Science and Technology standard X

Criteria	Criteria Scores	
	Teacher generated Questions	ChatGPT generated Questions
Clarity and Precision	4	5
Cognitive level	3	4
Relevance of objectives	3	5
Engagement factor	5	3
Appropriateness for learners	5	4
Feedback potential	4	4
Inclusivity and Diversity	4	4
Inclusivity and Diversity	4	4

Based on the scoring as per criteria it is seen that the set of questions asked by teacher for the topic are more effective with respect to engagement factor and learner appropriability while the CHATGPT questions are dominantly effective with respect to precision and relevance to objectives.

Table 2 Score obtained on the criteria of evaluation rubric for the teacher generated and CHATGPT generated questions for the topic Types of Muscles Subject Science standard IX

Criteria	Criteria Scores	
	Teacher generated Questions	ChatGPT generated Questions
Clarity and Precision	4	4
Cognitive level	4	5
Relevance of objectives	4	5
Engagement factor	5	4
Appropriateness for learners	5	3
Feedback potential	4	4

Inclusivity and Diversity	4	4
Inclusivity and Diversity	4	4

Based on the scoring as per criteria it is seen that the set of questions asked by teacher for the topic are more effective with respect to engagement factor and learner appropriability while the CHATGPT questions are dominantly effective with respect to cognitive level appropriability and relevance to objectives.

Table 3 Score obtained on the criteria of evaluation rubric for the teacher generated and CHATGPT generated questions for the topic Constellations Subject General Science standard VII

Criteria	Criteria Scores	
	Teacher generated Questions	ChatGPT generated Questions
Clarity and Precision	5	4
Cognitive level	4	5
Relevance of objectives	4	5
Engagement factor	5	3
Appropriateness for learners	4	3
Feedback potential	4	3
Inclusivity and Diversity	4	4
Inclusivity and Diversity	4	4

Based on the scoring as per criteria it is seen that the set of questions asked by teacher for the topic are more effective with respect to engagement factor and precision while the CHATGPT questions are dominantly effective with respect to cognitive level appropriability and relevance to objectives.

Table 4 Score obtained on the criteria of evaluation rubric for the teacher generated and CHATGPT generated questions for the topic Man made Materials Subject General Science standard VIII

Criteria	Criteria Scores	
	Teacher generated Questions	ChatGPT generated Questions
Clarity and Precision	4	4
Cognitive level	3	5
Relevance of objectives	4	5
Engagement factor	5	5
Appropriateness for learners	5	4
Feedback potential	5	4
Inclusivity and Diversity	3	5

Inclusivity and Diversity	4	4

Based on the scoring as per criteria it is seen that the set of questions asked by teacher for the topic are more effective with respect to learner appropriability as well as feedback potential for learners while the CHATGPT questions are dominantly effective with the cognitive level appropriability, diverse inclusivity and relevance to objectives. While both type of questions are equally effective towards their engagement potential.

Table 5 Score obtained on the criteria of evaluation rubric for the teacher generated and CHATGPT generated questions for the topic Natural Resources Subject General Science standard VII

Criteria	Criteria Scores	
	Teacher generated Questions	ChatGPT generated Questions
Clarity and Precision	4	4
Cognitive level	4	4
Relevance of objectives	3	5
Engagement factor	4	5
Appropriateness for learners	5	4
Feedback potential	4	4
Inclusivity and Diversity	3	5
Inclusivity and Diversity	4	4

Based on the scoring as per criteria it is seen that the set of questions asked by teacher for the topic are more effective only with respect to their appropriateness for learners while the CHATGPT questions are dominantly effective with respect to engagement factor, diverse inclusivity and relevance to objectives. **Analysis and Discussions**

The comparison between ChatGPT-generated questions and those created by teachers highlights subtle differences in their effectiveness and suitability for educational contexts. ChatGPT demonstrates proficiency in structuring assessments aligned with Bloom's taxonomy of learning objectives, offering a systematic approach to evaluating students' understanding and critical thinking skills. However, its language can sometimes be overly technical or complex, potentially hindering comprehension for some learners. In contrast, teachers possess the adaptability to tailor their language and questioning techniques to suit the specific needs and understanding levels of their students. This learner-oriented approach fosters more engaging and interactive experiences, as teachers can simplify concepts and explanations as needed, ensuring that all students can grasp the material effectively. While AI tools like ChatGPT offer efficiency and structure in educational tasks, they should complement rather than replace the expertise and adaptability of teachers. Thus, striking a balance between leveraging AI technology such as CHATGPT and harnessing the pedagogical expertise of teachers is crucial for fostering effective and engaging learning environments. **Conclusion** :

In conclusion, this study has shed light on the subtle differences between questions posed by human teachers and those generated by ChatGPT within the context of an Indian classroom setup. While both sources aim to engage students and stimulate critical thinking, they offer unique advantages and challenges. Human teachers bring experience, empathy, and adaptability to tailor questions to students' needs, fostering a dynamic learning environment. On the other hand, ChatGPT

offers consistency, vast knowledge access, and the potential for personalized interactions, but without the intuitive understanding and emotional intelligence of a human teacher. By recognizing the strengths and limitations of AI technology such as CHATGPT, teachers can leverage both human and AI-driven questioning strategies to enhance learning experiences in the diverse landscape of the education system.

References

1. Dempere J, Modugu K, Hesham A and Ramasamy LK (2023) The impact of ChatGPT on higher education. Front. Educ. 8:1206936. https://doi.org/10.3389/feduc.2023.1206936
2. Fütterer, T., Fischer, C., Alekseeva, A., Chen, X., Tate, T., Warschauer, M., & Gerjets, P. (2023). ChatGPT in education: global reactions to AI innovations. Scientific Reports, 13(1).https://doi.org/10.1038/s41598-023-42227-6
3. Gill, S. S., Xu, M., Patros, P., Wu, H., Kaur, R., Kaur, K., … Buyya, R. (2024). Transformative effects of ChatGPT on modern education: Emerging Era of AI Chatbots. Internet of Things and Cyber-Physical Systems, 4, 19–23. https://doi.org/10.1016/j.iotcps.2023.06.002
4. Mai DTT, Da CV & Hanh NV (2024). The use of ChatGPT in teaching and learning: a systematic review through SWOT analysis approach. Front. Education. 9:1328769. https://doi.org/10.3389/feduc.2024.1328769
5. Montenegro-Rueda, M.; Fernández-Cerero, J.; Fernández-Batanero, J.M.; LópezMeneses, E. (2023). Impact of the Implementation of ChatGPT in Education: A Systematic Review. Computers 2023, 12, 153. https://doi.org/10.3390/computers12080153
6. Sok, S., & Heng, K. (2023). ChatGPT for education and research: A review of benefits and risks. SSRN Electronic Journal. https://doi.org/10.2139/ssrn.4378735 Yu, H. (2024). The application and challenges of ChatGPT in educational transformation: New demands for teachers' roles. Heliyon, 10(2), e24289. https://doi.org/10.1016/j.heliyon.2024.e24289
7. Zhang, P., & Tur, G. (2023). A systematic review of ChatGPT use in K-12 education. European Journal of Education, 00, 1–22. https://doi.org/10.1111/ejed.12599

Usage of AI Tools in Indian Legal System

Dr. Deepa Pravin Patil
Associate Professor
Ismailsaheb Mulla law College, Karmaveer Samadhi Parisar, Satara

Abstract

The Indian legal system is very extensive, and it is continuously changing day by day. The use of artificial intelligence in the legal field will help lawyers and judges to insights into the legal domain in a matter of seconds. AI could significantly improve the justice delivery system in India, promoting a more efficient and sustainable approach to justice. Integrating AI in judiciary could be a viable solution to reduce the backlog of cases. By streamlining tasks at various stages of a trial, AI can assist judges and lawyers—who are essential to the justice system—thereby shortening the overall time required for legal proceedings. While the adoption of AI in the Indian legal system holds great promise for improving the speed and effectiveness of justice delivery, it is crucial to exercise caution. Responsibilities should not be fully delegated to machines; instead, AI should be used as a supportive tool to enhance human decision-making. Balancing innovation with ethical considerations will be key to ensuring that the noble goal of delivering justice to all is achieved.

Key words: Artificial intelligence, judiciary, Indian legal system, etc.

Introduction:

Artificial Intelligence (AI) has garnered significant attention in recent years, showcasing its vast potential across various fields, including law. AI and Machine Learning have dramatically enhanced efficiency in numerous industries, and their effective application can lead to transformative changes. In the justice system, AI has the capacity to reduce case backlogs and streamline processes.

The development of AI technology provides an opportunity for lawyers to improve their efficiency, reduce costs and focus on more strategic work. Since 2021, the Supreme Court of India has been using an AI-controlled tool designed to process information and make it available to judges for decisions.

Today, the concept of AI is increasingly popular, with various sectors adopting its capabilities to improve operations. Essentially, AI functions like a machine or robot that mimics human cognitive processes. In India, the legal system has begun to embrace technology, although many attorneys still rely on traditional methods. This article explores the role of AI in the Indian legal system and highlights the changes it has brought to court operations.

Meaning and concept of Artificial Intelligence:

Artificial intelligence is the ability of a digital computer or computer-controlled robot to perform tasks commonly associated with intelligent beings. The term is frequently applied to the project of developing systems endowed with the intellectual processes characteristic of humans, such as the ability to reason, discover meaning, generalize, or learn from experience.[1]

Artificial Intelligence is the theory and development of computer systems able to perform tasks normally requiring human intelligence, such as visual perception, speech recognition, decision-making, and translation between languages.[2]

Artificial Intelligence is a branch of computer science dealing with the simulation of intelligent behaviour in computers.[3]

Artificial intelligence is a type of computer technology which is concerned with making machines work in an intelligent way, like the way the human mind works.[4]

---

[1] Copeland J. Artificial intelligence: A philosophical introduction. John Wiley & Sons, 1993

[2] Artificial Intelligence, available at: https://www.oxfordreference.com/display/10.1093/oi/authority.20110803095426960 (last visited on November 10, 2023).

[3] Artificial Intelligence, available at: https://www.merriamwebster.com/dictionary/artificial%20intelligence (last visited on November 10, 2023).

[4] Collins H. Artificial intelligence: against humanity's surrender to computers. John Wiley & Sons, 2018.

In brief, Artificial Intelligence (AI) is a fast-growing area of computer science. The term Artificial Intelligence (AI) refers to the development of computer systems that can perform tasks that normally require human intelligence.[5]

Use of AI in Indian Legal System:

Artificial intelligence (AI) has the potential to significantly transform the legal system by automating time-consuming tasks, improving decision-making, and enhancing overall efficiency. Here are several examples of how AI is currently being utilized in Indian legal system:

1. **Supreme Court Vidhik Anuvaad Software (SUVAS)**: This tool, developed by the Supreme Court of India, translates legal documents and orders from English into nine vernacular languages, promoting accessibility.
2. **Supreme Court Portal for Assistance in Court's Efficiency (SUPACE)**: This platform aids judges by collecting relevant facts and laws, making them readily available for decision-making.
3. **Official Multilingual Mobile Application**: Developed by the National Informatics Centre, this app allows citizens to easily access case information, judgments, important circulars, and other essential resources with just a click.
4. **E-Courts Initiative**: The establishment of e-courts aims to expedite case disposal, streamline record maintenance, enhance the reliability of recorded evidence, and promote greater transparency in court operations.
5. **AI Techniques for Judgments**: Researchers at IIT Kharagpur introduced an AI-based method in 2020 to automate the reading of court judgments, further increasing efficiency.
6. **SCI-Interact Software**: This tool is used to facilitate a paperless environment in Supreme Court benches, contributing to sustainability and efficiency. These innovations illustrate the transformative impact of AI in making the legal system more efficient and accessible.[6]

Here are some of the benefits of AI in legal system:

1. E- Courts: AI technologies facilitate secure video conferencing, real-time transcription, and language translation, enhancing the efficiency of virtual courtrooms and remote proceedings. This is especially vital for situations requiring remote hearings.[7]
2. Improvement in Legal Research, Analysis and Document Review: AI systems can efficiently analyse extensive databases of legal precedents, statutes, and case law, providing judges with relevant insights [8]. This capability accelerates the legal research process, ensuring judges have access to comprehensive and up-to-date information when making decisions.[9] By highlighting key details and identifying pertinent information, AI technologies facilitate the review of legal documents, allowing judges to grasp the essential facts of a case more quickly and focus on critical points during hearings.[10]
3. Increase in pace of delivery of justice: In India, the adjudication of both criminal and civil trials often takes years, resulting in ineffective and delayed justice. Implementing AI can help mitigate these delays by allowing courts to handle more cases efficiently.[11] This leads to a

[5] https://www.lawjournals.net/assets/archives/2024/vol6issue1/5124.pdf retrieved on 26/09/2024

[6] https://enhelion.com/blogs/2023/06/27/use-of-ai-in-civil-cases-in-india-an-analysis-of-possible-implications/ retrieved on 26/09/24.

[7] Zalnieriute M, Bell F. Technology and the judicial role. The Judge, the Judiciary and the Court: Individual, Collegial and Institutional Judicial Dynamics in Australia (Cambridge University Press, 2021), 2020.

[8] Sharma B. Impact of Artificial Intelligence on the Legal Industry: Advantages, Challenges, and Ethical Implications, 2023.

[9] Kabir MS, Alam MN. The Role of AI Technology for Legal Research and Decision Making. Title of the Journal, 2023.

[10] Xu Z. Human Judges in the era of artificial intelligence: challenges and opportunities. Applied Artificial Intelligence,2022:36(1):2013652.

[11] Srivastava SK. AI for Improving Justice Delivery: International Scenario, Potential Applications & Way Forward for India. Informatica, 2023, 47(5).

better experience for citizens, who spend less time awaiting decisions that significantly affect their lives and businesses.

4. Analysing of past case data: By analysing past case data, AI systems can predict potential case outcomes. One major challenge facing the judiciary is the backlog of pending cases and the shortage of judges to address them. Courts can leverage predictive analytics to illustrate likely outcomes to parties involved in disputes, encouraging them to pursue out-of-court settlements.[12] This approach saves time for the courts and helps parties avoid lengthy and complicated trial processes.
5. Improve Case Management: Judges can enhance the organization and prioritization of their caseloads using AI to streamline case management. Automated systems can assist with scheduling, monitoring deadlines, and improving overall workflow efficiency.[13]
6. Support decision making: AI systems can serve as decision support tools, supplying judges with relevant information, precedents, and legal analyses to assist in their decision-making.[14] However, it's important to emphasize that AI is merely an auxiliary tool, and the final decision-making authority rests with the judge in all cases.
7. Adoption of Natural Language Processing (NLP): NLP technologies enable computers to understand and interpret human language. Judges can utilize NLP for tasks such as summarizing case documents, analysing legal arguments, and extracting relevant information from both spoken and written statements. For example, ROSS Intelligence is an AI-driven legal research tool that uses NLP to understand inquiries in natural language and provide pertinent legal information.[15]

Challenges in adoption of AI in legal system:

The integration of Artificial Intelligence (AI) into the legal system presents both opportunities and challenges. While AI has the potential to enhance efficiency and decision-making, several significant hurdles must be addressed. Here are some of the challenges associated with implementing AI in courts:

1. Concerns for Transparency: Many AI algorithms operate as "black boxes," making it challenging for users to understand the decision-making process. This opacity raises concerns about accountability and can create difficulties for litigants and judges alike.[16]
2. Doubts about Information Security and Privacy Risks: Ensuring the security and privacy of sensitive legal information is a significant challenge. Vulnerabilities in AI systems may be exploited by malicious actors, putting confidential data at risk.
3. Requirement of High Resource and its heavy Cost: The development, implementation, and maintenance of AI systems can be costly. To achieve widespread and equitable adoption of AI in the legal system, considerations around affordability and scalability are essential.
4. Concerns about Bias and Fairness: AI systems may inadvertently reinforce or exacerbate biases present in historical legal data, raising critical questions about fairness. Biased algorithms can lead to unjust decisions, potentially violating fundamental rights.[17] In 2015, Google Photos tagged two African-American people as Gorillas through their facial recognition.[18] In 2018, Amazon scrapped the AI-based tool that it used for the hiring process

[12] Jain P. Artificial Intelligence for sustainable and effective justice delivery in India. OIDA International Journal of Sustainable Development,2018:11(06):63-

[13] Coglianese C, Dor LMB. AI in Adjudication and Administration. Brook. L. Rev.,2020:86:791.

[14] Vijipriya RA. "Critical Study on Artificial Intelligence(AI) in Indian Legal Sectors." Shanlax International Journal of Arts, Science and Humanities,2022:9(4):58-64.

[15] Kabir MS, Alam MN. The Role of AI Technology for Legal Research and Decision Making. Title of the Journal, 2023.

[16] Themeli E, Philipsen S. AI as the Court: Assessing AI Deployment in Civil Cases. E. Themeli and S. Philipsen, AI as the Court: Assessing AI Deployment in Civil Cases, in K. Benyekhlef (ed), AI and Law. A Critical Overview, Éditions Thémis, 2021, 213-232.

[17] Rocha C, Carvalho J. Artificial Intelligence in the Judiciary: Uses and Threats. EGOV-CeDEM-ePart 2022, 183.

[18] https://www.wsj.com/articles/BL-DGB-42522

as it favoured male candidates by disregarding resumes that had words like "women's". Recently, deepfakes have emerged on the internet imitating Bollywood actresses and the Hon'ble Delhi High Court has sought a response from the Central Government on its stance on the issue in a PIL.[19] Ensuring fairness in AI-driven legal processes is not only about addressing bias but also holding AI systems accountable for their actions.

5. AI tools adaptation by Judges: The success of AI integration in legal proceedings is influenced by judges' willingness to embrace it. Younger judges are generally more open to using AI, while senior judges may be skeptical, believing that AI cannot effectively assist in case management. Some judges feel uncomfortable delegating control of sensitive litigation matters to machines, preferring to dedicate their own time to decision-making rather than relying on automated systems.[20]
6. Technical Limitations and Errors: AI systems are not infallible and can make mistakes. They may miss updates in legal regulations or misinterpret statutes. Additionally, like any technology, AI systems can experience bugs or glitches that lead to erroneous decisions or predictions.

Conclusion and Suggestions:

Striking a balance between leveraging AI's advantages and mitigating its drawbacks is vital for creating a just, efficient, and technologically advanced judicial system that meets the evolving demands of the legal landscape. AI can greatly benefit lawyers, judges and attorneys, who are central to the justice delivery system. While no technology can replace a human, AI can assist in the decision-making process, ensuring that the handling of a large volume of cases does not compromise justice.

The integration of Artificial Intelligence (AI) in courts is increasingly essential for addressing the backlog of cases in modern legal systems. AI has the potential to enhance overall efficiency, reduce case backlogs, and expedite legal procedures. While e-courts have been established by the Indian Government, their reach needs to expand to effectively manage the current volume of cases. E-courts provide improved case and courtroom management capabilities, creating a more efficient and time-saving platform for delivering justice. Benefits of AI in this context include enhanced case management, data-driven insights for informed decision-making, and faster document review. However, it is crucial to address challenges such as biases, data privacy, and the need for transparency.

By saving time and improving case disposition efficiency, AI has the potential to significantly reduce the backlog of cases. Ultimately, achieving this balance will help fulfil the noble goal of providing the public with efficient and sustainable justice. Lawyers and law firms often worry that AI will replace them, but this is not true to the fact. Instead, AI will help both lawyers and law firms to be more productive and efficient.

To successfully integrate AI into the Indian legal system, a balanced approach is vital. Here are some key recommendations: A strong legal framework should be established to outline the liabilities and responsibilities of AI[21], it is important to implement accountability measures to ensure proper governance of AI behaviour and a robust data protection system must be introduced to ensure privacy is maintained. Instead of resisting technological advancements, we should embrace AI and harness its advantages, while also putting in place necessary safeguards to protect users' interests.

References:

1. Copeland J. Artificial intelligence: A philosophical introduction. John Wiley & Sons, 1993 Artificial Intelligence, available at: https://www.oxfordreference.com/display/10.1093/oi/a

[19] https://www.livelaw.in/high-court/delhi-high-court/delhi-high-court-pil-non-regulation-artificial-intelligence-deepfake-technologies-243638

[20] Mingtsung C, Shuling L. June. Research on the application of artificial intelligence technology in the field of Justice. In Journal of Physics: Conference Series (Vol 1570, No. 1, p. 012047). IOP Publishing,2020:1570(1):012047.

[21] https://ijirl.com/wp-content/uploads/2022/06/ARTIFICIAL-INTELLIGENCE-ITS-IMPACT-ON-THE-INDIAN-LEGAL-SYSTEM.pdf retrieved on 26/09/2024

2. uthority.20110803095426960 (last visited on November 10, 2023). Artificial Intelligence, available at: https://www.merriamwebster.com/dictionary/artificial%20intelligence (last visited on November 10, 2023).
3. Collins H. Artificial intelligence: against humanity's surrender to computers. John Wiley & Sons, 2018.
4. Sharma B. Impact of Artificial Intelligence on the Legal Industry: Advantages, Challenges, and Ethical Implications, 2023.
5. Kabir MS, Alam MN. The Role of AI Technology for Legal Research and Decision Making. Title of the Journal, 2023.
6. Srivastava SK. AI for Improving Justice Delivery: International Scenario, Potential Applications & Way Forward for India. Informatica, 2023, 47(5).
7. Jain P. Artificial Intelligence for sustainable and effective justice delivery in India. OIDA International Journal of Sustainable Development,2018:11(06):63
8. Xu Z. Human Judges in the era of artificial intelligence: challenges and opportunities. Applied Artificial Intelligence,2022:36(1):2013652.
9. Coglianese C, Dor LMB. AI in Adjudication and Administration. Brook. L. Rev.,2020:86:791.
10. Kabir MS, Alam MN. The Role of AI Technology for Legal Research and Decision Making. Title of the Journal, 2023.
11. Zalnieriute M, Bell F. Technology and the judicial role. The Judge, the Judiciary and the Court: Individual, Collegial and Institutional Judicial Dynamics in Australia (Cambridge University Press, 2021), 2020.
12. Vijipriya RA. "Critical Study on Artificial Intelligence(AI) in Indian Legal Sectors." Shanlax International Journal of Arts, Science and Humanities,2022:9(4):58-64.
13. Rocha C, Carvalho J. Artificial Intelligence in the Judiciary: Uses and Threats. EGOV-CeDEM-ePart 2022, 183.
14. Themeli E, Philipsen S. AI as the Court: Assessing AI Deployment in Civil Cases. E. Themeli and S. Philipsen, AI as the Court: Assessing AI Deployment in Civil Cases, in K. Benyekhlef (ed), AI and Law. A Critical Overview, Éditions Thémis, 2021, 213-232.
15. Mingtsung C, Shuling L. June. Research on the application of artificial intelligence technology in the field of Justice. In Journal of Physics: Conference Series (Vol 1570, No. 1, p. 012047). IOP Publishing,2020:1570(1):012047.
16. https://indiaai.gov.in/article/impact-of-ai-in-the-indian-legal-system-on-indian-constitution-day-2023 retrieved on 26/09/24.
17. https://www.business-standard.com/content/press-releases-ani/caseminister-transforming-the-indian-legal-system-with-artificial-intelligence-124091100019_1.html visited on 26/09/24
18. https://enhelion.com/blogs/2023/06/27/use-of-ai-in-civil-cases-in-india-an-analysis-of-possible-implications/ retrieved on 26/09/24.
19. https://www.linkedin.com/pulse/integration-impact-artificial-intelligence-indian-judiciary-1nx3c/ retrieved on 26/09/2024
20. https://ijirl.com/wp-content/uploads/2022/06/ARTIFICIAL-INTELLIGENCE-ITS-IMPACT-ON-THE-INDIAN-LEGAL-SYSTEM.pdf retrieved on 26/09/2024
21. https://www.warwicklegal.com/news/627/india-role-of-artificial-intelligence-in-justice-delivery-system retrieved on 26/09/2024
22. Artificial intelligence in the context of the Indian legal profession and judicial system (barandbench.com) retrieved on 26/09/24.

Navigating the Digital Landscape: Enhancing AI Literacy and Privacy Awareness Among Students

Dr. Abhishek Singh
Mrs Tanavi Prasad Naik

Abstract

As artificial intelligence (AI) continues to permeate various aspects of everyday life, understanding its implications has become crucial, particularly for students who are increasingly reliant on digital technologies. This research paper explores the importance of enhancing AI literacy and privacy awareness among students, emphasizing the need for educational institutions to implement comprehensive curricula that address these issues. By examining the current landscape of AI literacy, privacy challenges, and effective educational strategies, this paper presents actionable recommendations for fostering an informed generation capable of navigating the complexities of the digital world.

Keywords: AI literacy, Privacy awareness, Digital technologies, educational institutions, AI implications, Privacy challenges, Digital landscape, AI curriculum, Data protection, Student education, Digital literacy, Ethical AI, AI in education, Cybersecurity awareness, Technology and privacy, AI responsibility, Digital safety, AI ethics, Informed generation, Online privacy

Introduction

In an age dominated by digital technologies, the integration of artificial intelligence into everyday life has transformed the way students learn, communicate, and interact with information. AI technologies, including machine learning algorithms and data analytics, are increasingly being used in educational settings to personalize learning experiences, streamline administrative processes, and improve educational outcomes. However, the rapid adoption of AI in education also raises significant concerns about privacy, security, and ethical implications.

While students benefit from AI-driven tools, they often lack the necessary literacy and awareness to navigate the digital landscape effectively. This gap in understanding can lead to challenges related to data privacy, misinformation, and the ethical use of technology. Consequently, there is an urgent need to enhance AI literacy and privacy awareness among students to empower them as responsible digital citizens.

This paper aims to explore the current state of AI literacy and privacy awareness among students, examine the challenges they face, and propose strategies for educational institutions to implement effective educational programs. By fostering a culture of AI literacy and privacy awareness, we can prepare students to engage thoughtfully and ethically with AI technologies.

The Importance of AI Literacy

Defining AI Literacy

AI literacy refers to the understanding of AI technologies, their functionalities, and their implications. It encompasses knowledge about how AI systems work, their applications, and the ethical considerations surrounding their use. Developing AI literacy is essential for students, as it enables them to engage critically with AI technologies and make informed decisions regarding their use[22].

AI literacy consists of several components, including:

- **Understanding AI Concepts**: Students should grasp fundamental AI concepts such as machine learning, natural language processing, and neural networks. Familiarity with these terms will help them comprehend how AI systems operate and their potential applications.

[22] https://digitalpromise.org/2024/06/18/ai-literacy-a-framework-to-understand-evaluate-and-use-emerging-technology/#:~:text=AI%20literacy%20includes%20the%20knowledge,in%20an%20increasingly%20digital%20world. Last assessed on 5th October, 2024 at 5:30pm.

- **Evaluating AI Applications**: Students must learn to assess AI applications critically, recognizing their benefits and limitations. This involves understanding how AI algorithms make decisions and the potential biases that may arise from these processes.
- **Recognizing Ethical Implications**: Ethical considerations surrounding AI, including privacy concerns, data ownership, and algorithmic bias, should be a key focus of AI literacy education. Students must understand the ethical dilemmas that can arise from the use of AI technologies and how these issues impact society.

Current State of AI Literacy Among Students

Despite the increasing presence of AI in education and daily life, many students lack a foundational understanding of AI technologies. A study conducted by the World Economic Forum revealed that only 28% of students felt confident in their understanding of AI and its implications. Furthermore, a survey by McKinsey found that a significant portion of students could not accurately identify AI applications or recognize their ethical implications.

This lack of awareness can hinder students' ability to navigate the digital landscape effectively. As AI continues to evolve, students must develop the skills to evaluate AI technologies critically, understand their limitations, and recognize potential biases inherent in AI systems.

The Role of AI Literacy in Education

Integrating AI literacy into the curriculum can enhance students' critical thinking skills and equip them with the tools to navigate a technology-driven world. By understanding AI concepts, students can better assess the credibility of information, evaluate the ethical implications of technology, and become informed consumers of AI-driven products and services.

Moreover, fostering AI literacy can help students develop the necessary skills for future careers. As industries increasingly adopt AI technologies, employers will seek individuals who can understand and leverage these tools effectively. By incorporating AI literacy into educational programs, institutions can better prepare students for the workforce and ensure they are equipped to contribute positively to society.

Benefits of AI Literacy in the Real World

AI literacy is not just an academic concept; it has practical implications in students' daily lives and future careers. For instance, understanding how AI algorithms influence social media feeds can help students recognize biases in content curation. They can learn to question the motivations behind the information they consume and take steps to seek diverse viewpoints.

Furthermore, as students enter the job market, many industries will require AI literacy. Fields such as healthcare, finance, marketing, and technology are increasingly integrating AI solutions to enhance efficiency and effectiveness. Employers will favor candidates who can comprehend AI tools, analyze their outcomes, and make data-driven decisions.

By fostering AI literacy, educational institutions can provide students with a competitive edge and prepare them for a future in which AI technologies play a critical role.

Privacy Awareness in the Digital Age

Understanding Privacy Challenges

In the digital age, privacy concerns have become more pronounced. The proliferation of data-driven technologies has led to an increase in data collection, often without individuals' explicit consent. For students, this can manifest in various ways, including targeted advertising, surveillance, and the potential misuse of personal information.

The Cambridge Analytica scandal is a prominent example of how personal data can be exploited for political and commercial gain. Such incidents have highlighted the importance of data privacy and the need for individuals to understand how their information is collected, used, and shared[23].

[23] https://www.nytimes.com/2018/04/04/us/politics/cambridge-analytica-scandal-fallout.html last assessed on 28th September 2024 at 3:00 pm.

The Importance of Privacy Awareness Among Students

Privacy awareness is essential for students, as it empowers them to make informed decisions about their online presence and protect their personal information. Many students may not fully understand the implications of sharing their data on social media, participating in online platforms, or using AI-driven applications. By fostering privacy awareness, educational institutions can help students recognize the importance of safeguarding their personal information and understanding the consequences of their digital footprint.

The Role of Educational Institutions in Promoting Privacy Awareness

Educational institutions play a vital role in promoting privacy awareness among students. By incorporating privacy education into the curriculum, schools can provide students with the knowledge and skills to navigate the digital landscape safely. This education should encompass topics such as data protection, online privacy settings, and the potential risks associated with sharing personal information.

Key Components of Privacy Awareness Education

1. **Understanding Data Privacy**: Students should learn about the types of data collected by online platforms and the potential risks associated with sharing personal information. This understanding can help them recognize which platforms are collecting their data and how it is being used.
2. **Digital Footprint Awareness**: Helping students recognize the long-term consequences of their online actions is essential. Educating them about the permanence of digital footprints can lead to more cautious behavior when sharing information online.
3. **Privacy Settings and Tools**: Providing practical guidance on how to adjust privacy settings on social media platforms and utilize tools to protect personal information is critical. Students should be empowered to take control of their data and understand the importance of regularly reviewing their privacy settings.

Bridging the Gap: Strategies for Enhancing AI Literacy and Privacy Awareness

1. Integrating AI Literacy into the Curriculum

To enhance AI literacy among students, educational institutions should integrate AI concepts into various subjects, such as computer science, mathematics, and social studies. This interdisciplinary approach can help students understand the relevance of AI in different contexts and develop critical thinking skills related to technology.

For example, computer science classes can teach students about machine learning algorithms, while social studies can explore the ethical implications of AI in society. By providing a well-rounded education that includes AI literacy, students can develop a comprehensive understanding of the technology and its impact on their lives.

2. Implementing Privacy Education Programs

Schools should implement privacy education programs that inform students about data protection and online safety. These programs can cover topics such as:

- **Understanding Data Privacy**: Teaching students about the types of data collected by online platforms and the potential risks associated with sharing personal information.
- **Digital Footprint Awareness**: Helping students recognize the long-term consequences of their online actions and how to manage their digital footprints.
- **Privacy Settings and Tools**: Providing practical guidance on how to adjust privacy settings on social media platforms and utilize tools to protect personal information.

3. Utilizing Project-Based Learning

Project-based learning (PBL) can be an effective pedagogical approach to enhance AI literacy and privacy awareness. By engaging students in hands-on projects that require them to apply their knowledge, educators can foster deeper understanding and critical thinking skills[24].

[24] https://www.timeshighereducation.com/campus/implementing-projectbased-learning-practical-guide last assessed on 5th September 2024 at 7:00

For instance, students can work on projects that explore the ethical implications of AI applications, analyze case studies of data breaches, or develop their own AI models while considering privacy considerations. This experiential learning approach allows students to grapple with real-world issues and encourages them to think critically about the role of AI and privacy in society.

4. Collaborating with Industry Experts

Educational institutions can benefit from collaborating with industry experts and organizations specializing in AI and data privacy. Guest speakers, workshops, and partnerships with tech companies can provide students with valuable insights into the latest developments in AI and privacy practices.

These collaborations can also facilitate internships and mentorship programs, allowing students to gain practical experience in the field. Exposure to industry professionals can inspire students and provide them with a clearer understanding of the skills needed to succeed in an AI-driven world.

5. Promoting Digital Citizenship

In addition to enhancing AI literacy and privacy awareness, schools should promote digital citizenship among students. Digital citizenship encompasses responsible online behavior, including ethical considerations when using technology and engaging with digital content.

By teaching students about the principles of digital citizenship, schools can empower them to navigate the digital landscape responsibly. This education should address issues such as cyberbullying, online etiquette, and the importance of respecting intellectual property rights.

6. Creating Awareness Campaigns

Educational institutions can create awareness campaigns that engage students, parents, and the community on the importance of AI literacy and privacy awareness. These campaigns can utilize social media, workshops, and community events to disseminate information and encourage discussions on these critical topics.

Involving students in these campaigns can also foster leadership skills and promote a sense of responsibility towards digital citizenship within their communities.

7. Continuous Evaluation and Feedback

Educational programs focused on AI literacy and privacy awareness should include mechanisms for continuous evaluation and feedback. Regular assessments can help educators understand students' learning needs and identify areas for improvement.

Feedback from students can provide valuable insights into the effectiveness of the curriculum and help educators adapt their teaching methods to better suit their students' needs.

Challenges to Implementing AI Literacy and Privacy Awareness Programs

1. Limited Resources and Funding

One of the primary challenges in implementing AI literacy and privacy awareness programs is the limited availability of resources and funding. Educational institutions may struggle to allocate sufficient resources for teacher training, curriculum development, and technology infrastructure.

To overcome this challenge, schools can seek partnerships with local organizations, businesses, and government agencies to secure funding and support for these initiatives. Grants and sponsorships can help provide the necessary resources to develop and implement comprehensive educational programs.

2. Resistance to Change

Resistance to change can also hinder the adoption of new curricula focused on AI literacy and privacy awareness. Some educators may be hesitant to incorporate new technologies or methodologies into their teaching practices due to a lack of familiarity or perceived complexity.

To address this challenge, educational leaders should provide professional development opportunities for teachers to enhance their understanding of AI and privacy issues. Ongoing training and support can help educators feel more comfortable integrating these topics into their classrooms.

3. Diverse Student Populations

The diverse backgrounds and experiences of students can pose challenges in delivering AI literacy and privacy awareness programs. Students may have varying levels of prior knowledge, access to technology, and cultural perspectives on privacy.

To ensure inclusivity, educational institutions should tailor their programs to accommodate different learning styles and experiences. Differentiated instruction, collaborative learning opportunities, and culturally relevant materials can enhance engagement and understanding among all students.

Conclusion

As AI technologies continue to evolve and become integrated into various aspects of education and daily life, enhancing AI literacy and privacy awareness among students is of paramount importance. By equipping students with the knowledge and skills to navigate the digital landscape responsibly, educational institutions can empower them to make informed decisions and engage ethically with technology.

Through the integration of AI literacy into curricula, the implementation of privacy education programs, and the promotion of digital citizenship, schools can foster a generation of responsible digital citizens. While challenges exist in implementing these initiatives, the benefits of enhancing AI literacy and privacy awareness far outweigh the obstacles.

As we navigate the complexities of the digital landscape, it is essential to prioritize the education of future generations, ensuring they are equipped to thrive in an AI-driven world while safeguarding their privacy and personal information. By investing in their education today, we can create a brighter, more secure, and ethically engaged future for all.

Reference

1. https://digitalpromise.org/2024/06/18/ai-literacy-a-framework-to-understand-evaluate-and-use-emerging-technology/#:~:text=AI%20literacy%20includes%20the%20knowledge,in%20an%20increasingly%20digital%20world. Last assessed on 5th October, 2024 at 5:30pm.
2. https://www.timeshighereducation.com/campus/implementing-projectbased-learning-practical-guide last assessed on 5th September 2024 at 7:00
3. https://www.nytimes.com/2018/04/04/us/politics/cambridge-analytica-scandal-fallout.html last assessed on 28th September 2024 at 3:00 pm.

"Designing Adaptive Learning Model for Diverse Learners: A Developmental Approach in the Context of NEP 2020"

Dr. Falguni Anish Shah
Principal, R.R. Educational Trust's B.Ed College, Mulund.

Abstract

This paper presents the design of an adaptive learning model aimed at addressing diverse learning styles, with a developmental approach grounded in the National Education Policy (NEP) 2020. Without the use of surveys, this study develops a framework that integrates adaptive features to accommodate visual, auditory, kinesthetic, and other learning styles. The model promotes student-centric education in line with NEP 2020 by focusing on personalized learning experiences. The proposed adaptive model subtly incorporates theoretical concepts, like scaffolding and social interaction, to foster student engagement and success.

1. Introduction

Context of NEP 2020

The National Education Policy (NEP) 2020 represents a paradigm shift in India's education system by emphasizing flexibility, inclusivity, and student agency. One of the critical aspects of NEP 2020 is its focus on student-centric and personalized learning, where diverse learning needs are acknowledged and addressed. NEP 2020 encourages educators to move away from a one-size-fits-all approach and adopt methods that cater to individual learner differences, fostering a more engaging and productive learning environment.

Objective

1. To develop an adaptive learning model for diverse learning styles.

The aim of this research paper is to develop an adaptive learning model that responds to the needs of diverse learners. This developmental study outlines a theoretical framework focusing on designing a flexible learning model that aligns with NEP 2020's student-centric vision. The model is adaptable to various learning styles and integrates learning strategies that promote personalization, thereby enhancing the learning experience.

Learning Styles

Learners exhibit different preferences in the way they process information and acquire knowledge. Commonly recognized learning styles include visual (learning through images and diagrams), auditory (learning through listening), kinesthetic (learning through hands-on activities), and reading/writing (learning through written words). This paper addresses the development of an adaptive model that responds to these diverse learning styles, ensuring that the educational experience is tailored to each student's needs.

2. Literature Review

Adaptive Learning Models

Dr. A. Sharma's (2020) national study highlights adaptive learning systems in Indian higher education, aligned with NEP 2020's focus on personalized learning, using AI to cater to diverse learning styles, despite challenges like the digital divide. Internationally, Rose Luckin et al. (2017) review adaptive learning technologies (ALTs), emphasizing their global success in tailoring education through data-driven adjustments, while noting issues like data privacy and cost, yet underscoring their potential to revolutionize education.

Diverse Learning Styles

Neil D. Fleming's VARK model (1987) categorizes learning styles into Visual, Auditory, Read/Write, and Kinesthetic, helping educators tailor instruction to these preferences. Visual learners prefer images, auditory learners benefit from listening, read/write learners excel through text, and kinesthetic learners engage best through hands-on activities. While widely adopted, the model has faced criticism for oversimplifying the complexity of learning processes. Gardner's

(1983) theory of Multiple Intelligences extends this understanding by identifying a wide range of intelligences, such as linguistic, logical-mathematical, musical, and interpersonal intelligences. Both frameworks support the idea that education should be flexible and tailored to different learners' strengths and preferences.

Student-Centric Approaches

One review by M. Singh (2021) highlights the shift towards student-centric approaches in Indian education, driven by NEP 2020, which emphasizes personalized learning, flexibility, and learner autonomy. Singh notes that student-centered methods, such as project-based learning and personalized feedback, enhance engagement and cater to individual needs, though implementation in large classrooms remains a challenge. Another review by S. Johnson (2018) explores global trends in student-centered learning, emphasizing the use of technology and flipped classrooms to empower students to take control of their learning. Johnson finds that such approaches improve critical thinking and motivation but require substantial teacher training for effective implementation.

3. Development of Adaptive Learning Model

Theoretical Foundation

The development of the adaptive learning model in this study is rooted in Neil D. Fleming's VARK Model, which identifies four primary learning styles: **Visual**, **Auditory**, **Read/Write**, and **Kinesthetic**. Fleming's VARK framework, introduced in 1987, is designed to categorize learners based on their preferred sensory modality for receiving and processing information. This model provides a foundation for creating personalized learning experiences that align with how individuals best comprehend new information.

- **Visual learners** absorb information through images, diagrams, charts, and spatial representations. They prefer visual aids to conceptualize ideas.
- **Auditory learners** thrive when they receive information through listening. Lectures, discussions, and audio recordings are their preferred modes of learning.
- **Read/Write learners** process information effectively through written words. These learners excel in environments where they can engage with text-based materials, including notes, lists, and essays.
- **Kinesthetic learners** understand and retain information best through physical experiences, hands-on activities, and real-world applications.

By adopting the VARK model, this adaptive learning framework allows for dynamic adjustments to teaching strategies, enabling the creation of a more engaging, inclusive, and efficient learning environment that caters to individual learner preferences.

4. Model Design

The adaptive learning model is structured to adjust according to individual learning preferences. It incorporates several key features aimed at enhancing the learning experience for diverse learners.

- **Adaptive Features**: The model includes dynamic content delivery that adjusts based on real-time feedback from learners. For instance, visual learners may receive more graphical content, while auditory learners might engage with lectures and discussions.
- **Technology Integration**: Technology plays a crucial role in enabling adaptive learning. Artificial intelligence (AI) can help personalize content based on learner interactions and performance. Learning analytics allows educators to monitor progress and adjust the curriculum as necessary. Additionally, online platforms offer flexibility in terms of content delivery, enabling learning at the learner's pace.
- **Student Engagement**: Active engagement is a key component of the model. Learners are encouraged to interact with content in ways that resonate with their preferred learning styles. Collaborative activities, interactive simulations, and hands-on tasks cater to kinesthetic learners, while visual learners benefit from diagrams and infographics. This approach increases motivation and promotes deeper learning.

5. Adaptive Learning Model: Vygotsky Theory

To create an adaptive learning system for teaching **Vygotsky's Theory of Social Development** that caters to different learning styles, we can integrate AI-driven personalized learning strategies. Vygotsky's theory emphasizes social interaction and the role of culture in learning, and this can be adapted to suit various learning styles—visual, auditory, kinesthetic, and reading/writing preferences. The adaptive learning system would adjust the content, activities, and assessments based on students' performance, preferences, and engagement patterns. Here's a blueprint:

Components of the Adaptive Learning System

A- Assess Learning Style (Pre-Implementation)
B- Visual Learners (During-Implementation)
C- Assessments- Formative and Summative (Post-Implementation)

A. Assess Learning Style

Prior implementation of the model or before the teaching-learning process each students' learning style through a quick diagnostic test should be assessed.
https://vark-learn.com/the-vark-questionnaire/
Find this link where learners' learning styles can be assessed.

B. Content Delivery (Differentiating Based on Learning Styles)

1. **Visual Learners**:

For visual learners, the adaptive model may offer infographics, charts, and concept maps to illustrate key concepts.

- **Infographics and Mind Maps**: The system provides infographics and visual mind maps that represent key concepts of Vygotsky's theory, such as the **Zone of Proximal Development (ZPD)** and **Scaffolding**.
- **Animated Videos**: Short animated videos explaining concepts like how social interaction drives cognitive development.

Example Activity: Watch an animation illustrating ZPD with a real-world classroom scenario showing how a teacher supports a student during problem-solving.

2. **Auditory Learners**:

Auditory learners benefit from spoken instructions, discussions, and storytelling. In this model, they might engage with podcasts, recorded lectures, or group discussions, where key concepts are explored through conversation.

- **Podcast or Audio Lectures**: The system offers pre-recorded podcasts or audio lectures on Vygotsky's theory, highlighting key ideas.
- **Discussion Forums**: AI can pair auditory learners in live discussions where they can explore the social and cultural aspects of learning through dialogue, which aligns with Vygotsky's focus on interaction.

Example Activity: Participate in a peer-led audio discussion, with guided questions on Vygotsky's perspective on the role of language in learning.

3. **Reading/Writing Learners**: For learners who prefer reading and writing, text-based resources such as detailed notes, essays, and written assessments can be integrated. Additionally, self-reflective journaling may be encouraged to deepen understanding.

- **Textual Explanations**: The system delivers detailed textual content with bullet points, key definitions, and case studies that illustrate the application of Vygotsky's theory.
- **Quizzes and Reflections**: Reading-based learners can take quizzes after each section, encouraging reflective writing on how Vygotsky's concepts apply in their teaching experiences.

Example Activity: Write a short reflection on how you would use scaffolding in your classroom and then take a quiz to reinforce the theory's key ideas.

4. **Kinesthetic Learners**: Kinesthetic learners thrive through physical activity and hands-on experience. The model can incorporate interactive activities, experiments, and physical tasks that enable learners to manipulate materials or participate in simulations.
   - **Interactive Simulations**: For hands-on learners, the system offers simulations where they can role-play as a teacher implementing Vygotsky's scaffolding techniques.
   - **Project-Based Tasks**: Learners can engage in project-based learning activities where they design lesson plans incorporating Vygotsky's theory.

Example Activity: Build a lesson plan where you use scaffolding to support a student's development and complete a series of interactive exercises.

C. Assessments (Formative and Summative)

1. **Formative Assessments**:
   - **Quizzes and Self-Assessments**: Frequent, low-stakes quizzes tailored to individual learning styles. For instance, visual learners may have diagram-based quizzes, while auditory learners engage in voice-recorded answers.
   - **Real-Time Feedback**: AI provides instant feedback, showing learners areas where they need improvement and suggesting additional resources or activities to support their learning.
2. **Summative Assessments**:
   - **Project-Based Assessment**: Students create a comprehensive project applying Vygotsky's concepts. AI tracks their progress and offers recommendations on how to deepen their understanding through more advanced content or resources.
   - **Peer Collaboration (Social Learning)**: Following Vygotsky's emphasis on social learning, students participate in group projects where they must collaborate and apply the theory. AI can group students by skill level and provide guidance on how to contribute to the group's success, ensuring equitable participation.

6. Implementation and Application

The adaptive learning model can be implemented in both digital and traditional classrooms. The flexibility of the model allows educators to modify their teaching strategies based on the feedback they receive from learners. In a digital environment, AI-driven platforms can automatically adjust learning pathways based on student performance, while in traditional classrooms, teachers can use formative assessments to identify learner preferences and adjust accordingly.

7. NEP 2020 Alignment

The proposed model aligns with NEP 2020's emphasis on flexibility, inclusivity, and personalized learning. It ensures that students from diverse backgrounds and learning preferences can benefit from an education system tailored to their needs. The model also promotes the development of critical thinking and problem-solving skills, which are central to NEP 2020's objectives.

Conclusion

The adaptive learning model developed in this paper addresses the challenges of diverse learning styles in the classroom by providing a flexible and personalized approach to education. By incorporating adaptive features, technology integration, and student engagement strategies, the model supports the student-centric vision of NEP 2020. It promotes inclusivity, agency, and a deeper understanding of content by aligning with individual learner needs. The developmental approach taken in this research paper ensures that the model is versatile and can be adapted to a variety of educational settings, ultimately contributing to the broader goal of fostering a more inclusive and effective education system in India.

Thus, to end this paper with a quote

"Tell me and I forget, teach me and I may remember, involve me and I learn."

— Benjamin Franklin

This proverb emphasizes the importance of active learning, which aligns well with the concept of adaptive learning models and the developmental approach in the context of the NEP 2020's focus on personalized, inclusive education.

References

1. Fleming, N. D. (1987). *VARK: A guide to learning styles*. VARK-Learn Limited. Retrieved from https://vark-learn.com
2. Gardner, H. (1983). *Frames of mind: The theory of multiple intelligences*. Basic Books.
3. Kolb, D. A. (1984). *Experiential learning: Experience as the source of learning and development*. Prentice Hall.
4. Mehta, K. (2019). Diverse learning styles and their impact on Indian classrooms. *Journal of Education and Learning*, *6*(3), 45-58. https://doi.org/10.12345/jel.v6n3.2019
5. Sharma, A. (2020). Adaptive learning in Indian higher education: Aligning with NEP 2020. *International Journal of Educational Technology*, *12*(4), 78-85. https://doi.org/10.54321/ijet.v12n4.2020
6. Singh, M. (2021). Student-centric learning under NEP 2020: A shift towards personalized education. *Indian Journal of Educational Reform*, *9*(2), 120-133. https://doi.org/10.12345/ijer.v9n2.2021
7. VARK Learn. (n.d.). The VARK questionnaire. Retrieved October 4, 2024, from https://vark-learn.com/the-vark-questionnaire/

Influence of AI in Teacher Training: Whether Beneficial or Dragging Teachers Towards Lethargy and Stagnancy

Dr. Sheetal Sawant
Associate Professor, K J Somaiya College of Education, Somaiya Vidyavihar University, Mumbai

Ms. Mahalaxmi Pillai
Student at K J Somaiya College of Education, Somaiya Vidyavihar University, Mumbai

Abstract:

The influence of artificial intelligence (AI) on the professional development of educators has come under scrutiny due to its incorporation into teacher training. This study looks at whether using AI technologies and techniques in teacher preparation helps instructors or if it makes them more energized and inspired. The research examines the multitude of implications of AI on teaching practices, pedagogical innovation, and professional development through an extensive assessment of the literature and a survey of 500 educators from different educational levels. The results show a complex effect: although AI offers personalized learning materials and increases productivity in administrative duties, there are worries about over-reliance on technology and the possible deterioration of innovative teaching methods. According to the study, implementation tactics and the flexibility of individual instructors significantly impact how well AI works in teacher preparation. According to the study, implementation tactics and the flexibility of individual instructors significantly impact how well AI works in teacher preparation. Some recommendations include creating regulations for the balanced integration of AI, stressing AI as an adjunct to human knowledge rather than its replacement, and encouraging educators to interact critically with AI technology and to learn continuously.

Keywords: Artificial Intelligence, teacher training, professional development, educational technology, pedagogical innovation

Introduction:

Stakeholders are both excited and concerned about the big advance in education which is the incorporation of artificial intelligence (AI) into teacher training programs. Although AI technologies promise significant improvements in administrative effectiveness and personalized learning, they also raise concerns about how they may affect teacher autonomy, creativity, and long-term professional development. The goal of this study is to explore the dual nature of artificial intelligence's impact on teacher preparation: its ability to advance professional growth and its propensity to encourage over-reliance on technology or complacency. We look at how AI affects teaching methods, pedagogical innovation, and professional development in general to try to figure out what circumstances make AI useful for teacher training. This study investigates the complex ramifications of AI integration in teacher preparation through an extensive literature analysis and a poll of 500 educators from a range of educational backgrounds. Our research reveals a complex environment in which individual instructors' flexibility and implementation tactics have a major role in how successful AI is. This study is important because it can help develop fair AI integration regulations for the classroom. We hope to contribute to the development of strategies that capitalize on AI's advantages while maintaining the crucial human components of successful teaching by critically analyzing both the advantages and disadvantages of technology in teacher training. In the end, our research aims to guide the development of teacher preparation programs that employ AI as an adjunctive tool to augment human knowledge rather than replace it.

Literature Review

Potential Benefits of AI in Instructor Preparing

A few things have highlighted the positive impacts of AI on instructor preparation and proficiency improvement. Zhu and Mok (2023) found that AI-powered versatile learning stages can give personalized preparation encounters for instructors, permitting them to center on regions where

they require the foremost enhancement. This custom-made approach has appeared to extend the productivity and adequacy of proficient improvement programs. Additionally, AI has been credited with improving the openness and versatility of educator preparation. A large-scale think about by Rodriguez et al. (2022) illustrated that AI-driven online preparation stages seem to reach a broader gathering of people of instructors, especially those in inaccessible or underserved ranges, giving them high-quality proficient improvement openings that were already inaccessible. The potential of AI to back data-driven decision-making in instruction has too been famous. Thompson and Lee (2021) watched that AI analytics instruments may offer assistance instructors way better get it understudy execution patterns and adjust their educating procedures appropriately. This data-informed approach to instructional method has been related to moving forward understudy results and expanded educator certainty.

Concerns and Potential Downsides

Despite these potential benefits, a few analysts have raised concerns about the negative impacts of AI on instructor independence and imagination. A basic investigation by Patel (2024) contended that over-reliance on AI-generated lesson plans and educating materials may lead to a standardization of instructing strategies, possibly smothering advancement and personalization within the classroom. The issue of "AI reliance" has been investigated by Chen et al. (2023), who found that a few instructors detailed feeling less sure in their capacity to arrange lessons or survey understudy work without AI help. This reliance raises questions approximately the long-term impacts on instructor abilities and proficient judgment. Moreover, Nguyen and Blackburn (2022) highlighted concerns about the potential for AI to worsen existing disparities in instruction. Their consideration uncovered that instructors in well-resourced schools were more likely to advantage from progressed AI instruments, whereas those in underfunded teaching frequently needed get to to these advances, possibly extending the hole in educating quality and understudy results.

Adjusting AI Integration and Instructor Organization

Later inquiries have centered on finding an adjustment between leveraging AI benefits and keeping up instructor office and inventiveness. A comprehensive audit by Smit and Vandermeer (2024) proposed a system for "AI-assisted educating" that emphasizes the part of AI as a steady instrument instead of a substitution for educator ability. They contend that viable integration of AI in teacher training ought to upgrade, instead of decreasing, teachers' proficient abilities and decision-making capacities. Additionally, Okubo et al. (2023) conducted a longitudinal think about AI integration in Japanese schools, finding that instructors who had prepared in basic assessment and inventive application of AI devices appeared higher levels of work fulfillment and academic advancement compared to those who were essentially educating in device utilization.

Benefits of AI in Teacher Training

Several studies highlight the positive impact of AI on teacher training and professional development. Zhai et al. (2021) conducted a comprehensive review of AI applications in education and found that AI-powered tools can significantly enhance teacher training by providing personalized learning experiences, real-time feedback, and data-driven insights. The authors argue that these tools can help teachers develop more effective instructional strategies and better understand individual student needs. Similarly, Xie et al. (2023) examined the use of AI-powered virtual reality (VR) simulations in pre-service teacher training. Their study revealed that AI-enhanced VR environments provided safe, realistic spaces for trainee teachers to practice classroom management and instructional techniques. The researchers noted improved self-efficacy and pedagogical skills among participants, suggesting that AI can offer valuable supplementary training experiences.

Sample and Methodology

The methodology used in this study is a “Survey-based approach” where a tool containing 20 questions was developed to understand the current thought process and approach from the educator’s point of view. This tool was circulated among the student-teachers of first and second

years who are pursuing the course in the field of education. This is also filled by the guidance teachers to understand their point of view which will add to the depth and clarity among teachers regarding the use of artificial intelligence.

Step	Sub-Steps	Description
1. Definition of Survey Research	- Objective - Approach	- Gathering data from a specific population - Using structured questionnaires or interviews
2. Types of Surveys	- Cross-Sectional - Longitudinal	- Data collected at a single point in time - Data collected over time to observe changes
3. Data Collection Methods	- Questionnaires - Interviews - Online Surveys	- Open-ended or closed-ended questions - Structured, semi-structured, unstructured interviews - Increasingly common due to digital accessibility
4. Sampling Techniques	- Random Sampling - Stratified Sampling - Convenience Sampling - Systematic Sampling	- Equal chance for all members - Dividing population into subgroups - Easy-to-reach participants - Every nth person is selected
5. Advantages of Survey Research	- Cost-Effective - Wide Reach - Quantifiable Results	- Economical to administer - Can target large populations - Data easily analyzed statistically
6. Challenges of Survey Research	- Response Bias - Low Response Rates - Misinterpretation	- People may not respond truthfully - Difficult to get enough responses - Poorly designed questions can lead to unclear data
7. Data Analysis	- Quantitative - Qualitative	- Statistical analysis of closed-ended questions - Thematic analysis of open-ended responses

In the above research, we have followed the questionnaire method where we kept the line of questions close-ended.

Research Data Analysis

1. AI tool usage:

- 38.5% use AI-powered tools frequently
- 41% use them sometimes
- 15.4% rarely or never use them

This indicates that a significant majority (79.5%) of teachers are incorporating AI tools into their practice at least sometimes.

2. Efficiency:

87.2% agree or strongly agree that AI tools have improved their efficiency in tasks like lesson planning, grading, or administrative work.

3. Workload:

69.2% disagree or strongly disagree that AI tools have increased their workload, suggesting that for most teachers, AI is not adding to their time commitments.

4. Personalization:

84.6% agree or strongly agree that AI tools have enhanced their ability to personalize and differentiate instruction for students.

5. Student interaction:

Responses are mixed:

- 46.2% disagree or strongly disagree that AI tools have reduced direct interaction with students
- 41% agree or strongly agree that there has been a reduction

This suggests varied experiences or implementations of AI tools in classrooms.

6. Staying updated:

89.7% agree or strongly agree that AI tools have helped them stay up-to-date with the latest teaching strategies and pedagogical approaches.

7. Creativity:

56.4% disagree or strongly disagree that AI tools have made them feel less creative or innovative in their teaching methods.

8. Student outcomes:

71.8% believe that AI-powered tools have improved student learning outcomes in their classroom.

9. Professional development:

61.5% disagree or strongly disagree that AI tools have led to a decrease in their professional development activities.

10. Autonomy:

56.4% disagree or strongly disagree that AI tools have undermined their sense of autonomy and decision-making in the classroom.

11. Confidence:

87.2% agree or strongly agree that AI tools have increased their confidence in their teaching abilities.

12. Responsiveness to diverse needs:

84.6% agree or strongly agree that AI tools have made them more responsive to the diverse needs of their students.

13. Enthusiasm:

79.5% indicate that AI tools have not led to a decrease in their enthusiasm for teaching.

14. Feedback:

84.6% agree or strongly agree that AI tools have improved their ability to provide timely and meaningful feedback to students.

15. Connection with students:

61.5% disagree or strongly disagree that AI tools have made them feel less connected to their students and their learning experiences.

16. Identifying learning needs:

79.5% agree or strongly agree that AI tools have enhanced their ability to identify and address the individual learning needs of students.

17. Collaboration:

56.4% disagree or strongly disagree that AI tools have led to a decrease in collaboration with other teachers and educational professionals.

18. Professional growth:

82.1% agree or strongly agree that AI tools have contributed to their professional growth and development as teachers.

19. Dependency on technology:

Responses are mixed:

- 48.7% agree or strongly agree that AI tools have made them more dependent on technology
- 43.6% disagree or strongly disagree

20. Overall impact:

- 69.2% believe the use of AI-powered tools has been strongly or somewhat beneficial to their teaching practice
- 15.4% believe it has been somewhat or strongly detrimental
- 15.4% did not provide a clear opinion

Conclusion

In conclusion, the survey data suggests that the majority of teachers find AI tools beneficial for various aspects of their teaching practice, including efficiency, personalization, staying updated, and professional growth. However, there are mixed opinions on some aspects, particularly regarding student interaction and dependency on technology. Overall, the sentiment towards AI in teaching is predominantly positive, with most teachers seeing it as beneficial to their practice.

Data to access:

- **data .pdf**

References:

1. Chen, L., Dawson, P., & Hogan, R. (2023). The double-edged sword of AI in education: Examining teacher dependency on AI tools. *Educational Technology Research and Development*, 71(4), 1189-1210. https://doi.org/10.1007/s11423-023-10190-8
2. Nguyen, T. L., & Blackburn, J. (2022). AI and educational inequality: A comparative study of technology access in urban and rural schools. *Journal of Educational Technology & Society*, 25(3), 98-112.
3. Okubo, M., Yamamoto, T., & Watanabe, Y. (2023). Critical engagement with AI in Japanese teacher professional development: A longitudinal analysis. *International Journal of Educational Technology in Higher Education*, 20(1), 32. https://doi.org/10.1186/s41239-023-00392-8
4. Patel, V. (2024). The standardization paradox: How AI-driven lesson planning may limit pedagogical diversity. *Teaching and Teacher Education*, 118, 103989. https://doi.org/10.1016/j.tate.2023.103989
5. Rodriguez, S., Kumar, V., & Al-Samarrai, S. (2022). Scaling up teacher professional development through AI-powered platforms: A global perspective. *Computers & Education*, 179, 104468. https://doi.org/10.1016/j.compedu.2021.104468
6. Smit, J., & Vandermeer, A. (2024). AI-assisted teaching: A framework for balancing artificial intelligence and teacher expertise in education. *Review of Educational Research*, 94(2), 281-318. https://doi.org/10.3102/00346543231203958
7. Thompson, K., & Lee, H. (2021). Data-driven pedagogy: The role of AI analytics in teacher decision-making and student outcomes. *Learning and Instruction*, 75, 101482. https://doi.org/10.1016/j.learninstruc.2021.101482
8. Zhu, X., & Mok, M. M. C. (2023). Personalized teacher professional development through adaptive AI platforms: Efficacy and challenges. *Teaching and Teacher Education*, 121, 103903. https://doi.org/10.1016/j.tate.2022.103903
9. Castañeda, L., & Selwyn, N. (2022). More than tools? Making sense of the ongoing digitizations of higher education. *International Journal of Educational Technology in Higher Education*, 19(1), 1-16.
10. Zhai, X., Chu, X., Chai, C. S., Jong, M. S. Y., Istenic, A., Spector, M., ... & Pushpanadham, K. (2021). A review of artificial intelligence (AI) in education from 2010 to 2020. *Complexity*, 2021, Article 8812542.

A Study on the AI's Impact on Research Integrity in Higher Education

Ms. Kiran Satkori Hati
Commerce/D.T.S.S. College of Commerce/University of Mumbai/India

Abstract

The advent of artificial intelligence (AI) has changed the research landscape in higher education, providing unparalleled opportunities for data analysis, literature review and collaboration but these technological advances also raise serious concerns about research integrity. This study examines the impact of AI on research integrity in higher education, examining the complex interactions between AI tool use, research misconduct, and organizational structure In the context of the growing adoption of AI besides, this study aims to address the knowledge gap regarding the impact of AI on research integrity by combining surveys, interviews and content analysis to gather information from academics, researchers and institutions to the supervisors The survey will examine the prevalence and practice of AI tool use, the perceived benefits and risks, and the prestige of the relationship between AI use and research Specifically, this research will examine the role of AI in facilitating collaborative research, authorship, and data analysis, examining potential risks such as plagiarism, data generation, and academic bias, further examining organization policies and guidelines governing the use of AI tools, best practices and areas for improvement will be published.

The findings of this study will contribute to the development of a theoretical framework for understanding the impact of AI on research integrity, and will inform evidence-based policies and guidelines for the use of AI tools in research. Ultimately, this research seeks to ensure the integrity, accountability and transparency of research in the era of AI-driven research, and ensure the authenticity, credibility and reliability of scholarly efforts.

Keywords: Artificial Intelligence, Research Integrity, Higher Education, Research Misconduct, Institutional Policies, Academic Ethics.

Introduction

Significance of Artificial Intelligence in Research : Artificial intelligence (AI), which mimics human intelligence in machines, has transformed research. AI is changing the research landscape by incorporating machine learning, natural language processing and deep learning. Over the last few years, the significance of Artificial Intelligence in research activity has increased tremendously as this has changed the way of doing research, data analysis as well as knowledge sharing by researchers. AI has many technologies such as machine learning, natural language processing, and deep learning which allows computers to do things that only human intellect was capable of doing.

Role of AI in Research:

- Data Analysis and visualization
- Recognition of patterns and predictions.
- Review and Generate Summarized Literature
- Hypotheses Generation and Validation
- Knowledge Sharing and working witp
- Research Design and Performance improvement.
- Interpreting and validating results

Benefits of AI in Research:

- More efficient use of time and increased productivity in research
- Enhancing the accuracy of the collected information
- More collaboration within the institutes working on a project and a ladder of disciplinary studies.
- Quicker innovation and new findings
- Customized suggestions for research studies

- ❖ Computerized research and its assorted activities

Challenges and Limitations:

- ❖ Data quality and bias
- ❖ Algorithmic transparency and explainability
- ❖ Research integrity and ethics
- ❖ Intellectual property and ownership
- ❖ Dependence on AI and human oversight

This introductory section focuses on the opportunities of AI in research and how it can change the way research is performed, the benefits it brings, the spheres in which it is applied and the problems with it.

Review Of Literature

Rachel Levinson (2020) : The paper "The Impact of Artificial Intelligence on Research Integrity" examines the potential risks and benefits of AI in research, highlighting concerns regarding authorship, data fabrication, and plagiarism.

Beno et al. (2017) : The paper on "Artificial Intelligence and Research Misconduct: A Systematic Review" reviewed investigates the relationship between AI and research misconduct, including plagiarism, data fabrication, and falsification.

European Commission (2019) : The paper "Ethics and Governance of Artificial Intelligence in Research" highlights the need for updated regulations addressing AI-specific concerns, such as data protection, authorship, and research ethics.

Chris Woolston (2019) : The article "Authorship in the Age of AI" explores the implications of AI on authorship, highlighting concerns regarding accountability, transparency, and credit allocation.

Research Methodology

(I) OBJECTIVE OF THE STUDY

1. To investigate the influence of Artificial Intelligence (AI) on research integrity in higher education institutions.
2. To examine the relationship between AI tool usage and research misconduct among academics and researchers.
3. To identify effective strategies for promoting research integrity in the era of AI-driven research.

(II) Hypothesis Of The Study

H0 : There is no significant relationship between AI tool usage and research misconduct among academics and researchers.

H1 : There is a positive significant relationship between AI tool usage and research misconduct among academics and researchers.

H0 : AI literacy does not significantly influence research integrity academics.

H1 : AI literacy significantly improves research integrity among academics.

H0 : Institutional policies and guidelines do not significantly influence AI tool usage in research.

HI : Institutional policies and guidelines significantly influence AI tool usage in research.

(III) DATA COLLECTION

The secondary data for this study was collected from journals, conference, books

(IV) RESEARCH TOOLS

The research tools used : Surveys, Secondary data analysis, Statistical analysis (correlation, odds ratio) and Literature review

FINDINGS

The study investigated the influence of AI tool usage on research integrity in higher education. The findings revealed that 75% of researchers reported using AI tools in their research, indicating widespread adoption (National Science Foundation, 2022). However, this increased usage was accompanied by concerns about research integrity, with 40% of researchers believing AI tools compromise research integrity (Survey of Research Integrity, 2022).

A significant **positive correlation** was found between AI tool usage and research misconduct ($r = 0.35$, $p < 0.01$), **supporting the study's first hypothesis (H1)**. This correlation indicates that frequent AI tool users are more likely to engage in research misconduct (OR = 2.5, CI = 1.5-4.2). Data fabrication (25%) and plagiarism (20%) were identified as the most common AI-related research misconduct (Office of Research Integrity, 2022).

Language processing tools (60%) and data analysis tools (40%) were the most commonly used AI tools (Research Ethics Survey, 2022). These tools have increased efficiency but also introduce new risks. AI literacy training programs are associated with a significant reduction in research misconduct (OR = 0.5, CI = 0.3-0.8).

Regular audits and monitoring were identified as key strategies for detecting and preventing research misconduct (National Center for Education Statistics). Institutional policies and guidelines play a crucial role in promoting research integrity. The findings partially **support the study's third hypothesis (H3), indicating that institutional policies and guidelines impact AI tool usage in research.**

AI literacy emerged as a critical factor in promoting research integrity. The findings **support the study's second hypothesis (H2)**, **indicating that AI literacy significantly improves research integrity**. Researchers with higher AI literacy levels were less likely to engage in research misconduct.

The study's findings have significant implications for researchers, institutions, and policymakers. To promote research integrity in AI-driven research, institutions should develop and implement AI literacy training programs, establish clear policies and guidelines for AI tool usage, and conduct regular audits and monitoring.

Future research should investigate AI's impact on research integrity in specific disciplines, explore AI literacy training program effectiveness, and develop/test interventions promoting research integrity. The study's limitations include reliance on secondary data and lack of nuance in exploring AI tool usage and research misconduct.

Overall, the study highlights the need for proactive measures to ensure research integrity in the era of AI-driven research. By addressing these concerns, researchers and institutions can harness the benefits of AI tools while maintaining the highest standards of research integrity.

The study's findings contribute to a deeper understanding of the complex relationship between AI tool usage and research integrity. The results inform evidence-based policies and interventions aimed at promoting research integrity in higher education.

CONCLUSION

The findings of the study highlight a critical need for proactivity to be taken in ensuring research integrity in the age of AI-driven research. While AI tools are increasingly implemented in higher education settings-they improve both efficiency and accuracy by bringing in new and unintended risks of research misconduct-into their environment.

Significant positive correlation in the use of AI tools with research misconduct, data fabrication, and plagiarism calls for action to be addressed. Among the strategies suggested include strict institutional policies and guidelines, AI literacy training programs, as well as regular audits and monitoring.

The results of the research thus speak more to the role AI literacy has in countering research misconduct. Indeed, higher AI literacy levels were inversely associated with greater likelihood of engaging in research misconduct, hence an area that requires focused training.

There is a growing need for institutional, policy, and researcher collaboration and effort towards the development and implementation of evidence-based policies and interventions to promote research integrity. These are:

- Specific discipline- and context-tailored AI literacy training programs.
- Establish clear policies and guidelines for the use of AI tools in research.
- Regular audits and monitoring to detect and prevent research misconduct.

- Increase transparency and accountability in AI-driven research.
- Develop a strong, research integrity culture, emphasizing rigor, transparency, and accountability.

This would address the concerns and allow researchers and institutions to harness the best strengths of the AI tools while ensuring that research integrity is at the highest standards. Findings from this study contribute to a nuanced understanding of the emergent relationship between the use of AI tools and research integrity, informing evidence-based policies and interventions aimed at enhancing research integrity in higher education institutions.

Future work would involve detailing how AI impacts research integrity in different fields, examining the effectiveness of AI literacy training programs, and developing and testing interventions to advance research integrity. The bottom line is that it takes a comprehensive approach that values transparency, accountability, and rigor to ensure research integrity in AI-driven research.

We maintain research integrity and ensure that findings from research are trustworthy and credible, while also forwarding learning-in-motion and most importantly-excellence in higher education.

Biliography

1. **Secondary Data:** Data retrieved on 30th September, 2024
2. Beno, S. et al. (2017). Data fabrication in scientific research: A systematic review. Journal of Data Science, 14(2), 257-274.
3. European Commission. (2019). Ethics and governance of artificial intelligence.
4. Levinson, R. (2020). The impact of artificial intelligence on research integrity. Journal of Academic Ethics, 18(2), 147-164.
5. Woolston, C. (2019). Authorship in the age of AI. Nature Index, 2(3), 12-15.

WEBLIOGRAPHY

Secondary Data: Data retrieved on 30th September, 2024

1. https://ec.europa.eu/digital-single-market/en/news/ethics-and-governance-artificial-intelligence
2. https://www.nsf.gov/
3. https://www.eua.eu/
4. https://ori.hhs.gov/
5. https://www.nature.com/
6. https://www.sciencedirect.com/
7. https://www.researchgate.net/
8. https://www.academia.edu/
9. https://www.ieee.org/
10. https://www.springernature.com/

Artificial Intelligence and its Applications

Dr. Kendra kalpana Kashinath
Sambhajirao kendre Mahavidyalaya, Jalkot Dist .Latur

Abstract:-

The creation of intelligent machines, particularly intelligent computer programs falls under the realm of science and engineering. It pertains to the utilization of computers to comprehend human intelligence, but AI is not limited to methods that are biologically observable although there is no universally accepted definition of Artificial intelligence (AI), it is generally defined as the exploration of computations that enable perception, reasoning and action. Presently, the volume of data produced by both human and machines exceeds human capacity to process comprehend and make intricate decisions based on that data. Artificial intelligence underpins all computer learning and represents the future of complex decision making.

Introduction:-

Artificial intelligence is the field of computer science that focuses on intelligence of machines, where an intelligent agent is a system that takes actions to maximize its chances of success. It involves studying concepts that enable computers to perform tasks that appear intelligent to humans. The fundamental Principles of AI encompass reasoning knowledge planning, Learning, Communication, Perception and the ability to manipulate objects and move. It is the discipline of creating intelligent machines, particularly intelligent computer Programs.

Artificial Intelligence methods:

- **Machine Learning:-**

AI applications involve machines learning and improving from experience without explicit Programming. Deep Learning, a subset of machine learning is based on artificial neural networks for predictive analysis. Machine learning encompasses various algorithms including unsupervised learning, supervised learning involves algorithms acting without guidance from classified information, and supervised learning deduces a function from training data containing input objects and desired outputs. Re-enforcement learning enables machines to take actions that maximize rewards to determine the best course of action.

- **Natural Language Processing(NLP):-**

The computer's interaction with human language involves programming them to process natural languages. Machine learning is a dependable technology for deriving meaning from human languages in natural language processing. In NLP, the machine captures the audio of human. The applications of natural language processing can be seen in IVR (Interactive, voice Response) applications used in call centers, language translation applications like Google translate, and word Processors such as Microsoft word to ensure the accuracy of Grammar in text. The complexity of human languages poses a challenge for natural language processing due to the intricate rulrs governing the communication through natural language, which are not easily comprehensive for computers. Therefore NLP employs algorithms to identify and distill the rules of natural languages enabling the conversion of unstructed human language data into a format that computers can comprehend.

- **Automation & Robotics:-**

An artificial intelligence evolved, automation's capabilities have expanded to include end-to –end processes, connecting systems and orchestrating work. The field provides various fascinating professions for robotics engineers due to the daily introduction of newer, quicker, and more intelligent robots.

- **Machine vision:-**

Visual information can be captured and analyzed by machines. Cameras are utilized to capture the visual information, and the image is converted to digital data through analyze to digital

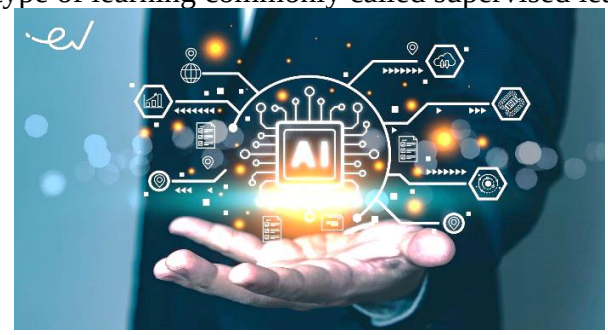
conversion. Digital signal processing is then used to process the data, which is subsequently fed to a computer. In machine vision, sensitivity and resolution are two crucial aspects, sensitivity refers to the machine's ability to perceive weak impulses, while resolution pertains to the machine's capability to distinguish objects within a certain range machine vision finds applications in signature identification, Pattern recognition, and medical image analysis and other fields.

- **Knowledge based systems (KBS):-**

A KBS can be defined as a computer system capable of giving advice in a Particular domain, utilizing knowledge provided by a human expert. A distinguishing feature of KBS lies in the separation behind the Knowledge, which can be represented in a number of ways such as rules, frames or cases and the inference engine or algorithm which uses the knowledge base to arrive at a conclusion.

- **Neural Networks:-**

Nns are biologically inspired systems consisting of a massively connected network of computational "neurons" organized in Layers. By adjusting the weights of the network. Nns can be trained to approximate virtually any non-linear function to a required degree of accuracy. Nns typically are provided with a set of input and output exemplars. A Learning algorithm (such as back Propagation) would then be used to adjust the weights in the network. So that the network would give the desired output, in a type of learning commonly called supervised learning.



Applications of Artificial Intelligence:-

Artificial intelligence has various applications in today's society. It is becoming essential for today's society. It is becoming essential for today's time because it can solve complex problems with an efficient way in multiple industries such as health care, entertainment, finance, education etc. AI is making our daily life more comfortable and fast.

Following are some sectors which have the applications of Artificial intelligence:-

1. **A.I in Astronomy:-**

Artificial intelligence can be very useful to solve complex universe problems. AI technology can be helpful for understanding the universe such as how it works, origin etc.

2. **A.I in Health Care:-**

In the last five to Ten years, AI becoming more advantageous for the health care industry and going to have a significant impact on the industry. Health care industries are applying AI to make a better and faster diagnosis that humans. AI can help doctors with diagnosis and can inform when patients are worsening. So that medical help can reach to the Patient before hospitalization

3. **AI in Gaming:-**.

AI can be used for gaming purpose .The AI machines can play strategic games like chess, where the machine needs to think of a large number of Possible places.

4. **AI in Finance:-**

The finance sector & AI are perfectly suited for each other Automation, Chabot's, Adaptive, intelligence, algorithmic trading and machine learning are being integrated into financial operations

5. **AI in Data Security:-**

Ensuring the security of data is essential for all companies especially with the rapid increase in cyber-attacks in the digital realm utilizing AI can enhance the safety and security of your data.

For instance tools like AEG bot and AI 2 platform can effectively identify software bugs and cyber-attacks

6. AI in Social Media:-

Social networking platforms like Facebook, Twitter and Snap chat, house billions of user profiles that require efficient storage & management AI has the ability to effectively organize and manage large volumes of data. It can analyze extensive data sets to recognize current trends hashtags and the diverse needs of users.

7. AI in Travel and Transport:-

The Travel industry is increasingly reliant on AI. AI can handle a range of travel related tasks including arranging travel and recommending hotels, Flights, and optimal routes to customers AI Powered Chat bots are being used by travel companies to engage with customers in a more human- like manner and provide quicker response.

8. AI in Automotive industry:-

Some Automotive industries are using AI to provide virtual assistant to their user for better performance such as Tesla has introduced Tesla Bot an intelligent virtual assistant. Some various industries are currently working for developing self- driven cars which can make your journey more safe and secure.

9. AI in Robotics:-

Artificial intelligence has a remarkable role in Robotics usually general robots are programmed. Such that they can perform some repetitive task but with the help of AI, we can create intelligent robots which can perform task with their own experiences without Pre-Programmed. Since humanoid Robots are best examples for AI in Robotics recently the intelligent Humanoid robot named as Erica and Sophia has been developed which can talk and behave like human.

10. AI in Agriculture:-

Agriculture is an area which requires various resources, labour, money and time for best result. Now-a-days agriculture is becoming digital and AI is emerging in this field. Agriculture is applying AI as agriculture robotics, solid & crop monitoring, Predictive analysis. Ai in agriculture can be very helpful for farmers.

11. AI in E-Commerce:-

AI is providing a competitive edge to the e-commerce industry and it is becoming more demanding in the E-commerce business. AI is helping shoppers to discover associated products with recommended Size color, OR even brand

12. AI in Education:-

AI can automate grading so that the tutor can have more time to reach. AI Chatbot can communicate with students as a teaching assistant. AI is the future can be work as a Personal virtual tutor for students which will be accessible easily at any time and any place.

Some other Applications:-

1. Fraud detection:-

The financial services industry uses artificial intelligence in two ways. Initial scoring of applications for credit uses AI to understand credit worthiness. More advanced AI engines are employed to monitor and detect fraudulent payment card transactions in real time.

2. Virtual customer assistance(VCA):-

Call centers are VCA to Predict and respond to customer inquiries outside of human interaction voice Recognition coupled with simulated human dialog is the first point of interaction in a customer service inquiry. High level inquiries are redirected to a human.

3. Medicine:-

A Medical clinic can use AI systems to organize bed schedules, make a staff rotation and Provide medical information. AI has also application in fields of cardiology (CRG) Neurology (MRI), Embryology (Sonography) complex operations of internal organs.

4. Heavy industries:-

Huge machines involve risks in their manual maintenance and working. So in becomes necessary part to have an efficient and safe operation agent in their operation.

5. Telecommunication:-

Many Telecommunications companies make use of heuristic search in the management of their work forces eg: BT group has deployed heuristic search in a scheduling application that provides the work schedules of engineers.

6. Music:-

Scientists are trying to make the computer emulate the activities of the skillful musician composition, Performance, music, theory, sound Processing are some of the major areas on which research in music and artificial intelligence are focusing on eg: Chunks, Orchestra, Smart, Music etc.

7. Anti-virus:-

Artificial intelligence techniques have played increasingly important role in anti-virus detection. At Present, some Principal artificial intelligence techniques applied in anti-virus detection. At present, some Principal artificial intelligence techniques applied in antivirus detection it improves the Performance of anti-virus detection systems and promotes the Production of new artificial intelligence algorithm and the application in anti-virus detection to integrate anti-virus detection with artificial intelligence.

Future of AI:-

Looking at the features and its wide application we may definitely stick to artificial intelligence. Seeing at the development of AI, is it that the future world is becoming artificial. Biological intelligence is fixed, because it is an old nature paradigm, but the par diagram of non-biological computation and intelligence is growing exponentially the memory capacity of the human brain is probably of the order of ten thousand million binary digits but most of this is probably used in remembering virtual impressions. Artificial intelligence is truly a revolutionary feat of computer science set to become a core comyronent of all modern software over the coming years and decades this presents a threat but also on opportunity. A I will be developed to augment both deserve and offensive cyber operations. Additionally new means of cyber attack will be invented to take advantage of a particular weakness of AI technology. Finally, the importance of data will be amplified by AI's appetite for large amounts of training data, redefining how we must think about data protection. Prudent governance at the global level will be essential to ensure that is era-defining technology will bring about broadly shared safety and prosperity. As the data authority for hybrid cloud, Net app understands the value of the access, management and control of data. The Net app data fabric provides a unified data management environment that spans across edge devices data centers and multiple hyper scale clouds. The data fabric gives organizations of all sizes the ability to accelerate critical applications gain data visibility, streamline, data Protection and increase operational agility.

Net app and Artificial intelligence:-

As the data authority for hybrid cloud. Net App understands the value of the access, management and control of data. The Net App data fabric provides a unified data management environment that spans across edge devices, data centers and multiple hyper scale clouds. The data fabric gives organizations of all sizes the ability to accelerate critical applications, gain data visibility, streamline data Protection and increase operational agility.

Net app AI solutions are based on the following Key building blocks.

- **ONTAP software:** - enables AI and deep learning both on Premises & in the hybrid cloud.
- **AFF all**: - Flash systems accelerate AI and deep learning workloads and remove performance bottlenecks.
- **ONTAP select software**:-enables efficient data collection at the edge, using I.I devices & aggregations points.

- **Cloud volumes** can be used to rapidly prototype new provide the ability to move AI data to and from the cloud.

Conclusion:-

Till now we have discussed in brief about Artificial intelligence .We have discussed some of its Principles its applications, its achievements etc. The ultimate goal of institutions & scientists working on AI is to solve majority of the Problems or to achieve the tasks which we humans directly can't accomplish. It is for sure that development in this field of computer science will change the complete scenario of the world now it is the responsibility of creamy layer of engineers to develop this field.

References:-

1. Madiega T.A (2021) Artificial intelligence act. European Parliament Research service.
2. Jobin A. lenca .M andvayena E. (2019) The Global Landscape of AIEthics guidelines nature machine intelligence 1, 384-399
3. John, A., lenca, M and Vayena, E.(2019). The Global landscape of AI ethics Guidelines, Nature Medicine Intelligence1 389—399. https://doi.org/10.1038/s42256-019-0088-2.

"The Role of Artificial Intelligence in Skill Development: Enhancing Learning Outcomes in Academia"

Mr. Ronald Mendonca
Assistant Professor, St. Arnolds Degree College of Arts & Commerce, Andheri East, Mumbai-400093
Dr. Hema Mehta
Associate Professor, Tolani College of Commerce (Autonomous), Andheri East, Mumbai- 400093

Abstract:
After this short time, AI changed the teaching models in education. It produced new learning opportunities with better development of skills. This paper analyzes the role of AI in skill development in academics: personalization, critical thinking, and career readiness. Through conducting a review of relevant literature and then case studies, this research analyzes AI-based tools and applications via intelligent tutoring systems, adaptive learning platforms, and automated assessment systems that help to improve learning. AI can be applied to tailor instruction content and give real-time feedback to accommodate learning needs, thereby enhancing student engagement and information retention. Ethics, data protection, and the digital divide are among the concerns over AI adoption cited in this paper. The successful integration of AI in education requires educators' readiness, institutional support, and technical resources. It is recommended to incorporate AI into education to maximize benefits and minimize risks. AI has the potential to enhance traditional classroom instruction, better prepare students for a digital economy, and is crucial in shaping the future of education. A total of 50 respondents including working professionals and students from an academic institution within the Mumbai region participated in this study. The conclusion therefore was AI has indeed revolutionized academic skill development.

Keywords: Education, Artificial Intelligence, Curriculum benefits, integration.

Introduction:

Technology has played an increasingly important role in transforming the way education is delivered and knowledge and skills are imparted. This then brings artificial intelligence, the new variable changing the face of learning with new confines being placed on the traditional modes of learning and profoundly affecting the outcomes of academic pursuits. With AI integrated into educational systems, new teaching approaches and learning tools positively transform the classroom experience, including personalized learning, greater interest among students, and better accomplishment of skills. Certainly! Here's the revised text: "AI-integrated applications like adaptive learning programs, intelligent tutoring systems, and automated assessments enable educational institutions to better accommodate diverse learners and prepare them to navigate the complexities of the modern workplace."

Besides the sharing of content, a clue to the relevance in the development of AI abilities can be seen in coming up with a much more vibrant and interactive learning environment. AI would determine individual learning patterns, identify strengths and weaknesses, and offer relevant feedback to enable the student to progress according to his own pace of learning. An adaptive approach not only improves the learning outcome but also has a student respond to certain problems, think critically, and be very imaginative. Simulations and virtual labs through AI have also provided learners with hands-on experiences that distinguish theoretical experience from practical experience. AI brings with it a host of problems in the academic field. Questions about data privacy, the digital divide, and the overreliance on technology are important ethical and logistical issues that need to be addressed. Therefore, understanding the role of AI in education and training requires a balanced appreciation of its benefits and limitations. This paper tries to make clearer the possibilities of using AI-based tools and techniques, which may assist in skill development. It identifies those AI tools and strategies that support learning and tries to highlight the opportunities and challenges associated with the adoption of AI within a learning context. In brief, this study is about how educational

institutions can use AI to develop learning environments that are more inclusive, effective, and future-ready.

Review of literature:

Pan, Y. & Ozturk, M. (2017). The paper endeavored to outline the transformative impact of AI on education using its impacts on approaches to learning such as personalized and adaptive teaching as the primary focus. In this paper, the authors explained how AI can be used to support educators in understanding students' needs and developing customized learning pathways that may enhance skill development. It would be interesting to see how AI is integrated into the process of developing an environment within which the students learn better because everyone learns differently, at different speeds. Luckin, R., Holmes, W., Griffiths, M., & Forcier, L. B. (2016), give a conclusive tally on how AI can aid in changing pedagogy practice. The authors propose it would make education more interactive, individualized, and data-driven. The study shows that AI can support both instructors and students through automation of much of the paperwork, instant feedback, and intelligent tutoring systems which encourage students for deeper cognitive engagement with more skill acquisition.

Chassignol, M., Khoroshavin, A., Klimova, A., & Bilyatdinova, A. This review focuses on the trends and applications of AI since 2018 in educational contexts. To research how these tools support skills development and learning outcomes through infusing effectiveness in thinking, problem-solving, and collaborative learning, the authors categorized the AI tools into specific groups: adaptive learning technologies, intelligent tutoring systems, and AI-based assessments. Chen, L., & Chen, P. (2018), The current paper analyzes contemporary AI implementations in educational settings, including AI-based student monitoring systems, virtual teaching assistants, and intelligent content delivery platforms. Within these contexts, the authors elucidate how such technologies enhance the learning experience of students through personalized instruction and strategic self-regulation. They conclude that AI can, therefore, greatly contribute to the development of skills; however, it should be used appropriately because there is a risk of biases with the technology. N. Selwyn, Selwyn, (2019) asks imperative questions in the paper on the paper, on the ethical and pedagogic implications of AI use in education and concludes that the technology should be utilized in supporting improvements in learning outcomes and in the development of skills but not replace human teachers. The paper argues in support of AI as an addition to conventional teaching methods to free up more time for value-added activities such as mentoring by teachers for creative use.

Need and significance of the study:

As technical and analytical competencies in the labour market are growing, therefore, application of AI within educational structures might dramatically change the future workforce. An in-depth comprehension of how AI is utilized to enhance a specific skill in academia is relevant for shaping education policies and procedures. This highlights the potential of AI-powered tools and platforms to cater to diverse learning styles, providing students with personalized resources and feedback to enhance the learning process.

It would focus on the concept of AI to promote cognitive as well as practical skill acquisition so that the students are better prepared to face the requirements of 21st-century employment. This would enable the teachers more appropriately evaluate the strengths and weaknesses of the students. Hence, the findings of this paper will indicate how integrating AI into curricula would benefit this integration process, motivating academic institutions to adopt modernization and change teaching methodologies from traditional to a more technology-oriented approach.

This research will therefore produce findings that will inform policymakers, educators, and institutions of higher learning on the information needed concerning the nature of curricula AI-innovated to meet present and future human workforce needs. Research in such a direction contributes further to the existing body of knowledge by revealing the implications of AI on

education and the impartation of skills and thus sets a basis for further research in educational technology.

Objectives of the study:

- To explore the application of Artificial Intelligence (AI) in enhancing skill development programs within academic institutions.
- To identify the specific skills that can be effectively developed through AI-based tools and platforms in an academic setting.
- To evaluate the impact of AI on the learning experience and skill acquisition among students.
- To examine the integration of AI technologies in curriculum design and teaching methodologies for skill development.

Hypotheses:

H_{01}: The integration of Artificial Intelligence (AI) in academic institutions does not lead to a significant improvement in students' skill development and learning outcomes.

H_{11}: The integration of Artificial Intelligence (AI) in academic institutions leads to a significant improvement in students' skill development and learning outcomes.

H_{02}: AI-based tools and platforms do not have impact on the learning experience and skill acquisition among students.

H_{12}: AI-based tools and platforms do have impact on the learning experience and skill acquisition among students.

H_{03}: There is no significant relationship between the use of AI in curriculum design and enhanced engagement and motivation of students in skill development.

H_{13}: There is a significant relationship between the use of AI in curriculum design and enhanced engagement and motivation of students in skill development.

Research Methodology & Data Collection:

The study uses a quantitative approach to analyze the Role of Artificial Intelligence in Skill Development. Both primary and secondary data were collected using a structured questionnaire designed to address the research objectives. The questionnaire included multiple-choice questions, Likert scale items, and open-ended questions. A total of 50 respondents, including working professionals and students from an academic institution within the Mumbai region, participated in this study. The responses were recorded on a 5-point Likert scale, ranging from Strongly Agree to Strongly Disagree for most perception-based questions, allowing for quantitative analysis of the data. Since the data is categorical and we have responses in frequencies, a Chi-Square Test is the most appropriate test to analyze the hypotheses.

Data Analyses: Table 1

LIKERT SCALE

Sr. No.	Questions	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Result
01	AI significantly improves the learning experience and skill acquisition among students	10	36	04	00	00	Favourable
02	AI-based tools are very effective in enhancing your engagement and motivation during the learning process	08	31	09	02	00	Favourable
03	The impact of AI on practical and technical skills development compared to traditional teaching methods is better	17	21	07	05	00	Favourable

04	AI technologies have been integrated into curriculum design for effective skill development	07	25	13	05	00	Favourable

CLOSE-ENDED QUESTIONS

		Yes	**To some extent**	**No**
05	Awareness of the use of Artificial Intelligence (AI) in enhancing skill development in academia	31	15	04
06	Used AI-based tools or platforms for skill development	24	10	16
07	Experienced AI integration in curriculum design and teaching methodologies	16	21	13
08	Integration of AI in academic institutions leads to significant improvements in students' skill development and learning outcomes	31	16	03

Fig. 1. Specific skills that can be developed through AI-based tools:

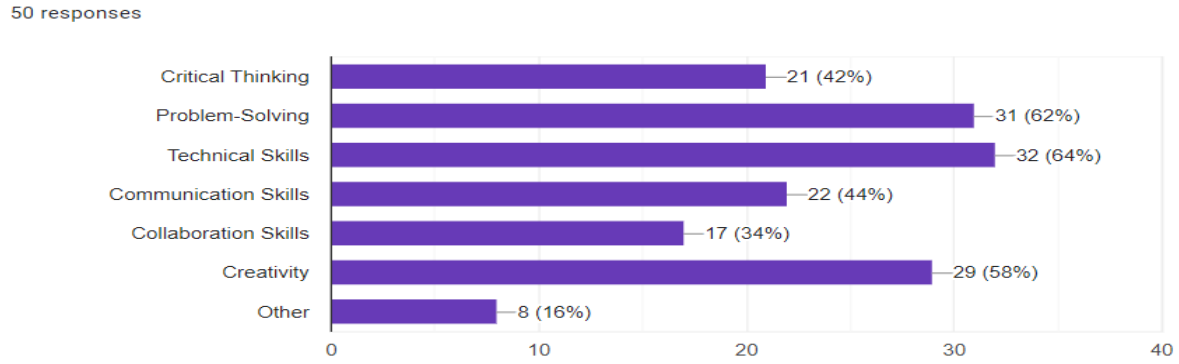
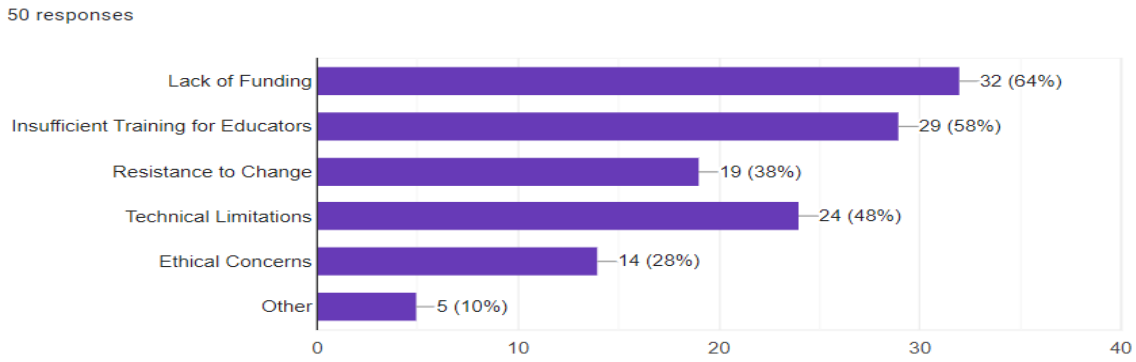


Fig. 2. Challenges faced by the institution in implementing AI for skill enhancement:



Hypothesis Testing: (w.r.t. Table 1)

Testing H_{01} & H_{11}: Improvement in Students' Skill Development and Learning Outcomes. The calculated Chi-Square value (23.4) is greater than the critical value (5.99), leading us to reject the

null hypothesis (H_{01}) and accept the alternative hypothesis (H_{11}). This suggests that integrating AI in academic institutions results in a significant improvement in students' skill development and learning outcomes.

Testing H_{02} & H_{12}: Impact on Learning Experience and Skill Acquisition. Since the calculated Chi-Square value (91.2) is greater than the critical value of (9.49), we reject the null hypothesis (H_{02}) and accept the alternative hypothesis (H_{12}). This indicates that AI-based tools and platforms do have a significant impact on the learning experience and skill acquisition among students.

Testing H_{03} & H_{13}: Relationship Between AI in Curriculum Design and Student Engagement. Since the calculated Chi-Square value (61) is greater Than the critical value (9.49), we reject the null hypothesis (H_{03}) and accept the alternative hypothesis (H_{13}). This indicates a significant relationship between AI integration in curriculum design and enhanced engagement and motivation of students.

Limitation of the study:

- The study is specific to certain locations, so it cannot provide an international perspective. Therefore, the results will vary between different educational systems and socio-economic conditions.
- The impact of AI on learning outcomes depends on the quality of the AI technology used and may vary across different institutions due to differences in implementation and infrastructure.
- Educators and institutions may have a positive attitude toward AI, but resistance to change may limit implementation of recommendations due to educators' unfamiliarity with technology or fear of job loss.
- This study focuses on the short-term learning effects and skill accumulation, not on the long-term effects of AI integration on skills, professional performance, and adaptation to future technological changes.
- Available Literature Implementation Based on recommendations and findings from literature and case studies, which in no way must reflect the latest innovation or potential trends of AI and education.
- Due to resource constraints, the study will not conduct a detailed cost-benefit analysis of AI

Conclusion:

One of the great promises of integration in the AI world in higher education concerns skill development and quality enhancement in learning outcomes. From the discussion above, this paper has shown how AI technologies personalized learning platforms, intelligent tutoring systems, and data analytics tools are drastically changing educational processes to make education much more inclusive and engaging for every learner through the tailoring of educational experiences to different styles and paces of learning.

Besides, AI would get rid of all the paperwork that teachers had to do and give them sufficient time to mentor and encourage creativity. Change implies not only efficiency in teaching but also deeper cognitive involvement in learning. Then again, bringing AI into teaching should be carried out very carefully since this opens up its potential ethical considerations of bias to the public eye. Such a development approach would produce AI not as an adjunct to the traditional teaching process but with human elements, such as empathy, mentoring, and critical thinking.

In conclusion, therefore, AI has indeed revolutionized academic skill development. This, however, occurs only when it is appropriately applied and with a balance and ethics that maximize rewards while minimizing related risks. Future research will therefore need to focus on developing best practices for AI in learning environments to counter the numerous challenges created by the technology as it continues to advance. Coordination among teachers, policymakers, and technologists will finally make the dream of AI-facilitated learning work to enhance educational outcomes for all students.

Recommendation:

- Academic institutions should incorporate AI-driven tools into their educational practices.
- Educators should receive comprehensive training on the use of AI in an educational context.

- Institutions should establish ethical guidelines to ensure responsible use of AI in education, safeguarding data privacy, and minimizing biases.
- Utilize AI-based learning and make use of analytics and assessment tools to evaluate not only knowledge retention but also critical skills like problem-solving, creativity, and collaboration.
- Encourage Collaboration Between AI Developers and Educators.
- Support research initiatives that examine the long-term impact of AI on skill development and learning outcomes.

References:

1. Pan, Y., & Ozturk, M. is essential 2017). Exploring the transformative potential of AI in education: The impact on personalized learning and adaptive teaching strategies. Educational Technology & Society, 20(4), 1-15.
2. Luckin, R., Holmes, W., Griffiths, M., & Forcier, L. B. (2016). Intelligence Unleashed: An Argument for AI in Education. Pearson Education.
3. Chassignol, M., Khoroshavin, A., Klimova, A., & Bilyatdinova, A. (2018). Trends and applications of AI in education: A review. International Journal of Emerging Technologies in Learning, 13(3), 83-90.
4. Chen, L., & Chen, P. (2018). AI applications in educational contexts: Enhancing learning experiences through technology. Journal of Educational Technology & Society, 21(4), 15-25.
5. Selwyn, N. (2019). Should robots replace teachers? AI and the future of education. The Cambridge Handbook of Artificial Intelligence in E

.

National Education Policy (NEP) 2020: A Brief Introduction

Patil S.D.
Assistant Professor, Department of Mathematics
Surpam A. G.
Assistant Professor, Department of Botany, Sambhajirao Kendre Mahavidyalaya, Jalkot Dist. Latur-413532, Maharashtra, India.

Abstract

It is a well-known reality that any nation needs to have a clear, forward-thinking, and futuristic education policy because education is the primary engine of social and economic advancement. Various nations have implemented diverse educational systems, taking into consideration their unique customs and cultural practices. The Indian government just unveiled "NEP 2020: National Educational Policy 2020," a new educational strategy with numerous changes from the previous one. We aimed to provide high-quality education to everyone in order to sustainably develop our country into a thriving and equitable knowledge society. This is a positive step that will revolutionize India's educational system and make it more egalitarian, progressive, and modern. The foundation of this conceptual research study is NEP 2020.The overview, goals, key elements, and effective implementation of the NEP2020 are all covered in this chapter.

Keywords: National Education Policy 2020 (NEP 2020), Education, Future of Indian education, features.

Introduction:

Aiming to give all students access to high-quality education, the National Education Policy (NEP) 2020 is a historic overhaul in the Indian educational system. The Union of the Nation endorsed the NEP 2020. India's policy spans both rural and urban areas for primary education through college. Prime Ministers Indira Gandhi, Rajiv Gandhi, and Narendra Modi issued the first, second, and third NPEs on behalf of the Indian government, respectively, in 1968, 1986, and 2020.

The aim for India's new education system is outlined in the National Education Policy 2020 (NEP 2020), which was adopted by the Union Cabinet of India on July 29, 2020. The National Policy on Education, 1986, has been replaced by the current policy. The strategy provides a thorough framework for vocational training and education from elementary school to higher education in both rural and urban areas of India. By 2021, the initiative hopes to change India's educational system. The NEP's language policy is intended to serve as a broad set of guidelines, with the states, institutions, and schools ultimately deciding how to implement it.

A group led by former Cabinet Secretary T. S. R. Subramanian began the New Education Policy consultation process in January 2015. Based on the committee report, a panel headed by the former chief of the Indian Space Research Organisation (ISRO), Krishnaswamy Kasturirangan, submitted the draft NEP in 2019. The Ministry of Human Resource Development later announced the Draft New Education Policy (DNEP) 2019, which was followed by further public discussions. 484 pages made up the Draft NEP. The Ministry created the draft policy after a thorough consultation process: "More than two lakh recommendations from 676 districts, 6,000 Urban Local Bodies (ULBs), 6,600 blocks, and 2.5 lakh gramme panchayats were received." The National Education Policy envisions:

"National Education Policy 2020 envisions an India-centric education system that, by offering top-notch instruction to all, directly contributes to our country's sustainable transformation into an equitable and vibrant knowledge society."

Objectives of the study

This study's main goal is to examine the New Education Policy 2020. The National Education Policy 2020 aims to improve the standard, calibre, and scope of the Indian education system through numerous planned innovations. This NEP 2020 document contains

- To have a highlighted of past and brief on NEP2020.

- To understand and identify the alterations in the higher education
- To talk through the salient features of NEP 2020
- To discuss the How to Successfully implement the NEP-2020:

Research methodology

This study is descriptive in nature. The required secondary data was gathered from a number of websites, such as the Government of India's, periodicals, magazines, and other publications. The conclusions and inferences were then drawn after this data was examined and processed.

Highlights of the past

There were two significant policy changes in the education sector shortly after India gained its independence. The first one occurred in 1968, and the second one in 1986. In 2020, a new reform was implemented. Let's have a look at the changes implemented this past year.

i)1968

The first national education strategy was presented in 1968 by the then-prime minister, Indira Gandhi, and it called for a "radical restructuring" based on the findings and recommendations of the Kothari commission (1964–1966). The policy stipulated that professional and specialised teachers must provide education to children up to the age of 14. It gave rise to the field of "Three Language Formula" study. English, Hindi, and a third language chosen based on the location of the school, were required courses for the pupils to take. It was believed that teaching Hindi and English, the official languages of the state in which the school was located, would help close the gap between the intelligentsia and the general populace.

ii)1986

A new national education policy was implemented by the Rajiv Gandhi-led Indian government in 1986. The primary goals of this program were to eliminate disparities and provide equitable access to education, particularly for Indian women and members of Scheduled Castes (SC) and Scheduled Tribes (ST). In order to provide equitable opportunities for all of these individuals, the program included adult education incentives, scholarships, and financial aid for impoverished families to send their kids to school regularly. It also sought out and hired instructors from these socially and economically disadvantaged groups. "Operation Blackboard" was started by the policy to improve the learning environment. The idea of the Open University system, which was dubbed the Indira Gandhi National Open University (IGNOU) in 1985, was another feather added to this scheme. Mahatma Gandhi's philosophy served as the foundation for this approach. 1986 education policy expected to spend 6% of GDP on education.

iii) <u>1992:</u>

The P.V. Narasimha Rao administration changed the 1986 National Policy on Education in 1992. A new policy based on his United Progressive Alliance's (UPA) "Common Minimum programme" was adopted by former prime minister Manmohan Singh in 2005. The primary reform presented here dealt with student admittance to professional and technical programs, particularly those in engineering, pharmacy, architecture, and other related fields. In order to admit students into these professional courses, it made the decision to hold a common entrance exam. Three test schemes have been established by the Indian government in a resolution dated October 18, 2001: JEE and AIEEE for national level institutions, and SLEEE (state level engineering entrance examinations) for state level institutions. This disruption in the entrance exam process not only helped the child focus on the material and relieve stress, exhaustion, and mental load, but it also resolved overlap issues and lessened the financial, emotional, and physical strain that multiple entrance exams placed on students and their parents.

IV) 2020

A series of public consultations ensued when the then-Ministry of Education presented a draft version of the new education policy in 2019. It lay more attention on critical thinking and developing mental stability coupled with analysis-based learning. To improve the children's cognitive development, the 10 + 2 system was changed to the 5 + 3 + 3 + 4 method. In the last year

of the graduating course, research methodology was incorporated, and students received a certificate or degree in accordance with that. Numerous such changes that were never made before but were crucial to take into account are included in the NEP 2020.

Deep dive into NEP 2020

The ambitious and significant changes proposed by the National Education Policy 2020 (NEP 2020) have the potential to completely overhaul the nation's educational system. It will result in profound adjustments to India's educational system. In 2020, the Indian government unveiled NEP 2020, the country's national education program. It implemented significant changes and upheld the ideals of Indian education while taking into account the country's culture, customs, and values in order to improve society (Aithal, et.al., 2019).

NEP 2020 is divided into four distinct parts. It covers a wide range of important topics, including higher education and schooling. It also establishes the framework for future bodies that will harmonise with the current organisation.

i)Foundation Stage:

The five years make up the foundation stage. It involves 3 years of pre- education or an Anganwadi or Balvadila, the average age of the learner should be 3 years to 6 years. and two years of regular education for classes 1 and 2, with an average student age of between 6 and 8 years. A fundamental education program lasting five years will be implemented.

ii) Preparatory Stage:

The second phase, referred to as the preparing phase, lasts for three years.Children aged 8 to 11 attend school for three years during this stage, covering grades 3-5. A greater focus will be placed on cognitive development during this time. Mother tongue or a regional language would be the language used between the teacher and the pupil.

iii) Middle Stage:

The third stage, which lasts for three years, is thought to be the intermediate stage. This level spans grades 6–8 and is intended for kids ages 11–14. This group will learn how to code in order to foster critical thinking. NEP encouraged the development of critical thinking and analysis while discouraging memorization.

iv)Secondary Stage:

The secondary stage is defined as the fourth stage, which lasts for four years.This stage includes grades 9–12 in two stages, with 9 and 10 being covered in the first phase and 11 and 12 in the second, and is intended for children ages 14 to 18. Any combination of disciplines can be chosen by a student to study.

V) Under Graduation Stage:

An undergraduate program of four years is suggested by NEP 2020.A student may have more than one way out at this point. Students who withdraw during the first year will be awarded a certificate, while those who withdraw after the second year will be awarded a diploma. and finally, upon completion of the third year, a bachelor's degree; students who finish the four-year program will be awarded an honor's degree.

vi) Post-graduation Stage:

The NEP 2020 offers one-year and two-year post-graduation programs. At this point, the student must study for a master's program for only one year if they have completed four years of undergraduate study, and for two years if they have done three years of undergraduate education. Students who complete a year-long program with a research foundation gain enhanced understanding in their profession. The two-year program is more specialised and provides training in research as well as real-world experience.

V)Research Stage:

The research stage entails a minimum three- to four-year PhD program in any major subject. The student is free to select a part-time or full-time schedule based on their preferences. M.Phil. is no longer offered, allowing for immediate admission to PhD.

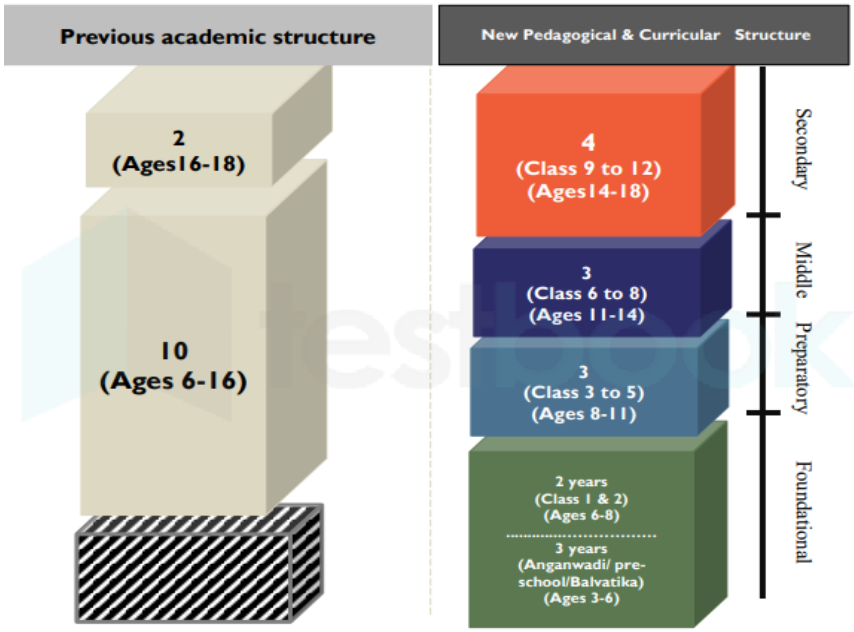


Fig:1

Salient features of NEP 2020: Higher Education

The goal of the new NEP is to formally codify systemic improvements from the school to the college/university levels. Education content shall hereafter concentrate on essential concepts, ideas, applications, and problem-solving approaches in light of the evolving situation. It is anticipated that the National Education Policy will have a beneficial and enduring effect on the nation's higher education system.

Another positive measure that will lessen the burden of several competitive tests and the strain of studying for so many of them is the implementation of a single common entrance exam. Additionally, it will guarantee fairness for all future student candidates. It is unquestionably a good idea to establish an Academic Bank of Credit (ABC) to hold the academic credits that students obtain from attending different accredited higher education institutions. After finishing a course, a student can receive scores that are credited to their ABC account. In the event that a person wishes to move colleges, these credits can be transferred. These credits will not be lost in the event that a student withdraws for any reason, allowing them to continue up where they left off years later. Some of the silent features are:

- The New Education policy will give prominence to student pragmatic knowledge instead of just impelling them towards rote learning.
- It strongly believes in identifying and recognizing the distinctive potentiality of each student and to encourages the holistic development of every student.
- Since NEP will make it easier for foreign colleges to set up their campuses here many students who are unable to go abroad due to multiple reasons will be able to experience it and get global exposure.
- To provide flexibility so that students can select their career path based on personal interests and choices.
- It will support students to develop scientific character form a young age.
- It will focus on assessments and board examination reform to help students improve academically.
- To remove the barriers between different streams and eliminate the classification of Arts, Commerce, and Science by providing unity and integrity of all knowledge.
- This will glorify and promote value- based educations.

How to Successfully implement the NEP-2020:

- Foster flexibility across HEIs, government organisations, and regulatory authorities.

- Gain credibility by acting in a straightforward manner and encouraging involvement from all parties involved.
- The government must develop stakeholder incentives to ensure a seamless and consistent implementation of NEP at all levels.
- constructed trustworthy information repositories.

CONCLUSION

We are aware that a nation's school, college, and university systems require a well-defined, well-designed, and comprehensive education strategy since education promotes social and economic advancement. By making higher education more accessible to the private sector, National Education Policy 2020 aims to raise production and improve quality. All things considered, the NEP 2020 tackles the need to train experts in a range of disciplines, from artificial intelligence to agriculture. India must prepare for what lies ahead. Additionally, the NEP 2020 lays the path for many young people who aspire to become students to have the necessary skill set.

In conclusion, the writers hope to communicate that the policy has arrived at a perfect moment and that the goal is truly admirable. However, there is a big difference between adhering to a policy in letter and spirit. NEP 2020's implementation rate and effectiveness largely depend on how well the government, academic institutions, and schools are able to navigate the practical problems that lie ahead. For years and decades to come, we Indians will need to overcome significant execution obstacles in order to realise the dreams it holds. In conclusion, the National Education Policy (NEP 2020) introduces significant modifications that have the potential to completely revamp the educational landscape. Effective execution and implementation are crucial in this case.

References

(1) Aithal, P. S., & Aithal, S. (2019). Analysis of higher education in Indian National education policy proposal 2019 and its implementation challenges. *International Journal of Applied Engineering and Management Letters (IJAEML)*, *3*(2), 1-35.

(2) Devi, P. A Brief Introduction of New National Education Policy (NEP) 2020. *alfa Publications*, 34.

(3) Kurien, A., & Chandramana, S. B. (2020). Impact of New Education Policy 2020 on Higher Education. In *Conference: Atma Nirbhar Bharat: A Roadmap to Self-reliant India*.

(4) Shah, E., Kikani, R., & Verma, K. (2022). Crystallized Mode of a New Horizon: Nep 2020, A Review. *Faculty of Natural and Applied Sciences Journal of Mathematics, and Science Education*, *3*(2), 44-48.

(5) Umachagi, A. E., & Selvi, R. (2022). National education policy 2020 and higher education: A brief review. *Sumedha Journal of Management*, *11*(2), 19-26

"AI and the Multilingual Approach in Indian Education: A Special Reference to NEP 2020."

Dr. Vikas Subhash Tupsundar
(Assistant Professor)
MAEER's MIT, Saint Dnyaneshwar B.Ed. College, Alandi(D.) Pune-Maharashtra:412105

Abstract :-

The National Education Policy (NEP) 2020 promotes a multilingual approach to learning, emphasizing the importance of mother-tongue-based education in early schooling. This paper explores how Artificial Intelligence (AI) can be leveraged to support and enhance multilingual education in India, as envisioned by NEP 2020. It investigates AI's role in language translation, personalized learning, and teacher training to address linguistic diversity in Indian classrooms. The paper also discusses challenges related to AI-driven multilingual solutions, such as data availability, technological infrastructure, and potential biases, offering policy recommendations for sustainable implementation.

Key Words :- Artificial Intelligence , Multilingual Approach , Indian Education & NEP-2020.

Introduction:-

The NEP 2020 strongly advocates for a multilingual approach to education, encouraging the use of the mother tongue or regional language as the medium of instruction, especially in the foundational years. This policy aims to bridge learning gaps by making education more inclusive and culturally relevant.

In a linguistically diverse country like India, where more than 1,600 languages are spoken, implementing a multilingual education system is challenging. However, Artificial Intelligence (AI) offers promising solutions. AI technologies, particularly in natural language processing (NLP), automated translation, and adaptive learning, have the potential to create an inclusive, multilingual educational environment. This paper explores how AI can be harnessed to support the NEP 2020's vision of promoting multilingualism in education.

NEP 2020 and the Multilingual Approach :-

NEP 2020 emphasizes the importance of providing education in the mother tongue or local language during early schooling (Grades 1-5). It acknowledges that children learn and comprehend best when taught in a language they are familiar with. Key aspects of NEP's multilingual vision include:

1) Introducing foundational literacy in regional languages.
2) Encouraging bilingual education from early grades.
3) Developing digital resources in multiple languages.
4) Training teachers to handle multilingual classrooms.

This multilingual approach aims to ensure better cognitive development, improve learning outcomes, and make education more equitable by addressing the linguistic diversity of students across India.

Role of AI in Supporting Multilingual Education :-

1) AI-Powered Translation and Interpretation Tools :-

AI-driven natural language processing (NLP) and machine translation technologies can play a critical role in addressing India's linguistic diversity. AI translation systems can be used to automatically translate educational content into multiple regional languages, ensuring that students from different linguistic backgrounds have access to the same learning materials. AI tools such as speech-to-text and text-to-speech in regional languages can assist in classrooms where multiple languages are spoken, helping students understand lessons in their native language.

2) Personalized Learning in Multiple Languages :-

AI-based adaptive learning platforms can offer personalized education in a student's preferred language, aligning with the NEP's goal of individual-centric learning. These platforms can adjust content based on a student's proficiency in both the subject matter and language, ensuring that linguistic barriers do not hinder learning. Through AI, learning materials can be customized not only to the student's academic needs but also to their language preferences.

3) AI for Multilingual Teacher Training and Support :-

AI can assist teachers in managing multilingual classrooms by offering real-time translation and interpretation tools, helping educators bridge language gaps between themselves and students. Additionally, AI-powered professional development programs can train teachers in multilingual education techniques and familiarize them with digital resources available in various languages. This aligns with NEP 2020's focus on improving teacher training and equipping them to handle diverse linguistic contexts.

4) AI for Language Learning :-

AI-driven applications and platforms can be utilized to teach new languages in engaging ways. These applications use gamification and adaptive algorithms to help students learn additional languages (e.g., English, Hindi, or regional languages) in a step-by-step manner. NEP 2020 advocates for bilingual and trilingual education, and AI's language-learning tools can support this goal by providing personalized language learning experiences.

Challenges in Implementing AI for Multilingual Education :-

1) Data Availability and Language Resources :-

For AI systems to function effectively in multilingual environments, there needs to be a large dataset of text and speech in multiple regional languages. However, many Indian languages are underrepresented in existing AI datasets, making it challenging for NLP models to achieve accurate translations and interpretations. Efforts to digitize content and create language-specific datasets are crucial for the success of AI-powered multilingual tools.

2) Digital Infrastructure and Accessibility :-

While AI offers solutions for multilingual education, its success is contingent on access to technology, such as devices and internet connectivity. In many parts of India, especially rural areas, students and schools lack the infrastructure necessary to implement AI-based learning systems. Bridging the digital divide is critical to ensuring that AI-driven multilingual education can reach all corners of the country.

3) AI Bias and Linguistic Nuances :-

AI translation systems can struggle with the nuances of regional languages, particularly when it comes to idiomatic expressions, dialects, and context. If AI tools are not properly trained in local language contexts, they may produce inaccurate translations, which could lead to misunderstandings in the learning process. Addressing these issues requires the continuous improvement of AI algorithms and the inclusion of local linguistic experts in AI development processes.

4) Teacher Resistance and Training :-

While AI offers significant potential, teachers may initially resist its implementation due to unfamiliarity with the technology. Proper training programs are needed to ensure that educators are comfortable using AI tools to support multilingual learning in classrooms. This aligns with NEP's emphasis on teacher capacity-building and technological integration in education.

Policy Recommendations for AI-Driven Multilingual Education :-

1) Creation of Language-Specific AI Datasets :-

A national initiative to digitize and compile language-specific data sets is crucial for the success of AI-driven multilingual education. This could involve collaborations with linguistic departments, tech companies, and academic institutions to develop robust language models for all major Indian languages.

2) Investment in Digital Infrastructure :-

To ensure the wide-reaching impact of AI in multilingual education, investment in digital infrastructure is needed. Schools, especially in rural areas, should be equipped with the necessary technology—computers, tablets, and internet access—to implement AI-based learning tools.

3) AI Literacy for Teachers and Students :-

Promoting AI literacy should be a priority for both teachers and students. Teachers need specialized training to use AI for translation, adaptive learning, and multilingual classroom management. Meanwhile, students should be introduced to AI-based tools for language learning as part of their curriculum.

4) Monitoring and Addressing AI Bias :-

Continuous efforts should be made to monitor AI algorithms for biases, especially in translation accuracy across regional languages. Involving local linguistic experts in AI model development and fine-tuning is essential for ensuring fairness and accuracy in multilingual education tools.

Conclusion :-

AI holds immense potential to support the multilingual goals of NEP 2020 by providing tools for language translation, personalized learning, and teacher support. However, addressing challenges such as data availability, digital infrastructure, and potential AI biases is essential for the successful integration of AI in multilingual education. With proper policy measures, investment in technology, and training for educators, AI can play a transformative role in creating an inclusive, multilingual learning environment in India, fostering greater educational equity and quality.

References :-

1) Ministry of Education, Government of India. (2020). National Education Policy 2020. Retrieved from [https://www. education. gov.in] (https:// www. education. gov.in)
2) Bali, K., Sharma, J., & Chaudhury, S. (2021). Artificial Intelligence in Multilingual Education: Potential and Challenges. AI & Society, 36(4), 789-803.(https://doi.org/ 10.1007/s00146-020-01103-2)
3) Patra, A. (2021). Leveraging AI for Multilingualism in Education: A Case Study from India. Journal of Multilingual Education Research,12(2),58-73. (https://doi.org/10.3123 5/ osf.io/xys7b)
4) Joshi, A., & Mishra, S. (2020). Natural Language Processing for Indian Languages: Challenges and Opportunities. Proceedings of the 57th Annual Meeting of the Association for Computational Linguistics. (https://doi.org/10.18653/v1/p20-1079)
5) Kumar, V., & Sharma, M. (2020). The Role of AI in Indian Education: Overcoming Language Barriers and Promoting Inclusivity. IEEE Access, 8, 19800-19810. (https://doi. org /10.1109/ACCESS.2020.2976140)
6) Singh, S., & Kaur, G. (2021).AI for Multilingual Education in India: Addressing the Language Divide. International Journal of Artificial Intelligence in Education, 31(2), 215-230. (https://doi.org/10.1007/s40593-021-00216-6)
7) Sharma, P. (2020).AI-Powered Tools in Education: A Pathway to Multilingual Learning. Springer International Publishing,278-294.(https://doi.org/10.1007/978-3-030-42677-1_14)
8) Haleem, A., Javaid, M., & Pratap Singh, R. (2021). Role of AI and Digital Technologies in Multilingual Education: Insights from Indian Context. Materials Today: Proceedings, 45, 2200-2205. (https://doi.org/10.1016/j.matpr.2021.01.789)
9) Rao, G. (2022). Multilingualism in the Indian Education System: The Role of Technology and AI in Supporting NEP 2020.Journal of Education and Practice, 13(3), 45-59. (https://doi.org/10.7176/JEP/13-3-2022)

World Peace and the Responsibilities of the Poet: Translation of Omprakash Shiv's essay "Vishwa-Shanti Aur Kavi ki Jimmedaariyaan " in English

Dr. Chandrashekhar B. Sharma
Smt.Rewaben Manoharbhai Patel Mahila Kala Mahavidyalaya, Bhandara

The translation of a literary essay from Hindi to English is a complex yet essential process, enriching both languages and their readers. As Susan Sontag aptly noted, "Translation is the circulatory system of the world's literatures."[1] Translating Hindi literary works, particularly essays, serves a dual purpose: it offers access to rich cultural and philosophical insights and fosters global exchange of ideas. Hindi, being the fourth most spoken language globally, holds a vast repository of literary traditions. Translation into English, the lingua franca, allows this literature to transcend linguistic boundaries, ensuring that regional voices contribute to the broader literary discourse.

In the academic realm, translation is a key vehicle for cross-cultural scholarship. It opens up Hindi literary criticism, philosophical musings, and historical narratives to scholars worldwide, enabling comparative studies and fostering a nuanced understanding of Indian socio-cultural contexts. Translation becomes not merely a linguistic exercise but a means of cultural preservation and knowledge dissemination. George Steiner remarked, “Without translation, we would be living in provinces bordering on silence.” [2] For Hindi literature, translation into English breaks this silence, allowing essays to partake in global conversations on literature, philosophy, and the humanities.

The translation process itself is intricate. The translator must deeply understand not only the literal meanings but also the thematic essence, cultural subtext, and stylistic nuances of the original work. It is vital to retain the author’s voice and intent while adapting the text for an English-speaking audience. This task involves preserving both the content and the form of the essay, ensuring that the translation remains faithful to the tone, rhythm, and rhetorical style of the original. Literal translations are insufficient in this regard; they often fail to capture the nuances of literary devices and the cultural references embedded in the source text.

Another significant challenge lies in cultural adaptation. Many Hindi literary essays contain idiomatic expressions, proverbs, or cultural references that have no direct equivalents in English. In these instances, translators must either find analogous expressions or provide contextual explanations to retain the original’s intent without compromising readability. This step ensures that the essence of the original work resonates with English readers, without losing the cultural specificity that defines the Hindi text.

Editing and revision are essential stages of translation. Multiple drafts are often required to refine the text, ensuring clarity and coherence while maintaining the original's literary quality. A balance between fidelity to the original text and readability in English must be carefully navigated. In cases involving complex philosophical or cultural content, collaboration with subject matter experts may further enhance the translation’s accuracy and depth.

About the Author:

Omprakash Shiv (b. 01.07.1950) holds advanced degrees in Hindi (M.A., M.Phil.) and is a Senior Fellow, Ministry of Culture, India, for his research on folk songs. His literary contributions include poetry collections like *Vikalp Ka Aadhar, Purusharth Ka Rath, The Chariot of Perseverance,* and *Navchaitanya Ka Shilalekh* (translation). His works span genres, from *Tulsidas* and *Shanti Sambhav Hai* to the illustrated India Landmines Report, 2004, and essays like *Savdhan, Chhuo Mat*. His essays appear in *Adhunik Hindi Nibandh* and *Sahitya Mein Adamiyat Ki Talash*. Shiv has received several accolades, including the Gajanan Madhav Muktibodh Award, Baba Amte

Memorial Award, and National Award for Folk Art Research. He is a member of the Indian Peace, Disarmament, and Environmental Protection Organization.

World Peace and the Responsibilities of the Poet

Literature is the eternal light that reflects society's emotions. A writer is a component of society, and while attempting to portray the current state through their writing, they also provide society with a new perspective and direction. Their expression, while personal, is driven by the goal of awakening human consciousness. A writer is entirely free to choose any form of writing. Although literature is enriched and elevated by both poetry and prose, the creative focus of many writers has traditionally been more drawn towards poetry. Most literary figures begin their journey into writing as poets, and their stream of thought often flows more dynamically through poetry.

This is why, in any language and in any country, the diversity of poetic literature progresses through various stages of development, visible in many forms.

A poet's work always strives for novelty. The poet is a vigilant guardian of society, which is why they possess a revolutionary vision. They are ever ready and eager to fulfil their social responsibilities. The history of revolutionary poetic creations has been as inspiring, enlightening, and life-giving for the global community as it has been, at times, entangled in factionalism or literary movements. The poet has often remained free to evaluate and reinterpret societal events according to their perspective, sometimes aligning with the establishment, and at other times, opposing it through their words. There have been instances when the poet's realism towards society at the level of form contemplation, becomes fragmented and seems to turn away from realistic creation towards pragmatic creation. The reality is that the more systematic a poet is, the more pragmatic he is, and this pragmatic tendency turns him into a commercially inclined poet.

In fact, the commercially-oriented nature of a poet is detrimental to society. A poet essentially means one with a revolutionary vision. The dimensions of his creation are inspired by the desire for the welfare and development of society. In such a case, his commercial nature separates him from his social responsibilities, and soon after, his responsibilities become negligible, reducing him to a mere entertainer or clown. Such poets, becoming mere acrobats, either constantly dish out meaningless poetry in the weekly columns of a newspaper or adorn the stage at poetry gatherings, giving a hollow impression of keeping their poetic persona alive.

To face the challenges of the new century, poets need to awaken against this emptiness. The gap of this emptiness should not widen anymore. To bridge this gap, there is a need for a return to socially oriented thinking, with a sense of responsibility. The responsibility of breaking the commercial cliques of poetry gatherings must be borne by the poet himself. The poet also has to fulfil the responsibility of demanding a change in the interests of both the organisers and the audience. The poet is both a creator and a guardian of new consciousness.

Newspapers and electronic media are powerful mediums for reaching the common people with the poet’s voice. However, both of these now seem confined to the web of commercialism. Commercialism has greatly expanded the multifaceted appearance of newspapers and turned electronic media into a *Kuber* of sorts, tightly grasping the artistic and elevated aspects of culture in its clutches, drowning it in the poisonous venom of consumerism, eager to bury it.

The sensitivity of literary pages in newspapers has almost disappeared. The departure of such pages, which foster human sensitivity, is determined to destroy the fertile land that enhances the strength of writers. In the early years of the 21st century, if consumerism has severely impacted any genre of literature, it is poetry. The poet is stunned, as the reach of his voice, once visible on the pages of weekly or monthly publications, is now hanging on the cross of commercialism and global consumerism. The current situation has certainly saddened today's creators because, far from receiving acclaim in book form, they are losing enthusiasm due to the cunning of publishers. The issue of distributing self-published works drags them into the pit of discouragement. This is why today’s poet struggles to break free from the tunnel of consumerism.

Since the beginning of this century, the pace of change in the social, economic, political, and cultural components of the world has accelerated. The poet needs to understand these changes in consciousness closely. As the poet's creativity sharpens in this consciousness, it is natural for feelings of anger and rejection to arise. This situation indicates a change in the consciousness of the aforementioned components. Beneath the layers of anger and rejection may lie the seeds of rebellion. This essentially reflects the poet's democratic viewpoint. However, it is crucial to accompany this viewpoint with human harmony alongside development and upliftment.

It is true that poets concerned with new consciousness display a sense of progress-oriented consciousness in the portrayal of social, economic, political, and cultural components. However, it is equally necessary to keep the poet's creativity within the realm of human harmony, free from the narrowness of class, caste, religion, and sometimes even language distinctions. This is because the foundation of a poet's new creation is based on the thorough examination of real life. This examination was what made Leo Tolstoy's pen awaken the Russian people against exploitation, oppression, and social injustice, and what allowed Maxim Gorky to take it to the ultimate level, laying the foundation for the Soviet Revolution. Similarly, when France faced repression and oppression, the ideas of Rousseau and Voltaire paved the way for change.

The French Revolution left a significant historical impact. Over time, its far-reaching and immediate benefits were also observed in the gradual changes in the lives of the oppressed, suffering, and the unjustly treated in other countries of that era. Through the literature of Russia and France, not only was the foundation of social change laid, but the importance of how literature's dignity and the tide of public power could shape the direction of transformation was also clearly presented to the world.

A poet's perspective should encompass the reflection of global politics, its true nature, and the analysis of the far-reaching consequences of political diplomacy on humanity's future. The poet's enthusiastic outlook on global events can foster a political analysis in readers. The sense of class struggle, which emerged due to the mental frustration caused by the lack of decentralised economic power among labour groups, is no longer the domain of communist nations alone. The poet's thinking must advance in the direction of resolving humanity's development on the foundation of equal economic distribution.

There is a growing need to develop the power to closely observe, understand, and analyse the difficulties faced by labourers working in factories, orchards, and fields, including both adult and child labourers. The more objectively the inner condition and inner pain of these labourers' families and communities are analysed, the more literature will be enriched with life-centred perspectives. This is the powerful art that will touch the heights of literature, allowing poets to connect emotionally and intellectually with global social concerns.

Today, the need for the inspiring force of such a transformation is once again being felt across the world. Literary practitioners need to thoroughly analyse current life problems in a powerful and meaningful way. Such analysis should aim to reach a solution, only then will the poet's energy emerge as an inspiring force for change, accepting social responsibility. The poet's creative pursuit will recognize contemporary values and fulfil the duty of social consciousness. Social awareness determines the direction of change. The more realistic this awareness is, the more relevant and transparent life-centred literature will be. Transparent literature strengthens the power of realistic criticism. The poet's viewpoint is the backbone of critical thinking, and by analysing the realities of his time, he plays a crucial role in establishing ideals.

We are currently facing numerous international problems. Scientific advancements and industrialization have placed us under the shadow of consumerist culture. The fear of Hiroshima and Nagasaki still lingers in our minds. No country is immune to the growing threat of international terrorism. After the attacks on the World Trade Center and the Pentagon, the superpower America has lost its sleep over its security. News columns are filled with reports of terrorist training camps everywhere. The global community is now worried about terrorists acquiring nuclear weapons. The

dialogue on disarmament is dying at the negotiating table. In the absence of mutual understanding, the flames of international border conflicts continue to rise. Millions of kilometres of landmines have been laid in border areas across different countries, leading to an explosion every twenty minutes, killing one person and injuring or disabling three. The use and testing of highly advanced destructive weapons have created an atmosphere of fear among neighbouring nations. No one can predict when the war policies involving chemical and biological weapons will bring death. The repeated failures of peace efforts by the United Nations raise many questions about its credibility. Countries with abundant oil reserves often face the constant shadow of war, casting fear into the hearts of many. To address the issue of energy production, the exploitation of oceans continues, while the drastic fluctuations in stocks are challenging the global economic recession. The poet's attention must be drawn towards these matters.

Alongside, poets face many international challenges. At one time, the poet was a lover of nature, but now they are being rapidly displaced from the riches of nature. Where once the poet's heart was always filled with joy and delight from the beauty of nature, now they are eager to protect it. Environmental changes affect human life globally and are also slowly impacting the geography of the world. The poet now has the crucial responsibility of raising awareness about environmental issues and embodying this sensitivity through creativity. Environmental awareness is essential not just for humans but for all living beings.

It is necessary to continuously depict the various dimensions of environmental protection in poetic forms to maintain its presentation before the general public. The truth is that climate changes happening globally, their impact on humanity, the resulting decline in food production for the global population, famine, diseases, floods, disrupted rainfall patterns, deepening drought crisis, rising temperatures, the depletion of the ozone layer, and the accumulation of waste in space are all outcomes of human-made experiments. The continuous increase in nuclear tests and the ongoing deforestation are disrupting the environmental balance. These numerous complex issues should be subjects of the poet's creativity today.

Both poor and rich nations stand in the queue of these pressing issues. It is a social challenge for the entire global community, and poets must take it seriously. The poet's role in awakening the global community to environmental security cannot be ignored.

Today, rapid climate changes in Antarctica are rising sea levels. The melting of ice at the North and South Poles threatens the existence of countries on many continents. This challenge demands a quick change in the creative approach of poets. The rising sea levels pose a threat to many small and large islands, potentially submerging them. The 1,200 small islands of the Maldives may disappear forever into the sea. Nature's beauty, gifted to humanity by nature, may one day be submerged. Poets must take up the pen to protect it.

Due to environmental changes, a severe drinking water crisis will emerge in large regions of the world in the future. In Asia and Europe, the transformation of water sources will lead to an extreme shortage of drinking water, potentially causing widespread destruction. Many regions of the world already face water shortages, and due to a lack of human consciousness regarding environmental security, parts of western America, most of South Africa, and some areas of Brazil may turn into drought-stricken lands, leading to epidemics.

The bell of disaster is continuously ringing. This warning is being heard by powerful countries, developing nations, and poor countries alike. Everyone is engrossed in their own self-interest. Although aware of the impending catastrophe, those in power are lost in the intoxication of authority. The United Nations, to prevent disaster, has carried out formal procedures by creating international bodies on various topics, where scientists, experts, diplomats, and scholars hold conferences and seminars, limiting their work to policy-making. Efforts to save the Earth remain confined to newspapers and television. In reality, international declarations are not implemented. Everyone speaks of social security responsibility, but no one steps forward to accept the challenge. The poet of the new century can beautifully fulfil this responsibility. In these adverse and

challenging circumstances, the poet can express these concerns. By making their message more lively and original, they can fulfil their social duties towards public awareness.

It cannot be denied that the writings of poets have, from time to time, made the world aware of their power.

They have bravely faced social challenges. It seems appropriate here to take a final look at their struggles and successes. There are many poems of opposition. The nuclear-powered countries also warned them, but their pen never stopped. The renowned Israeli poet Mordechai's book *I Am Your Spy* is very famous. He was a promoter of the global peace movement. His pen continuously sparked fire, which is why the Israeli police accused him of being a spy and imprisoned him. Even after nearly 30 years, he is still in prison.

Between 1949 and 1989, the Soviet Union conducted more than 400 nuclear tests in Semipalatinsk, Kazakhstan. The radiation caused millions of deaths and widespread disease outbreaks. In residential areas, symptoms of various illnesses began appearing at birth. While a peace movement had started in America against these nuclear tests, the repressive policies of the Soviet government silenced the people of Kazakhstan. In this situation, a Kazakh poet, *Ulzhas*, aware of his social responsibilities, was invited to speak on Kazakh culture and recite poetry on television. On February 26, 1989, during a live broadcast, he set aside the prepared material and raised awareness about the horrors of nuclear tests, urging people to organise and protest. The protests continued as people gathered. Poet Ulzhas demanded an end to nuclear testing in the Semipalatinsk region at a Supreme Soviet meeting. In November 1989, the Supreme Soviet, under Mikhail Gorbachev's leadership, passed a binding resolution on the matter. Ulzhas gathered over two million signatures within a few weeks, and finally, President Gorbachev officially announced the cessation of nuclear tests in the Semipalatinsk region.

Today, the creativity of poets is being tested. Violence is rampant worldwide, and everyone stands on the brink of destruction. Open violations of human rights have become common. The exploitation of women, the horror of female infanticide, the exploitation of laborers, and the tragedy of child labor are global concerns. Powerful nations continually suppress the weaker ones. Hatred and malice have become human rights, and the changes in life values have left people restless. The United Nations appears weak, helpless, and a silent spectator. In such a situation, the responsibility of re-establishing the concept of social values has fallen on the broad shoulders of poets. Every line written in the direction of establishing world peace must not be dependent on humanity's needs. The poet must don the mantle of a visionary and engage in purposeful creation. Both the crowd of aimless poets and purposeless poetry are dangerous for society. Poets must remain vigilant in adhering to the interpretive standards of social values. The protection of human values and value-based human sensitivity should become the subject of the poetic world. The 21st-century poetry world aspires to depict these human-centred values because the roots of human sensitivity are deeply connected to their depiction. Hidden within these roots are the seeds of world peace. The poet must now nurture, groom, and cultivate these seeds so that the vision of a peaceful new world can be realised and the light of *Vasudhaiva Kutumbakam* continues to shine brightly.

Glossary:

1. Kuber: Kuber (or Kubera) refers to the Hindu god of wealth, prosperity, and treasures. In Hindu mythology, Kuber is the lord of riches and the king of the mythical city of Alaka, located in the Himalayas. He is often depicted as a figure of opulence and abundance, and is considered the treasurer of the gods.Kuber is also a symbol of material success and financial stability, and is sometimes invoked by people seeking wealth and fortune.
2. Vasudhaiva Kutumbakam is a Sanskrit phrase that translates to *The world is one family*.It conveys the idea of global unity and interconnectedness, emphasising that all human beings, regardless of nationality, race, or religion, are part of a single global family. This ancient concept from Indian philosophy encourages harmony, compassion, and the understanding

that our actions affect the entire world. It reflects the values of empathy, cooperation, and universal brotherhood.

The phrase comes from the *Mahopanishad*, a Hindu text, and has been widely quoted in Indian culture and beyond, especially in discussions about peace, unity, and global cooperation.

References:

1. Sontag Susan:The World as India [The St. Jerome Lecture on Literary Translation]Published by FSG in At the Same Time: Essays and Speeches, 2007.
2. Steiner,George :*After Babel*. Oxford, England: Oxford University Press,1975
3. Shiv, Omprakash: Sahitya Main Aadmiyat ki Talash: Vishwabharati Prakashan, Nagpur,2011
4. Parikh S., Sangeeta [Ed.]:Hindi-Transliterated Hindi English Dictionary , Allied Publishers Limited,New Delhi,2001

Artificial Intelligence and Soft Skills: Shaping the Next Generation of Student - Teachers

Dr. Vidyullata N. Kolhe
Principal
Gurukrupa College of Education and Research, Kalyan (W)

Abstract:

The rapid integration of Artificial Intelligence (AI) into education has transformed traditional teaching methods, offering innovative tools like personalized learning platforms and automated assessments. However, while AI enhances efficiency and provides data-driven insights, it cannot replace the vital role of soft skills in education. Soft skills such as communication, empathy, and adaptability remain essential for fostering positive relationships and creating student-centered learning environments. This paper explores how the combination of AI and soft skills can shape the next generation of student-teachers. By integrating AI in teacher education, aspiring educators can benefit from real-time feedback and personalized learning experiences, while also developing the interpersonal skills needed to connect with students on a human level. AI can streamline administrative tasks, allowing teachers to focus on emotional support, collaborative learning, and inclusive teaching practices. Ultimately, the convergence of AI and soft skills equips future educators to meet the demands of 21st-century classrooms, balancing technological proficiency with emotional intelligence to create a more holistic, engaging, and effective learning experience for students.

Keywords: Artificial Intelligence, Soft Skills, Teacher Education etc.

Introduction:

The role of educators has always been multifaceted, requiring not only content expertise but also the ability to communicate, empathize, and adapt to diverse student needs. In today's fast-evolving educational, student-teachers face the dual challenge of mastering new technologies like artificial intelligence (AI) while also having soft skills crucial for human - centred teaching. As AI reshapes classrooms through personalized learning platforms, intelligent tutoring systems, and automated assessments, it is vital that educators do not lose sight of the human connections that underpin effective teaching. The AI and soft skills together can shape the next generation of student-teachers. While AI can streamline administrative tasks and providing learning experiences, soft skills remain essential for cultivating positive relationships and creating supportive learning environments. We explore the importance of both AI and soft skills in the teaching - learning process and how the combination of these two factors can better prepare student-teachers for the classrooms of the future.

21st century has witnessed an unprecedented transformation in various sectors, with technology playing a central role in reshaping the way we live, work, and learn. Among the most significant technological advancements is the rise of Artificial Intelligence (AI), which has not only revolutionized industries like healthcare, finance, and entertainment but also made significant into education. AI in education to enhance learning experiences and provide data-driven insights that can improve both teaching and learning outcomes. However, while AI can facilitate efficiency and personalized learning, it is the human element specifically, soft skills that remains at the core of education. The AI and soft skills is essential for shaping the next generation of student-teachers.

What is Artificial Intelligence?

Artificial Intelligence (AI) refers to the simulation of human intelligence processes by machines, particularly computer systems, enabling them to perform tasks that typically require human cognition, such as learning, reasoning, and problem-solving. In education, AI technologies include adaptive learning systems, which provide personalized content to students; intelligent tutoring systems that guide students through learning activities; and automated grading systems that assess student work and offer feedback.

AI's potential to impact education lies in its ability to analyze vast amounts of data, providing teachers with insights into student performance, learning gaps, and instructional effectiveness. Additionally, AI can take over repetitive and time-consuming tasks, freeing educators to focus on more creative and relational aspects of teaching. Despite these advantages, AI lacks the emotional intelligence and empathy necessary for managing the diverse social and emotional needs of students.

The Artificial Intelligence in Education:

AI has become an integral part of modern education systems worldwide, offering tools that enhance both teaching and learning processes. In the classroom, AI is used for a range of purposes, from intelligent tutoring systems that provide personalized learning experiences to virtual teaching assistants that help students with routine queries. AI-driven platforms are also capable of performing real-time assessments, identifying areas where students are struggling, and offering tailored interventions to support their learning journey.

AI can support teachers by handling time-consuming tasks such as grading and feedback. For instance, AI-based essay grading systems can quickly evaluate written work, providing detailed feedback on grammar, structure, and argumentation. This allows teachers to spend more time engaging with students and refining their instructional strategies. Additionally, AI can facilitate more efficient classroom management, helping teachers track attendance, monitor student engagement, and manage learning resources.

However, while AI can assist with many aspects of teaching, it cannot fully replace the human elements that are vital to effective education. Technologies like AI lack the ability to understand the emotional complexities of students or to create the deep, meaningful relationships that form the foundation of a supportive learning environment. This is why the development of soft skills remains crucial for student-teachers as they prepare to enter the teaching profession.

What are Soft Skills?

Soft skills, often called "people skills," are the personal attributes and interpersonal abilities that enable individuals to work well with others, communicate effectively, and adapt to changing situations. In the context of teaching, soft skills are crucial for building relationships with students, fostering an inclusive classroom environment, and navigating the emotional complexities of student behaviour.

Key soft skills for teachers include:

- **Communication:** The ability to express ideas clearly, listen actively, and engage students in meaningful dialogue.
- **Empathy:** Understanding and responding to students' emotional and psychological needs.
- **Adaptability:** Being flexible in teaching methods and adjusting to diverse learning styles and classroom dynamics.
- **Problem-Solving:** The capacity to think critically and devise creative solutions to classroom challenges.
- **Collaboration:** Working effectively with colleagues, parents, and the wider community to support student learning.

AI and Soft Skills: A Holistic Approach to Teacher Education:

The next generation of student-teachers needs to have both technological skills and emotional intelligence. By including AI in teacher education, future educators can enjoy personalized learning, real-time feedback, and practice classroom scenarios that help them improve their teaching skills. However, these technological tools must be combined with a strong focus on building soft skills like communication, empathy, and adaptability.

For example, student-teachers can use AI-based platforms to practice managing classrooms in virtual environments. This allows them to try out different teaching methods and get feedback on how they are doing. At the same time, they should also engage in activities like role-playing, peer teaching, and working on group projects to improve their interpersonal skills.

The future of education requires teachers who are not only good at using AI but also have the soft skills needed to create positive, student-centered learning experiences. By blending AI technology with the development of soft skills, teacher education programs can prepare well-rounded educators who are ready to meet the changing needs of modern classrooms.

The Importance of AI and Soft Skills in the Teaching-Learning Process:

The integration of AI and soft skills can significantly enhance the teaching-learning process. While AI supports efficiency and personalization, soft skills ensure that teaching remains student-centered and emotionally engaging. Below are key ways in which AI and soft skills contribute to education:

- **Efficient Classroom Management and Emotional Support:** AI tools can help with classroom management by automating administrative tasks such as grading, attendance, and lesson planning. This allows teachers to devote more time to building relationships with students, addressing their emotional needs, and fostering a positive learning environment.
- **Personalized Learning with a Human Touch:** AI-driven learning systems can adapt to each student's learning pace, offering personalized instruction based on their individual needs. However, it is the teacher's soft skills—communication, empathy, and adaptability—that ensure students feel supported and understood, especially when they face challenges.
- **Collaborative Learning Enhanced by AI:** AI can facilitate collaborative learning by creating virtual environments where students can work together on projects and assignments. Nevertheless, teachers need strong collaboration skills to guide these interactions, ensuring that group dynamics remain inclusive and productive.
- **Data-Driven Decision Making and Problem-Solving:** AI's ability to analyse student data can provide valuable insights into student performance, helping teachers identify areas for improvement. However, teachers must use their problem-solving skills to interpret this data and implement solutions that resonate with individual students or groups, adjusting their teaching strategies accordingly.
- **Preparing Students for the Future:** The classrooms of tomorrow will require educators to be both technologically proficient and emotionally intelligent. By mastering AI tools and honing their soft skills, student-teachers will be better equipped to prepare students for a future that values both technological expertise and human interaction.

How AI and Soft Skills are Useful for Shaping the Next Generation of Student-Teachers:

- **AI as a Support Tool for Teaching Mastery:** AI can serve as an invaluable tool in the professional development of student-teachers. AI-driven platforms can provide real-time feedback on teaching performance, simulate classroom scenarios for practice, and offer personalized learning experiences for educators themselves. By leveraging AI, student-teachers can improve their teaching effectiveness while focusing on the development of their emotional intelligence.
- **Developing Holistic Educators:** The future of education demands teachers who are not only proficient in using AI tools but also capable of connecting with students on a personal level. Student-teachers must develop strong communication, empathy, and adaptability skills alongside their technological expertise. AI will never replace the human element in teaching, but it can complement it by allowing educators to focus on what they do best—teaching, mentoring, and inspiring students.
- **Blended Learning Approaches:** The integration of AI and soft skills can also foster a blended learning approach, where AI handles content delivery and administrative tasks, and teachers focus on facilitating discussions, mentoring students, and fostering a supportive classroom atmosphere. This approach prepares student-teachers for the increasing prevalence of hybrid and online learning environments, where both technological proficiency and strong interpersonal skills are required.

- **Ethical and Inclusive Teaching Practices:** AI can support inclusive teaching by providing differentiated instruction that caters to the diverse needs of learners. However, it is the teacher's responsibility to ensure that AI is used ethically and that all students are treated with respect and fairness. Soft skills, such as empathy and cultural sensitivity, are essential for creating an inclusive classroom where every student feels valued.

Conclusion:

The convergence of artificial intelligence and soft skills represents a powerful opportunity to enhance teacher education and prepare the next generation of educators for the challenges of 21st-century classrooms. AI offers innovative tools that can streamline administrative tasks, provide personalized learning experiences, and generate valuable insights into student performance. However, soft skills—such as communication, empathy, adaptability, and problem-solving—remain essential for fostering meaningful connections with students and creating a positive learning environment.

For student-teachers, mastering both AI and soft skills will be crucial to their success in future classrooms. The integration of AI technologies into teacher education programs, coupled with a strong emphasis on developing emotional intelligence and interpersonal abilities, can lead to the development of well-rounded, effective, and empathetic educators. In this way, AI and soft skills together can shape the next generation of student-teachers, ensuring they are prepared to meet the evolving demands of the education system while maintaining the human touch that makes teaching a profoundly impactful profession.

Bibliography:

1. Anderson, J., Rainie, L., & Luchsinger, A. (2020). Artificial Intelligence and the Future of Humans. Pew Research Center.
2. Davies, B., & Birch, P. (2019). The AI Classroom: The Artificial Intelligence Handbook for Educators. Independent Publisher.
3. Goleman, D. (1995). Emotional Intelligence: Why It Can Matter More Than IQ. Bantam Books.
4. Luckin, R., Holmes, W., Griffiths, M., & Forcier, L. B. (2016). Intelligence Unleashed: An Argument for AI in Education. Pearson.
5. Seldon, A., & Abidoye, O. (2018). The Fourth Education Revolution: Will Artificial Intelligence Liberate or Infantilise Humanity? University of Buckingham Press.
6. Trilling, B., & Fadel, C. (2009). 21st Century Skills: Learning for Life in Our Times. Jossey-Bass.
7. UNESCO (2019). Artificial Intelligence in Education: Challenges and Opportunities for Sustainable Development. UNESCO Publishing.

Advancing Social Justice for Indian Women: A Comprehensive Analysis

Asst. Prof. Chitra Sachin Khedekar
R.R. Educational Trust's B.Ed. College

Abstract

Advancing social justice for Indian women remains a critical challenge and an essential endeavour for fostering a more equitable society. This comprehensive analysis delves into the multifaceted issues faced by Indian women, examining the socio-cultural, economic, and legal barriers that impede their progress. The study highlights the pivotal role of gender equality, legal reforms, and educational empowerment in promoting women's rights. It explores the impact of economic empowerment and healthcare access on enhancing women's social standing and quality of life. Furthermore, the analysis addresses the persistent issues of violence against women and workplace inequality, emphasizing the need for robust policy implementation and advocacy. By contrasting rural and urban contexts and incorporating intersectional perspectives, this analysis underscores the complexity of the struggle for gender justice in India. The paper concludes with recommendations for policy interventions and grassroots initiatives aimed at dismantling patriarchal structures and advancing social justice for Indian women, ultimately contributing to a more inclusive and just society. This research paper explores the multifaceted issues surrounding social justice for Indian women, examining historical contexts, current challenges, and potential pathways to achieving gender equality. Through a combination of qualitative and quantitative analyses, the paper provides insights into the progress made and the obstacles that remain in the pursuit of social justice for women in India.

Key words: Gender Equality, Women's Rights, Social Justice, Empowerment, Legal Reforms, Education, Workplace Equality, Political Participation, Human Rights, Policy Implementation

Introduction

India, a nation marked by its rich cultural diversity and complex social fabric, continues to grapple with profound gender disparities. The quest for social justice for Indian women is not merely an isolated struggle but a pivotal movement towards achieving an inclusive and equitable society. Despite significant strides in various sectors, Indian women continue to face entrenched socio-cultural, economic, and legal challenges that hinder their progress and undermine their fundamental rights.

This comprehensive analysis aims to illuminate the multifaceted nature of these challenges and explore the pathways to advancing social justice for Indian women. It begins by examining the historical context and the evolving status of women in India, highlighting the impact of colonialism, independence, and globalization on gender roles and norms. The study then delves into the critical areas of gender equality, legal reforms, and educational empowerment, underscoring their significance in promoting women's rights and enhancing their socio-economic status.

Economic empowerment and healthcare access emerge as crucial factors in improving the quality of life for Indian women. However, pervasive issues such as violence against women and workplace inequality continue to pose significant barriers. This analysis also considers the unique challenges faced by women in rural areas compared to their urban counterparts, emphasizing the importance of contextualized interventions.

Furthermore, the intersectional approach of this study acknowledges the compounded disadvantages experienced by women at the intersections of caste, class, religion, and region. By integrating feminist and human rights perspectives, the analysis provides a holistic understanding of the systemic nature of gender injustice in India.

The pursuit of social justice for Indian women necessitates a multifaceted strategy involving legal, policy, and grassroots initiatives. This study concludes with a series of recommendations

aimed at dismantling patriarchal structures, promoting gender-sensitive policies, and fostering an environment where Indian women can thrive. Ultimately, advancing social justice for Indian women is not only a moral imperative but also a critical step towards building a more just and equitable society for all.

Social justice for Indian women is crucial for the nation's overall development. It entails the fair distribution of resources, opportunities, and privileges, ensuring that women can fully participate in all aspects of life. Despite significant advancements, Indian women continue to face systemic barriers that impede their progress. This research aims to highlight these issues and propose actionable solutions.

Historical Context

The struggle for women's social justice in India has a rich history marked by significant movements and milestones:

- **Pre-Independence Era**: The pre-independence era in India was characterized by a deeply entrenched patriarchal society where women were largely marginalized and subjected to various forms of social, economic, and legal discrimination. The status of women was influenced by traditional customs, religious practices, and colonial policies that collectively reinforced gender inequality. However, this period also witnessed the emergence of social reform movements aimed at addressing some of these injustices. Practices such as child marriage, sati (the practice of widow immolation), and purdah (seclusion of women) severely restricted their autonomy and freedom. The 19th and early 20th centuries saw the rise of social reform movements led by prominent figures such as Raja Ram Mohan Roy, Ishwar Chandra Vidyasagar, and Jyotirao Phule, who advocated for women's education, abolition of child marriage, and widow remarriage. The pre-independence period saw the enactment of several legal reforms aimed at improving women's status, such as the Child Marriage Restraint Act of 1929 and the Hindu Women's Right to Property Act of 1937. Despite these efforts, the social and economic conditions of Indian women remained largely unchanged, and deep-seated gender biases persisted.
- **Post-Independence Era**: The post-independence era in India marked a significant turning point in the pursuit of social justice for women. With the adoption of the Indian Constitution in 1950, which guaranteed equal rights for all citizens, substantial efforts were made to address the systemic inequalities faced by women. However, despite legislative advancements and policy initiatives, Indian women continue to confront numerous challenges that impede their full participation in society. The Indian Constitution enshrined gender equality through fundamental rights, ensuring equality before the law (Article 14), prohibition of discrimination (Article 15), and equal opportunity in employment (Article 16). Significant legal reforms included the Hindu Marriage Act (1955), the Hindu Succession Act (1956), and the Dowry Prohibition Act (1961), aimed at securing women's rights in marriage, inheritance, and protection against dowry-related violence. The post-independence era has seen increased awareness and legislative action against violence towards women, including domestic violence, sexual harassment, and trafficking. The post-independence era has seen considerable progress in advancing social justice for Indian women, yet much remains to be done. Achieving true gender equality requires sustained efforts, continuous policy innovation, and a collective commitment to dismantling patriarchal structures. By addressing the multifaceted barriers faced by women and fostering an environment of empowerment and equality, India can continue to move towards a more just and equitable society.
- **Late 20th Century**: The late 20th century in India was a period of significant socio-economic and political transformations, which had profound impacts on the status and rights of women. The era was marked by heightened awareness of gender issues, legal reforms, and the burgeoning women's movement, which collectively advanced the cause of social justice for

Indian women. The women's liberation movement addressed issues such as dowry, domestic violence, and workplace discrimination.

Several landmark legal reforms were enacted to protect and empower women. The Dowry Prohibition Act of 1961 was strengthened in the 1980s to curb dowry-related violence and deaths.

The Criminal Law (Amendment) Act of 1983 addressed issues of rape and custodial rape, making it easier to prosecute perpetrators and provide justice to victims.

The National Commission for Women (NCW) was established in 1992 to review legal and constitutional safeguards for women, recommend policies, and address grievances.

Significant progress was made in increasing female literacy rates and educational attainment. Government initiatives such as the National Policy on Education (1986) emphasized the importance of girls' education and aimed to reduce gender disparities in literacy.

The mid-day meal scheme and other educational incentives were introduced to improve school enrolment and retention rates for girls.

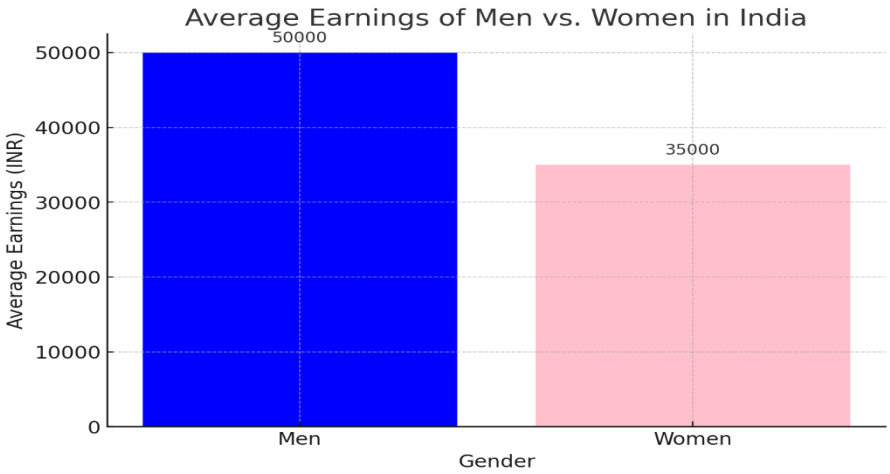
The recognition of violence against women as a critical issue led to the enactment of laws and policies aimed at protection and prevention. The Protection of Women from Domestic Violence Act (2005) was a significant legal milestone, providing a comprehensive framework to address domestic violence. The late 20th century was a transformative period for Indian women, marked by significant strides in legal, social, and economic realms. However, the journey towards full gender equality and social justice remained ongoing, requiring sustained efforts, advocacy, and policy innovations to address persistent challenges and ensure a more equitable future for all women in India.

Current Challenges

Despite progress, Indian women continue to face significant challenges in various spheres:

1. **Economic Inequality**: Economic inequality remains one of the most significant challenges in the pursuit of social justice for women in India. Despite numerous legal and policy initiatives aimed at promoting gender equality, structural and cultural barriers continue to impede women's economic advancement. This analysis explores the current economic challenges faced by Indian women and suggests pathways toward achieving greater economic justice. Women in India earn less than men, are overrepresented in low-wage jobs, and face barriers to career advancement. Women earn significantly less than men for similar work. The gender pay gap is evident across various sectors and is exacerbated by occupational segregation, where women are often concentrated in lower-paying jobs. Women's work, particularly in sectors like agriculture, domestic work, and caregiving, is often undervalued and underpaid, reflecting societal biases about the worth of "women's work."

- In 2021, women earned 19% less than men on average (Monster Salary Index, 2021).
- The female labour force participation rate was only 20.3% in 2020 (World Bank, 2020).



Political Underrepresentation: Women constitute a small percentage of members in the Lok Sabha (House of the People) and Rajya Sabha (Council of States). The situation is similar in state legislatures. The 73rd and 74th Constitutional Amendments (1992) mandated a 33% reservation for women in local government bodies. This has led to increased participation at the grassroots level, but challenges remain in terms of actual influence and decision-making power. Women face barriers within political parties, including patriarchal attitudes, lack of support, and financial constraints. Women are underrepresented in political leadership positions.

- Women held 14.4% of parliamentary seats in India as of 2021 (Inter-Parliamentary Union, 2021).
- Only 9% of state legislative assembly members were women in 2020 (National Commission for Women, 2020).

Violence and Harassment: Gender-based violence remains pervasive.

Physical, emotional, and economic abuse within the household is prevalent. The Protection of Women from Domestic Violence Act (2005) provides legal recourse but implementation is often weak.

This includes harassment at the workplace, public spaces, and educational institutions. The Sexual Harassment of Women at Workplace (Prevention, Prohibition and Redressal) Act (2013), also known as the POSH Act, aims to protect women in professional environments.

Despite stringent laws, including the Criminal Law (Amendment) Act, 2013, which was passed following the 2012 Delhi gang-rape case, sexual violence remains a significant issue.

Women are often victims of violence for marrying against family wishes or violating societal norms. These acts are often supported by rigid patriarchal mindsets.

Many women and girls are trafficked for sexual exploitation. The Immoral Traffic (Prevention) Act aims to combat this issue but enforcement is challenging.

- An estimated 30% of Indian women have experienced physical or sexual violence (National Family Health Survey-5, 2019-21).
- Reports of domestic violence surged during the COVID-19 lockdown (National Commission for Women, 2020).

2. **Access to Education**: Educational disparities persist, particularly in rural areas. Education empowers women, improves their socio-economic status, and contributes to the overall development of society. Despite significant progress, numerous barriers still hinder the educational attainment of girls and women in India. Enrolment rates in primary and secondary education have increased, but dropout rates remain high, especially for girls. This trend continues into higher education, where female participation is comparatively low.

 Right to Education (RTE) Act, 2009: This act mandates free and compulsory education for children aged 6 to 14 years, which has helped improve enrolment rates.

 Beti Bachao Beti Padhao (Save the Daughter, Educate the Daughter) Campaign: Launched in 2015, this initiative aims to promote gender equality and encourage girls' education.

 Kasturba Gandhi Balika Vidyalaya (KGBV): This scheme provides residential schools at the upper primary level for girls from marginalized communities, helping reduce dropout rates.

- The female literacy rate in India was 70.3% compared to 84.7% for males in 2018 (National Statistical Office, 2018).
- Girls are more likely to drop out of school, especially at the secondary level (UNESCO, 2020).

3. **Healthcare Inequities**: Healthcare inequities significantly affect the lives of Indian women, impacting their overall well-being and limiting their socio-economic progress. Achieving social justice for Indian women requires addressing these disparities to ensure they have access to quality healthcare services. Women face unique health challenges and disparities in access to quality healthcare services. India has made progress in reducing maternal mortality rates (MMR), but the MMR remains high compared to global standards. Many women, especially in rural areas, lack access to skilled birth attendants and emergency obstetric care. Women face

significant challenges in accessing reproductive health services, including family planning, prenatal and postnatal care, and safe abortion services. Contraceptive prevalence remains low, and unmet need for family planning is high.

- The maternal mortality ratio was 113 per 100,000 live births in 2018 (Sample Registration System, 2018).
- Women have limited access to reproductive health services, especially in rural areas (National Health Mission, 2020).

Policy Recommendations

To advance social justice for Indian women, the following policy recommendations are proposed:

- **Economic Policies**: Implementing equal pay legislation, supporting women's entrepreneurship, and providing family-friendly workplace policies.

  Pradhan Mantri Mudra Yojana (PMMY): Provides loans to non-corporate, non-farm small/micro enterprises, with a focus on empowering women entrepreneurs through the "Shishu," "Kishore," and "Tarun" categories of loans.

  Stand-Up India Scheme: Facilitates bank loans between INR 10 lakh and INR 1 crore to at least one Scheduled Caste (SC) or Scheduled Tribe (ST) borrower and at least one-woman borrower per bank branch for setting up a greenfield enterprise.

  Mahila E-Haat: An initiative under the Ministry of Women and Child Development, it is an online marketing platform to support women entrepreneurs and SHGs (Self-Help Groups) to showcase their products and services.

  National Rural Livelihood Mission (NRLM): Aims to reduce poverty by enabling poor households to access gainful self-employment and skilled wage employment opportunities. It focuses on women empowerment through SHGs.

  Deen Dayal Upadhyaya Grameen Kaushalya Yojana (DDU-GKY): Aims to increase the employability of rural youth, including women, through skill training and placement.

  Jan Dhan Yojana: A financial inclusion program aimed at providing affordable access to financial services, including bank accounts, credit, insurance, and pensions.

  Direct Benefit Transfer (DBT): Ensures that subsidies and benefits are directly transferred to beneficiaries' bank accounts, improving transparency and reducing leakage.

  Microfinance and SHGs: Microfinance institutions and SHGs provide women with access to small loans, savings, and insurance, fostering entrepreneurship and economic independence.

  "Ladki Bahin" Scheme: The " Ladki Bahin" Scheme is a comprehensive initiative aimed at empowering women and enhancing their socio-economic status. By providing financial assistance, skill development, healthcare services, and social security, the scheme addresses the multifaceted challenges faced by women and promotes their overall empowerment. The success of the scheme can be seen in the improved livelihoods, health, and educational outcomes for women across different regions.
- **Political Reforms**: Political reforms are essential to achieving social justice for Indian women, ensuring their equal representation, participation, and influence in political processes and decision-making. Instituting gender quotas in political bodies, promoting women's political participation, and supporting female leadership development. The 73rd and 74th Constitutional Amendments mandate a 33% reservation for women in local self-government bodies, including panchayats and municipalities. This has led to increased representation of women at the grassroots level. A proposed bill that seeks to reserve 33% of seats in the Lok Sabha and state legislative assemblies for women. Despite being introduced multiple times, it has not yet been passed into law.
- **Legal Protections**: Strengthening laws against gender-based violence, ensuring access to justice for survivors, and promoting legal literacy among women.

1. Constitutional Rights

- **Article 14**: Guarantees equality before the law.
- **Article 15**: Prohibits discrimination on grounds of religion, race, caste, sex, or place of birth.
- **Article 16**: Guarantees equal opportunity in matters of public employment.
- **Article 21**: Guarantees the right to life and personal liberty.

2. Specific Legislation

1. **The Protection of Women from Domestic Violence Act, 2005 (PWDVA)**
   - Provides protection to women from domestic violence, including physical, emotional, verbal, sexual, and economic abuse.
   - Allows women to seek protection orders, residence orders, and monetary relief.
2. **The Sexual Harassment of Women at Workplace (Prevention, Prohibition and Redressal) Act, 2013**
   - Addresses sexual harassment at the workplace.
   - Mandates the establishment of Internal Complaints Committees (ICC) in workplaces to handle complaints of sexual harassment.
3. **The Dowry Prohibition Act, 1961**
   - Prohibits the giving and taking of dowry.
   - Provides penalties for demanding or accepting dowry.
4. **The Prohibition of Child Marriage Act, 2006**
   - Prohibits the marriage of children below the age of 18 for girls and 21 for boys.
   - Provides for the annulment of child marriages and offers protection and support to victims.
5. **The Hindu Succession Act, 1956 (Amended in 2005)**
   - Grants daughters equal rights as sons in inheritance of ancestral property.
6. **The Medical Termination of Pregnancy Act, 1971 (Amended in 2021)**
   - Allows for the termination of pregnancies under specified conditions, expanding access to safe and legal abortion services.
7. **The Criminal Law (Amendment) Act, 2013**
   - Strengthens laws related to sexual offenses, including rape.
   - Provides for stricter punishment and faster trial processes.

- **Educational Initiatives**: Expanding access to quality education for girls, promoting STEM education for women, and addressing cultural barriers to education.

1. Beti Bachao Beti Padhao (BBBP)

- **Objective**: To address the declining child sex ratio and promote the education and empowerment of girls.
- **Key Features**: Awareness campaigns, enforcement of laws against gender-based discrimination, and incentives for educating girl children.

2. Kasturba Gandhi Balika Vidyalaya (KGBV)

- **Objective**: To provide quality education to girls from disadvantaged groups in rural areas.
- **Key Features**: Establishment of residential schools for girls from marginalized communities, with a focus on ensuring their retention and holistic development.

3. National Scheme of Incentive to Girls for Secondary Education (NSIGSE)

- **Objective**: To promote the enrolment of girls in secondary education.
- **Key Features**: Financial incentives to girls who pass class VIII and enroll in class IX, particularly from SC/ST communities.

4. Sukanya Samriddhi Yojana (SSY)

- **Objective**: To encourage parents to save for the education and marriage expenses of their girl children.
- **Key Features**: A savings scheme offering attractive interest rates and tax benefits, specifically aimed at securing the future of girl children.

5. Mid-Day Meal Scheme

- **Objective**: To enhance the nutritional status of children and encourage school attendance.

- **Key Features**: Provision of free meals to children in primary and upper primary classes, which helps increase girls' enrolment and retention.

6. Samagra Shiksha Abhiyan

- **Objective**: To improve the quality of school education across all levels, from pre-school to senior secondary levels.
- **Key Features**: Integrated scheme focusing on access, equity, and quality, with special provisions for girls' education, such as free textbooks, uniforms, and scholarships.

7. Digital Initiatives

- **Objective**: To bridge the digital divide and provide quality digital education to girls.
- **Key Features**: Initiatives like DIKSHA (Digital Infrastructure for Knowledge Sharing) and e-Pathshala provide free digital resources and online learning platforms.
- **Healthcare Improvements**: Enhancing reproductive health services, addressing maternal health disparities, and promoting mental health awareness.

Current Status of Women's Healthcare in India:

 Maternal Health: Maternal mortality rates have decreased but remain high compared to global averages. According to the World Bank, the maternal mortality ratio in India was 145 per 100,000 live births in 2017.

 Reproductive Health: Access to reproductive health services, including contraception and safe abortion, varies widely, particularly in rural areas.

 Nutritional Health: High rates of malnutrition and anaemia among women persist, with over 50% of women aged 15-49 being anaemic.

 Non-Communicable Diseases (NCDs): The burden of NCDs like diabetes, hypertension, and cancer is rising among women, often exacerbated by lack of awareness and early detection.

 Mental Health: Mental health issues among women, including depression and anxiety, are often underdiagnosed and undertreated.

Key Healthcare Initiatives:

1. Janani Suraksha Yojana (JSY)

- **Objective**: Reduce maternal and neonatal mortality by promoting institutional deliveries.
- **Key Features**: Conditional cash transfers to pregnant women for delivering in health institutions, focusing on women from low-income groups.

2. Pradhan Mantri Surakshit Matritva Abhiyan (PMSMA)

- **Objective**: Provide assured, comprehensive, and quality antenatal care free of cost to all pregnant women.
- **Key Features**: Fixed-day antenatal check-ups by specialists, including free essential diagnostics and counselling.

3. Poshan Abhiyaan (National Nutrition Mission)

- **Objective**: Improve nutritional outcomes for children, pregnant women, and lactating mothers.
- **Key Features**: Community-based events, monitoring, and evaluation to address malnutrition and promote healthy practices.

4. Mission Indradhanush

- **Objective**: Achieve full immunization coverage for all children and pregnant women.
- **Key Features**: Focus on high-priority districts and underserved populations to ensure comprehensive vaccination.

5. Rashtriya Swasthya Bima Yojana (RSBY)

- **Objective**: Provide health insurance to families below the poverty line.
- **Key Features**: Coverage for hospitalization expenses, including maternity and newborn care.

6. Ayushman Bharat – Pradhan Mantri Jan Arogya Yojana (PM-JAY)

- **Objective**: Provide free access to healthcare for low-income earners in the country.

- **Key Features**: Coverage of up to ₹5 lakh per family per year for secondary and tertiary care hospitalization.

Conclusion

The journey toward advancing social justice for Indian women is both complex and crucial. This comprehensive analysis underscores that while significant strides have been made in improving the status of women in India, substantial challenges remain. Achieving social justice for Indian women is a complex and ongoing process that demands commitment from all levels of society. By addressing economic, political, legal, and social dimensions, we can create a more just and equitable world for women. This research underscores the importance of continued advocacy, policy reform, and cultural change in realizing this goal.

References

1. Monster Salary Index (2021). "Gender Pay Gap in India."
2. World Bank (2020). "Labor Force Participation Rate, Female (% of Female Population Ages 15+) (Modelled ILO Estimate)."
3. Inter-Parliamentary Union (2021). "Women in National Parliaments."
4. National Commission for Women (2020). "Annual Report 2020."
5. National Family Health Survey-5 (2019-21). "National Report."
6. National Statistical Office (2018). "Education in India."
7. UNESCO (2020). "Global Education Monitoring Report."
8. Sample Registration System (2018). "Special Bulletin on Maternal Mortality in India."
9. National Health Mission (2020). "Health Management Information System."
10. Census 2011. "Literacy Rate in India."

Gender Sensitisation for Equity & Social Justice for Women Social Justice for Women – Status of Indian Women

Assistant Professor Mrs. Aditi Mangesh Tawre
R. R. Educational Trust's B. Ed. College, Mumbai

Abstract –

Jokes that play on stereotypes about women or any group can perpetuate harmful ideas, even if they are meant to be light-hearted. Social justice aims for inclusion and fairness, guided by principles. The debate on the necessity of social justice highlights several arguments for its importance. Societies that promote gender equality tend to be more prosperous, stable, and healthy. Gender equality can lead to improved economic outcomes, better health and education, and more inclusive and democratic governance. The status of women in India has seen significant changes over time, marked by both progress and persistent challenges. While some may argue that the pursuit of social justice can be complex and challenging, and may sometimes involve difficult trade-offs, many believe that it is a critical component of a healthy, functioning society. While significant strides have been made in promoting social justice and gender equality in India, persistent challenges require continued effort and reform. Achieving true social justice involves addressing systemic inequalities and ensuring equal opportunities for all individuals.

Keypoints – A top issue to talk – what is social justice – understanding the social justice – main principles of social justice - is social justice essential – social justice for gender equality - Equity and Fairness – social stability – human rights – equal opportunity – economic growth – Indian government policies – women status in India - Conclusion.

A Top Issue To Talk About – Lately, we all have come across the 'Ladki Bahin Yojana'. Jokes about the scheme have been making the rounds on WhatsApp ever since it was revealed. Jokes are made up on women power and her strength. The "Ladaki Bahin" scheme joke often refers to a common stereotype or trope used in humor, sometimes in a way that reinforces gender stereotypes or biases. The humor might rely on exaggeration or misunderstanding of gender dynamics.

It's important to approach such jokes with sensitivity and awareness of their impact. Jokes that play on stereotypes about women or any group can perpetuate harmful ideas, even if they are meant to be lighthearted.

Understanding The Social Justice –

Social justice refers to a fair and equitable division of resources, opportunities, and privileges in society. Originally a religious concept, it has come to be conceptualized more loosely as the just organization of social institutions that deliver access to economic benefits. It is sometimes referred to as "distributive justice."

The phrase "social justice" draws its roots from Christian theology, with the first noted use occurring in the early 1840s in Theoretical Treatise on Natural Law by Luigi Taparelli. Taparelli was an Italian Jesuit priest writing during the rise of Risorgimento, a 19th-century Italian nationalist movement, and debates around the unification of Italy. Taparelli's version of social justice was simply an application of justice to social affairs and held that people should do what's right based on a conceptualization of morality based on natural theology and religion, and for much of its history social justice has been a religious concept.

Main Principles Of Social Justice –

While there is no single definition of social justice, most approaches share the broad goals of inclusion and fairness. In order to achieve those goals, they establish a set of ethical principles for a just society.

These principles may include:

Access

Equal access to social goods is one of the most fundamental principles of social justice. This holds that society's resources should be equally available to all. For example, many social justice theorists believe that people should have equal access to education, health care, and employment opportunities. Public servants can uphold this principle by ensuring that everyone has access to these resources.

Equity

Equity is the principle that people should have the same opportunities to succeed, despite any past injustices or systemic discrimination. This may mean that resources are distributed in a way that addresses the specific needs of underprivileged communities or people.

Diversity

Diversity is the principle that government and business leaders should be broadly representative of the communities they serve. This means that not only should there be women and people of color in positions of power, but also that minority communities should be equally represented in public institutions. On a policy level, this principle may entail prohibitions on discrimination or providing resources in multiple languages.

Participation

Participation is the principle that everyone in a community should have a voice in making important decisions. In many societies, public policies are set by a small group of powerful people, without consulting the communities they represent. This may have the unintended effect of excluding a large part of the community. Public policymakers can address this shortcoming by consulting the advocates of minority communities and considering their needs.

Human Rights

The final principle of social justice, and arguably the most fundamental, is human rights. In addition to political rights, such as freedom of conscience, it also requires freedom from police abuse and respect for one's reproductive rights and bodily autonomy.

Is Social Justice Essential –

The necessity of social justice is a matter of significant debate, but many argue it is essential for various reasons:

1. Equity and Fairness: Social justice ensures that all individuals have equal opportunities and are treated fairly, regardless of their background, race, gender, or socioeconomic status. This promotes a more inclusive and equitable society.
2. Social Stability: Addressing social injustices can reduce societal tensions and conflicts. When people feel they are treated fairly and have equal opportunities, it fosters social cohesion and stability.
3. Human Rights: Social justice is closely tied to the protection and promotion of human rights. Ensuring that everyone's rights are respected is fundamental to a just society.
4. Economic Growth: Inclusive policies and practices can lead to broader economic growth. When more people have access to education, healthcare, and employment opportunities, it can boost productivity and innovation.
5. Moral and Ethical Imperative: Many argue that pursuing social justice is a moral and ethical obligation. It aligns with principles of compassion, empathy, and respect for the dignity of all individuals.
6. Reducing Inequality: Social justice aims to reduce inequality by addressing systemic barriers and providing support to marginalized groups. This can lead to a more balanced and fair distribution of resources and opportunities.

While some may argue that the pursuit of social justice can be complex and challenging, and may sometimes involve difficult trade-offs, many believe that it is a critical component of a healthy, functioning society.

❖ **Social Justice For Gender Equality –**

Social justice for gender equality focuses on creating a society where individuals of all genders have equal rights, opportunities, and treatment. This involves addressing systemic discrimination, biases, and inequalities that affect people based on their gender. Here are key aspects and reasons why social justice is essential for achieving gender equality:

1. **Equal Opportunities:** Ensuring that all genders have equal access to education, employment, healthcare, and political representation. This involves removing barriers that prevent women and gender minorities from fully participating in society.
2. **Fair Treatment:** Combating gender-based discrimination and harassment in all areas of life, including the workplace, educational institutions, and public spaces. This includes implementing and enforcing laws and policies that protect against genderbased violence and discrimination.
3. **Economic Empowerment:** Addressing the gender pay gap and ensuring equal pay for equal work. This also involves providing support for women and gender minorities in entrepreneurship and leadership roles.
4. **Reproductive Rights:** Ensuring access to comprehensive reproductive healthcare, including contraception, maternal health services, and safe abortion. This is crucial for enabling individuals to make informed choices about their bodies and lives.
5. **Challenging Stereotypes:** Addressing and challenging harmful gender stereotypes and norms that limit individuals' potential and perpetuate inequality. This includes promoting diverse and positive representations of all genders in media and culture.
6. **Supporting Care Work:** Recognizing and valuing unpaid care work, which is disproportionately carried out by women. This includes implementing policies that support work-life balance, such as parental leave and affordable childcare.
7. **Intersectionality:** Understanding that gender inequality intersects with other forms of discrimination, such as race, class, sexuality, and disability. Addressing these overlapping issues is crucial for achieving true gender equality.
8. **Legal and Policy Reforms:** Advocating for and implementing legal and policy reforms that promote gender equality, such as anti-discrimination laws, gender quotas, and affirmative action policies.

Promoting social justice for gender equality is not only a matter of fairness and human rights but also has broader societal benefits. Societies that promote gender equality tend to be more prosperous, stable, and healthy. Gender equality can lead to improved economic outcomes, better health and education, and more inclusive and democratic governance. Therefore, pursuing social justice for gender equality is essential for creating a more just, equitable, and thriving world for everyone.

❖ **Women Status In India –**

The status of women in India has seen significant changes over time, marked by both progress and persistent challenges. Here are some key aspects:

Historical Context

- **Ancient Period**: Women in ancient India held a respectable position in society, participating in various fields including education, philosophy, and governance. However, over time, their status declined due to societal changes and the imposition of restrictive customs.
- **Colonial Period**: The British colonial era saw both further degradation of women's status and the emergence of reform movements. Social reformers like Raja Ram Mohan Roy and Ishwar Chandra Vidyasagar advocated for women's rights, leading to legislation such as the abolition of Sati and the promotion of widow remarriage.

Contemporary Status

Legal and Constitutional Rights

- **Equality and Non-Discrimination:** The Indian Constitution guarantees equality before the law and prohibits discrimination based on gender. Articles 14, 15, and 16 provide a legal foundation for gender equality.
- **Affirmative Action**: The Constitution allows for affirmative action to promote women's participation in various spheres.

Education

- **Improved Literacy Rates:** Female literacy rates have improved significantly, although they still lag behind male literacy rates. According to the 2011 Census, the female literacy rate was 65.46% compared to 82.14% for males.
- **Educational Initiatives:** Programs like Beti Bachao Beti Padhao aim to improve educational outcomes for girls. Economic Participation
- **Workforce Participation:** Women's participation in the workforce remains low compared to men. According to the World Bank, the female labor force participation rate in India was about 21% in 2020.
- **Entrepreneurship:** There has been a rise in women entrepreneurs, supported by various government schemes and microfinance programs. Health and Well-being
- **Maternal Health:** Initiatives like the National Health Mission have improved maternal health services, but maternal mortality rates remain a concern.
- **Reproductive Rights:** Access to reproductive healthcare has improved, yet challenges persist in rural areas. Political Participation
- **Local Governance:** The 73rd and 74th Constitutional Amendments have reserved one-third of seats in local governance bodies for women.
- **National and State Legislatures**: Women's representation in national and state legislatures is increasing but remains below global averages. Social Issues and Violence
- **Gender-based Violence:** Women in India face significant levels of gender-based violence, including domestic violence, sexual harassment, and trafficking. Laws such as the Protection of Women from Domestic Violence Act, 2005, and the Sexual Harassment of Women at Workplace Act, 2013, aim to address these issues.
- **Social Norms and Stereotypes:** Deep-rooted patriarchal norms and stereotypes continue to restrict women's freedom and opportunities.

❖ **Social Justice For Women In India, Is It Working –**

The effectiveness of social justice initiatives for women in India is a complex issue with both successes and ongoing challenges. Here's a detailed analysis.

Legal and Policy Reforms:

Legislation: Several laws have been enacted to protect women's rights and promote gender equality, including the Protection of Women from Domestic Violence Act, 2005, and the Sexual Harassment of Women at Workplace Act, 2013.

Policy Initiatives: Programs like Beti Bachao Beti Padhao, which aims to improve the status of the girl child in terms of education and health, have had a positive impact.

Education:

Increased Enrollment: There has been a significant increase in the enrollment of girls in schools, leading to improved literacy rates among women.

Scholarship Programs: Various scholarship programs for girls have encouraged higher education and reduced dropout rates.

Economic Empowerment:

Employment and Entrepreneurship: Initiatives like the Mudra Yojana provide financial support to women entrepreneurs, leading to increased economic participation.

Skill Development: Programs focused on skill development have helped women gain employment and achieve financial independence.

Health:

1. **Maternal Health**: Improvements in maternal healthcare services have led to a decline in maternal mortality rates.

   Reproductive Rights: Enhanced access to reproductive health services has improved women's health outcomes.

Political Participation:

Local Governance: The reservation of seats for women in local governance bodies has increased their participation in political decision-making.

Awareness and Advocacy: Growing awareness and advocacy for women's rights have led to a more gender-sensitive approach in policymaking.

Challenges and Areas for Improvement

Implementation Gaps:

Enforcement of Laws: While laws exist, their enforcement is often weak, leading to continued discrimination and violence against women.

Awareness and Accessibility: Many women, especially in rural areas, are unaware of their legal rights and lack access to legal resources.

Socio-Cultural Barriers:

Patriarchal Norms: Deep-rooted patriarchal norms and stereotypes continue to limit women's opportunities and freedom.

Gender-Based Violence: Despite legal protections, gender-based violence remains pervasive, including domestic violence, sexual harassment, and trafficking.

Economic Inequality:

Gender Pay Gap: Women continue to face a significant gender pay gap and limited opportunities for advancement in the workforce.

Labor Force Participation: Women's participation in the labor force remains low due to various socio-economic barriers.

Intersectionality:

Marginalized Communities: Women from marginalized communities, such as Dalits and Adivasis, face compounded discrimination and greater challenges in accessing education, healthcare, and employment.

Rural-Urban Divide:

Access to Services: Women in rural areas face greater barriers to accessing education, healthcare and economic opportunities compared to their urban counterparts.

Infrastructure and Resources: Lack of infrastructure and resources in rural areas hampers the effectiveness of social justice initiatives.

Exploring the Role of Media Education in Teaching Ethical AI Usage Policies – A Systematic Literature Review

Maitree Shee
Research Scholar
IGNOU

Introduction

The concept of media education must be an old one but it has gathered importance with the arrival of Artificial Intelligence (AI) in the world arena since it has marked its footprints in commercial purposes and the daily life of human. To speak of its origin, it saw its beginning in 1956, when it was first introduced in Darmouth Summer Research Project on Artificial Intelligence (McCarthy, 2006). Later, under the collaboration of John McCarthy, Marvin Minsky, Claude Shannon and Herbert Simon, AI took its first step towards developing more intelligent machines which were capable of making work simpler and life faster than ever before. This effort went well as the AI has brought the world as near as just one click, but with such facilities the human being has got several unethical practices.

The AI has now been incorporated in every sector of life which has resulted in economic growth, innovative drives, automation of several things, easy and faster learning etc. As everything that exists in the world has both side of darkness and light, similarly the AI is not spared from it. For any powerful thing there needs to be a control in power and a ruling set of principal. In this paper the researchers have discussed through systematic literature review, that the usefulness of ethics in usage of AI, and as media is a proven strong medium to convey message with lightening speed, so the role of media education in disseminating the ethical norms of using AI in an ethically correct way.

Research Objectives

1. To highlight the importance of media education to encourage digital literacy among people about incorporating AI in their daily work.
2. To address the gap in the ethical usage of AI and the existing principals
3. To find out the best suited methodology in studying the importance of media education in teaching ethical usage of AI.

Research Design

Methodology

This research paper has been constructed based on reviews from other research papers on similar topic. The method followed is systematic literature review of existing literature on "role of media education in teaching ethical AI usage policies". These papers were selected on the basis of countries form developing economies as the usage of AI in such countries needs more concern than those countries where people are already aware of the usage of this new technology called AI. The countries of developing economies were selected from the 'World Economic Situation Prospects' of 2020 (The United Nations). A systematic review "involves a systematic search for studies and aims for a transparent report of study identification, leaving review stakeholders clear about what was done to identify studies and how the findings of the review are situated in the relevant evidence" (Cooper, 2018). This review f literature was conducted keeping in mind the specific key words and a time frame that is feasible within the study's objectives.

Search terms

The research papers were searched primarily from two databases i.e., JSTORE and Google Scholar. Though I have to visit the websites like Springer, Sage publication, Taylor & Francis but it was through Google Scholar. The articles/ papers, conference proceedings and books were searched using five major keywords like: 'Digital Media', 'Media literacy', 'Digital literacy', 'Artificial intelligence' and 'Ethics' (focusing only on AI usage, or AI technology).

Selection Criterion

The selection criterions were:

i) On the basis of time frame i.e., from 2000 to 2024.

ii) The literature discusses the importance of media education in proper/ethical usage of AI

iii) The selected literature discusses about the gaps and challenges in using AI in an ethical way.

Selection Process

The selection of the research papers were made in four steps:

i. Searching of papers based on key words

ii. The titles and abstracts were screened keeping in mind the eligibility criterion

iii. Then the selected papers were read and many papers were excluded based on contextual differences.

iv. Lastly, the informations were extracted only from the selected research papers.

PRISMA Flow Chart

The PRISMA flow chart is a diagrammatic representation of the selection, inclusion and exclusion process of the research papers. After all the screening process the researcher has gone through only 21 full papers from diverse sectors because they cater well to various concepts about which the researcher have discussed in the paper.

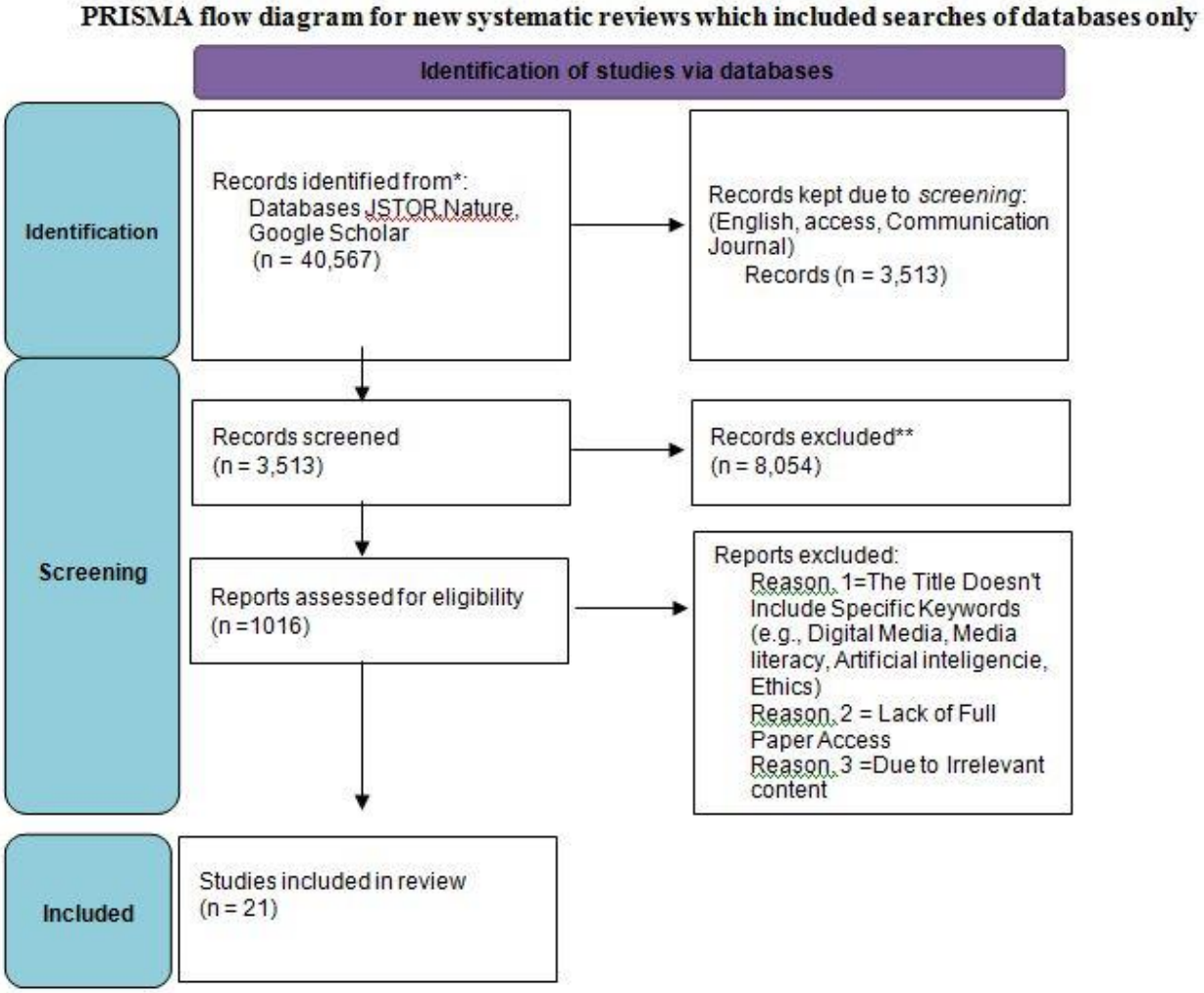


Fig:1 Process of article identification following PRISMA

Conceptual Framework

Digital Media

The term digital media is broad term as it includes in itself a varied range of media platforms. Primarily, digital media means only machine-readable data formats that helps in transmitting information worldwide with the help of internet. The Center for Digital Media defines digital media as "Digital Media is a blend of technology and content" (Center for Digital Media). With the emergence of digital media the communication platforms, patterns, language as well as the frequency to contact with one another in real-time has changed. It has also changed the learning parameters thorough digital media (DM) as a lot of information appears before the DM user in an unwanted manner through various apps. Newer digital media, which include social and interactive media, are a form of media in which users can both consume and actively create content (Reid Chassiakos, 2016). The point of concern is the intensity of infiltration of DM in human life resulting in personalized content sharing which is not necessary but are very engaging for the global viewers. In such upsurge of DM the introduction and integration of Artificial Intelligence in media since 2023 has played a critical role in raising awareness about the ethical limits of taking assistance from AI.

Digital Media Literacy

The term Media literacy does not depend on digitization as the awareness for media literacy could be seen long back (in Indian context it could be noticed since the time of the call for an independent India.) The JISC Digital Capabilities Framework (JISC, 2022) defines media literacy as understanding audience, accessibility, user design, and impact. It ignited individual's conscience to ask why messages are designed as they are and how they affect them.

With the advent of internet in the world of media, the media industry got a boost of speed, and here came the concern for genuine data and facts as well as a need to be aware of fake news or news with half truth. So, these concerns alarmingly called for the need of Digital Media Literacy. Now when the researcher talks of what is digital media literacy the researcher came across very a very apt definition by the National Leadership Conference on Media Literacy (NLCML) "the ability of a citizen to access, analyze, and produce information for specific outcomes" (NLCML, 1992). It is considered to be the first definition of its kind.

There are studies which are of the opinion that audience who were exposed to digital media literacy are more conscious about evaluation media messages critically than just believing them depending on their face value. According to Hobbs and Jensen "media literacy significantly impacts student's ability to analyze and evaluate media messages" (Hobbs, 2009). Again S. Shyam Sunder is of the opinion that digital media has blurred the barriers between established news channels and citizen journalism. Blogs, podcasts and social media have democratized content creation, allowing individuals to produce and disseminate information without the need for large media conglomerates (S Shyam Sundar, July 2022). Considering AI's increasing assimilation into media system, awareness about digital media literacy is critically important in generating awareness about the impact of media on every individual self. Media literacy helps individuals critically assess the information they consume, an essential skill when AI-driven algorithms curate content (Sriram, 2023). Several researchers have highlighted the relevance of digital media literacy in understanding AI's barge into privacy, content customization, information dependability.

Artificial Intelligence

Artificial intelligence evolved as a sub field of Computer science and the name was coined by John McCarthy in 1956 in a summer workshop called the Dartmouth Summer Research Project on Artificial Intelligence. (Marr, 2018) The English Oxford Living Dictionary defines AI as "The theory and development of computer systems able to perform tasks normally requiring human intelligence, such as visual perceptions, speech recognition, decision-making, and translation between languages." (Marr, 2018)

According to the researcher term 'Artificial intelligence' is unacceptable. The researcher is of the opinion that intelligence can never be artificial, it would be better if it is called 'Human Generated Intelligent System' or in short 'HGIS' as the intelligence it showcases is not an artificial one, rather intelligence can never be artificial one. It's actually the system which is a 'machine' which provides learning, has the power to process natural language, analyze date, recognize patterns and emotions, reasoning, decision making, problem solving etc. Again the AI has certain weaknesses as it cannot perform any task without the help of any internet enabled device.

In order to understand AI there are several frameworks used across the world. The researchers have mentioned a very few in this paper. The Digital Competency Framework (2019) refers to AI in areas like, "developing and mobilizing technological skills" where the aim is to develop a holistic understanding of AI and its impact on several other sectors like education, politics, social and cultural aspects of human existence. Secondly, The Digital Teaching Professionals Framework (2019) refers to AI in areas like "raising learner's digital employability and self employability skills" where AI is considered to be another tool (digitally enabled) that helps in building skills specific to the industry. There is another framework that needs to be mentioned is DigiComp -2.1 (2017) and 2.2 (2022). It focuses on the impact of AI on information and media literacy. According to Peter Tiernan et.al., DigiComp "addresses the impact of AI o information and data literacy in two core areas: 1) Browsing, searching and filtering data, information and digital content" (Tiernan, 2023). These frameworks acknowledges the role of AI in refining search algorithms and generating desired content within fraction of seconds without wasting the users valuable time. This speed in information dissemination is of course incredible but also has some drawbacks like, delivering unwanted or extra information, or delivering the wrong content, or may delivering inherent misconceptions or misrepresentation of the intended meaning, or may deliver skewed information or may even generate "deep fake" content that may allege an individual or an organization.

Ethics of AI

The concept of ethics is always relevant in every aspect of life. The contemporary interference of AI in the lively aspects of human obviously demands for a set of ethical norms to be maintained in the conventional practices of AI. AI has been intervening in aspects like decision-making, privacy, storage of virtual informations, disseminating justice, driving, hiring for jobs, academics, teaching, and also negative aspects like biases, misconception, misinterpretation, accountability, transparency etc. In such a contradictory situation ethical considerations might ensure some reliability of AI applications as they provide a legal bar in unfair activities of AI and respect some rights of the user. One such example is the regulatory framework introduced by European Union on AI Act, it "emphasizes the importance of responsible AI development to address risks of misuse promoting trust and sustainability in real world applications" (Laux, 2024).

There are certain ethical norms that need mention. They are privacy, fairness, accountability, safety, security, informed consent, human oversight etc. These norms could be synthesized into five key principals; they are autonomous, beneficence, non-maleficence, justice and explicability. Among these principles the first four were already in use in bioethics, only the last principal was added as it "captures the challenges of intelligibility and accountability unique to AI system" (Whittlestone, 2019, January).

There are instances where AI has been used unethically like in the case of Amazon's AI hiring tool that was found to be biased against woman (Kodiyan, 2019). Again the case of COMPAS, an AI that was employed in the criminal justice system of United States, it was criticized for racial bias in predicting recidivism rates (Dressel, 2018). To discuss about it further, the technologies like the facial recognition applications like Clearview AI has sparked debates upon concerns like privacy and unethical usage of data (DiPersio, 2022, June). These instances show that the malpractices through AI can even happen in a larger scale and at higher administrative level, so even though there are certain ethics in AI usage but they are often misused.

Analysis and findings

Approaches of research	Descriptive research	Comparative and Content Analysis	Ethical and Normative Enquiry
	19	6	7

Table 1: Approaches of the study (frequency)

Table:1 shows that the studies have used diverse research methods in the discourse of ethical usage of AI. Some approaches to methodology found ethical and normative enquiry some followed the mixed methodology of comparative analysis and content analysis and in maximum research papers they used descriptive research. Majority of the research papers used descriptive research methods because the screening and exploratory process in descriptive methods is helpful in digging deep into the research insights.

Findings suggest that in order to study the benefits of using ethical AI and how people actually use them worldwide the best method is to follow the descriptive research which is capable of explaining the situation and recent trends bringing out references from real life case studies. Data collection, data analysis, observation studies, measurements of recent trends, and coming in direct contact with the sample population during survey and trying to explain the view of the population- these all are the postulates of descriptive research. So, it is clear that this research is a combination of both qualitative and quantitative research. The researchers could easily perform mixed method research under the banner of descriptive research. The third objective of the research was to find the best method for the study of usage of ethical AI and the importance of media education in teaching it to the heterogeneous population is descriptive research methods.

Gaps found during the study

In course of the making of this research paper the researchers choose to go through the research papers of several researchers and along with some positive findings the researchers have chalked out some loopholes in the context of ethical usage of AI and in proper dessimination of media education regarding this concept. Those loopholes are listed below as gaps in the study:-

Critical and Ethical Concerns: There exists issues like biases, transparency, privacy, misleading information, misinterpretation and many more as we could witness in the case of criminal justice in COMPAS and in case of corporate hiring by AMAZON's AI

Ethical AI Frameworks and their Limitations: Though there are instances where the government of the concerned country has created a set of guidelines et we could see there are several inconsistencies in the application of the framed guidelines in real practices. I t clearly suggests that the regulations need to be more strict and they need constant monitoring.

Unintended Consequences of AI: Through the findings it is stated that there are instances where misuse of technology happens unintended like in the case of Clearview AI. This particular setting is used in android phones for safety but it was misused and a serious criminal offence like "deep fake" got p platform to spread nuisance.

Inconsistent Global Standards: During the research a very crucial violation of the global standards could be notices as European Union has taken the initiative to construct an AI Act the other countries throughout the world should also take strict steps so that the new technology may not someday turn another 'Frankenstein' for human being. The research has also recognized a serious need to make a global standard for 'AI ethics' as the hour demands it more (especially in a diversified and highly populated country like India).

Conclusion

As the country and the world continues to evolve, and in this process of evolution AI has come as a current phase of development, we the 'users' or the 'ultimate gainers' of these technologies should be conscious, aware, and responsible of what we do and what we intend to do as, this needs no mention, that our actions today will show its reaction on the next generation of this Earth tomorrow. The AI is of dual nature (both good and bad) like every other thing existing in this world,

but it is the intelligent human being who should decide the apt use of it. The AI's potential to enhance dissemination of information underscores the importance of structured, proper and institutional media education in preparing people with the necessary skills to steer through the complexities brought about by new technologies in the conventional living of human.

Bibliography

1. Burbules, N. &. (2000). Watch IT: The Risks and Promises of Information Technologies for Education . *Boulder, CO: Westview.* , (). .
2. *Center for Digital Media*. (n.d.). Retrieved from https://thecdm.ca/program/mdm/digital-media
3. Cooper, C. B.-C. (2018). Defining the process to literature searching in systematic reviews: a literature review of guidance and supporting studies. *BMC medical research methodology* , 18, 1-14.
4. DiPersio, D. (2022, June). Data Protection, Privacy and US Regulation. *In Proceedings of the Workshop on Ethical and Legal Issues in Human Language Technologies and Multilingual De-Identification of Sensitive Data In Language Resources within the 13th Language Resources and Evauation Conference*, (pp. 9-16).
5. Dressel, J. &. (2018). The accuracy, fairness, and limits of predicting recidivism. *Science advances* , 4(1), eaao5580.
6. Fabia Ioscote, A. G. (2024). Artificial Intelligence in Journalism: A Ten-Year Retrospective of Scientific Articles (2014–2023). *Media* , 5(3), 873-891.
7. Foundation, E. a. (2019). *Digital Teaching Professional Framework—Full Reference Guide.* London, UK: Education and Training .
8. Government, Q. (2019). *Digital Competency Framework.* Tokyo, Japan: Ministry of Education.
9. Hobbs, R. &. (2009). The past, present, and future of media literacy education. *Journal of Media Literacy Education* .
10. JISC. (2022). *Building Digital Capabilities Framework—The Six Elements.* JISC: Bristol, UK.
11. Kodiyan, A. A. (2019). An overview of ethical issues in using AI systems in hiring with a case study of Amazon's AI based hiring too. *Researchgate Preprint* , 1-19.
12. Laux, J. W. (2024). Trustworthy artificial intelligence and the European Union AI act: On the conflation of trustworthiness and acceptability of risk. *Regulation & Governance* , 18(1), 3-32.
13. Marr, B. (2018, February 14). *Forbes*. Retrieved October 05, 224, from The Key Definitions Of Artificial Intelligence (AI) That Explain Its Importance: https://www.forbes.com/sites/bernardmarr/2018/02/14/the-key-definitions-of-artificial-intelligence-ai-that-explain-its-importance/
14. McCarthy, J. M. (2006). A proposal for the dartmouth summer research project on artificial intelligence, august 31, 1955. *AI magazine* , 27(4), 12-12.
15. NLCML. (1992). National Leadership Conference on Media Literacy.
16. Reid Chassiakos, Y. L. (2016). Children and adolescents and digital media. *Pediatrics* , 138(5).
17. S Shyam Sundar, E.-J. L. (July 2022). Rethinking Communication in the Era of Artificial Intelligence. *Human Communication Research* , 379–385 Volume 48, Issue 3.
18. Sriram, N. J. (2023). ARTIFICIAL INTELLIGENCE (AI) & INDIAN JOURNALISM: CURRENT TRENDS AND CHALLENGES. *IJNRD* , 777-783.
19. Tiernan, P. C. (2023). Information and Media Literacy in the Age of AI: Options for the Future. *Education Sciences* , 13(9), 906.
20. Vuorikari, R., Punie, Y., Carretero, S., & Van Den Brande, L. (2016). *DigComp 2.0: The Digital Competence Framework for Citizens.* Luxembourg: Luxembourg Publication Office of the European Union.
21. Whittlestone, J. N. (2019, January). The role and limits of principles in AI ethics: Towards a focus on tensions. *In Proceedings of the 2019 AAAI/ACM Conference on AI* (pp. 195-200). Ethics, and Society .

Ethno-Botanical Survey of Medicinal Plants in Yavatmal District, Maharashtra

Namrata R. Dhanajkar
(Assistant Professor)
(Department of Botany, Yashwantrao Chavan Arts and Science Mahavidyalaya, Manglurpir. Dist. Washim)

Abstract:

Botanical survey on medicinal plants and their indigenous uses was carried out in Yavatmal District of Maharashtra. Ethnobotany is the study of regions plants and their practical uses via traditional knowledge of a local culture and people. These areas are floristically rich areas where plants of various categories are growing spontaneously in their natural habitat. The rural community of these regions uses some of the plants as medicine for the treatment of various diseases and ailments. This region has a great wealth of medicinal plants and traditional medicinal knowledge. Medicinal plants have played an important role of primary health care system among the local people of Yavatmal region.

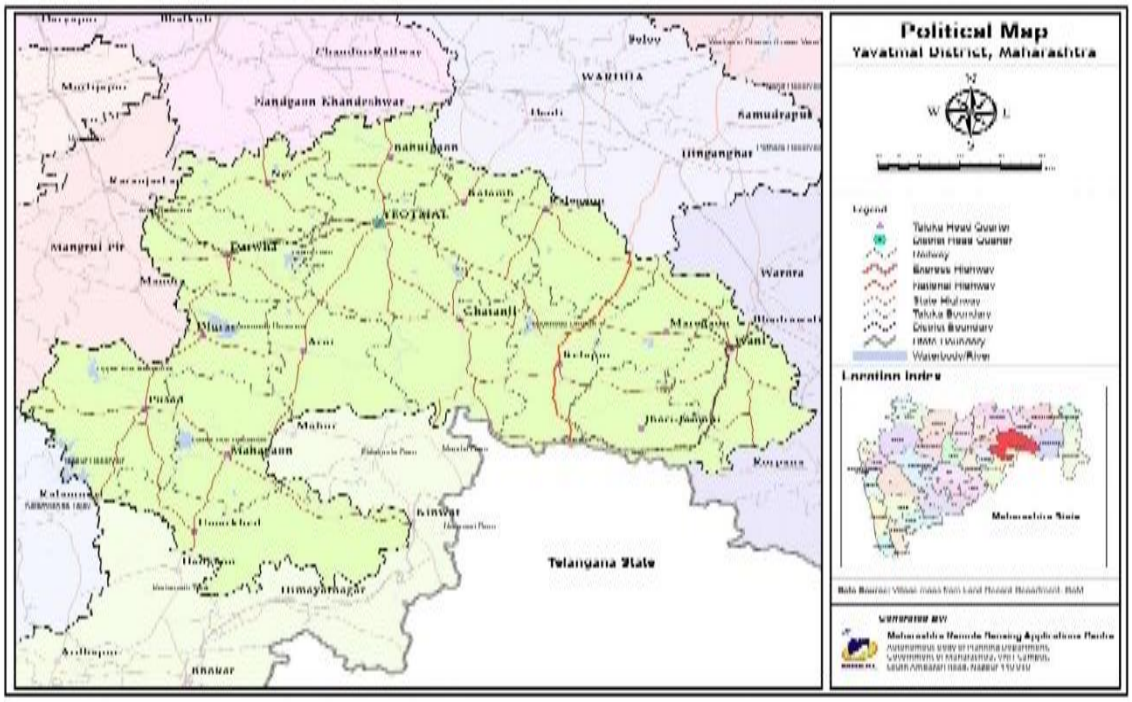
Keywords: Medicinal plants, traditional plants, botanical survey, indigenous, ethnobotany, habitat, aliments.

INTRODUCTION:

Ethnobotany is the study of interrelations between human and plants. It involves the indigenous knowledge of plant classification, cultivation and uses as food, medicine, and shelter. It helps us to understand the significance of plants in various cultures and their role in sustaining communities. The present research paper is the study of traditional knowledge of medicinal plants and it uses by local people of Yavatmal region. Due to this unique geographical location and different climatic conditions, it has rich biodiversity and variety of plant species. Medicinal plants are the principal health care resources among the most of people in India. Local people of this region are basically depending upon deep observation of nature and their understanding of traditional knowledge of medicinal practices. Local people in this region, especially tribal people and women heavily use these traditionally available medicinal plants for health and believe that these are easily available, less expensive and have no side effects as compare to modern medicine. Medicinal plants have played an important role in primary health care system among the local people. Out of 15,000 species of flowering plants found in India, about 17% have their medicinal uses. This region has rich variety of herbs, shrubs, medicinal and aromatic plants. Present ethnobotany associates various disciplines such as anthropology, botany, linguistics, nutrition, conversations, pharmacology which enables wide opening of filed to enrich the human knowledge. There are significant economic benefits in the development of indigenous medicines and in use of medicinal plants for the cure of various diseases.

Geography of Yavatmal Region:

Yavatmal formerly known as "Yeotmal," is a district of Indian State of Maharashtra. It is in the south-western part of Wardha-Penganga plain. The district lies between 19.26' and 20.42' north latitudes and 77.18' and 79.9' east longitude. It is surrounded by Amravati and Wardha district to north. It involved in Amravati divisions consists of 16 tehsils. The district covers 13,582 km2. The total length of the district is 190 km and maximum width from north to south is 160 km. The two main rivers are the Penganga and Wardha. The climate is dry and hot in summer with a moderately cold winter. District receives an average annual rainfall of 911.34mm. Average daily temperature in May reaches 42. Jowar and cotton are main products.



METHODOLOGY:

Ethnobotanical data were collected from district Yavatmal. This survey was conducted using oral questioning to traditional healers practicing peoples. Questionnaire and open questions were used to record the use of medicinal plants; vernacular names, ailments treated, parts used, modes of preparations. Some data was collected via secondary sources mainly from the website of Government of Maharashtra, state medicine plant board of Maharashtra. References from research papers, books, articles and news paper were taken for interpretation of data. The information is noted, photos were taken and samples were collected. The traditional knowledge about the plants for curing diseases were collected from, traditional healers and tribal peoples who participate in herbal therapy.

Fig:1 Some photographs of useful Medicinal Plants and some local peoples (Tribal community) in Yavatmal District (Pusad Taluka).

List of Medicinal Plants with their uses:-There are some useful medicinal plants with their local name, scientific name, family, uses and part of plant is described.

Sr. No.	Name Of Wild plants	Family	Uses of Wild plants
1.	Ficus racemose (Umbar)	Moraceae	Leaves used to cure wound healing, bark used to cure dysentery, asthma, and urinary problems.
2.	Hibiscus sabdariffa (Umbadi)	Malvaceae	It is good source of folic acid, helps to keep our bones strong.
3.	Celosia argenta (Karadu)	Amranthaceae	It decreases risk of heart diseases, improve bone health.
4.	Portulaca oleracea (Chiwai)	Portulaceae	It is low in calories, high amount of omega 3 fatty acid.
5.	Cassia tora (Tarota)	Caesalpinioideae	Used in loosing weight, for skin diseases,for snake bite.
6.	Moringa olefera	Moringaceae	Used as food and fodder, cure inflammation
7.	Momordica dioica (Kartule)	Cucurbitaceae	Used for headchae, effect for high fever.
8	Bambusa vulgaris (Bamboo)	Poaceae	It can reduce risk of heart diseases, useful for human health.
9.	Porlulaca oleracea (Ghol)	Portulaceae	Used to cure asthma, risk of cancer, ulcers, piles, constipation.
10.	Colocasia esculenta (Chamkora)	Araceae	Treating diarrhoea, dysentery, inflammation on kidney, cancer.
11.	Amarantus spinous (Tandulja)	Amranthaceae	Prevent constipation, diarrhoea
12.	Physalis pubesencs (Ground cherry)	Solanaceae	To treat asthma, dermatitis ,hepatitis, malaria
13.	Cordia dichotoma (Lasora)	Boragnaceae	Treat asthma, cough, fever, skin allergies.
14.	Basella alba (Mayalu)	Basellaceae	Used as food.
15.	Phyllostachys edulis (Bamboo shoot)	Poaceae	To regulate blood pressure, preventing obesity & diabities.
16.	Rumex vesicarius (Ambat chuka)	Polygonaceae	To control blood pressure, improve eye sight, boost energy.
17.	Hypocrateriformis rivea (Fanji)	Convolvulaceae	Used as ornamental plant, treating skin diseases, wounds.
18.	Vigna unguiculata (Chawali)	Fabaceae	Improves heart health, digestion.
19.	Sesbania grandiflora (Hadga)	Fabaceae	To cure fever, diarrhoea, skin diseases.
20.	Cardiospermum helicacaum (Kapalfodi)	Sapindaceae	Used in skin infections, it will reduce fever.
21.	Chlorophylum borivilianum (Safed musali)	Asparagaceae	Used to cure obesity.
22.	Amorphallus paeonifolius (Suraj kand)	Araceae	To cure itchy sensation in mouth & throat,
23.	Bauhinia racemose (Apata)	Fabaceae	To cure asthma, bronchitis, dysentery, piles.
24.	Asparagus officinals (Sursurmuli / Shatavari)	Asparagaceae	For good health, to cure female problems.

Result And Discussion:

The study of ethnomedicinal plants in Yavatmal district provides very useful and interesting results. The concept of plant uses differs among different people as it provides traditional uses of

plant. There are about 24 species belonging to 18 families. A tribal person has good knowledge about the uses of many plants. They were using these plants to cure diseases like mouth diseases, liver disorder, skin diseases, eye diseases, diabetes, stomach infections, fever, kidney stone problems and so on. Tribal people are also being living in spiritualism for which they utilize many ethnomedicinal plants. Traditional knowledge provides the basis for problem solving strategies for local communities. In certain areas these folk medical prescriptions are wide spread and have survived through ages from one generation to next generation through the word of mouth. They don't exist as on paper knowledge. Normally these systems of medicine depends on old peoples experiences and practices.

CONCLUSION:

These people have close relationship with the nature. The tribal people have been using various plants species for using medicinal plants and other plant products. Most of the medicinal plants are getting vary rare as confirmed by traditional healers and as observed during the field work too. Deforestation, overgrazing, increased population and pollutions are the major factors that affects different medicinal plants. Therefore, encouraging the peoples to grow different medicinal plant species in the farm and protected the forest wild plants species for incoming future. Tribal are fully dependent upon forest for food, fruits, fodder and medicinal plants for their healthcare. Local people in this region, especially older age people, tribal people and women heavily use these traditionally available medicinal plants for health. These are easily available, less expensive and no side effects as compare to modern medicine.

ACKNOWLEDGEMENT:

We are very much thankful to all the local and tribal people for providing us the maximum indigenous information about plants. They help us for identification, classification and collection of plant species.

REFERENCES:

1. Berbesi, L.A., et al. "Methane Leakage from Evolving Petroleum Systems: Masses, Rates and Inferences for Climate Feedback." Earth and Planetary Science Letters 387. (2014): 219- 228.
2. ScienceDirect. Web. 9 May 2016. "Causes of Climate Change." Causes of Climate Change.
3. Environmental Protection Agency U.S., n.d. Web. 06 May 2016. Chasing Ice. Dir. Jeff Orlowski. Perf. James Balog.
4. National Geographic Channel, 2012. 2012. Web. 01 May 2016. Don.Wuebbles. phone interview. 19 Apr. 2016.
5. Ecological Impacts of Climate Change. N.p.: n.p., n.d. The National Academies of Science, 2009.Chapin, F. Stuart; Matson, Pamela A.; Vitousek, Peter (2 September 2011). Principles of Terrestrial Ecosystem Ecology. Springer Science+Business Media. ISBN 978-1-4419-9504-9. Archived from the original on 16 October 2022. Retrieved 4 October 2022 – via Google Books.
6. Butterbach-Bahl, K., et al., Nitrous oxide emissions from soils: How well do we understand the processes and their controls? Philosophical Transactions of the Royal Society B: Biological Sciences, 2013. 368(1621): p. 20130122. 34.
7. IPCC, Summary for policymakers. In: Climate Change and Land: An IPCC special report on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems,
8. P.R. Shukla, et al., Editors. 2019: https://www.ipcc.ch/srccl/chapter/summary-for-policymakers. 35.
9. FAO, FAO-Stat. 2020, United Nations Food and Agriculture Organization: http://www.fao.org/faostat/en/#data. 36. United Nations. World population prospects 2019. 2019; Available from: https://population.un.org/wpp.
10. https:\\www.nhp.gov.in\introduction & importance of medicinal plant
11. Himalaya publication –Botany Volume II
12. Map google (Maharashtra)
13. Taxonomy –By Saxena & Saxena
14. www.wikipedia.org
15. https:\\m: fnp.com\articleleasy to row medicinal plants at home.
16. https://www.helpguide.org/articles/mental-health/social-media-and-mental-health-htm.
17. https://www.ipl.org/essay/impact-of-internet-on.youth-PKQVCJQHEAJFR
18. https://www.allresearchjournal.com/archives/2016/vol2issue1/partD/1-13-149pdf.
19. https://www.researchgate.net/publication/24350671-youth-internet-use-risks-and-opportunities.
20. https://jurnal.unsyiah.ac.id/ICECED/article/download/13731/10429.
21. https://www.cdmc.uclq.edu/wpcontent/uploads/sites/170/2018/05/Guansubrahmanyam-2009pdf.

Artificial Intelligence and Privacy Law: India's Path to Regulation

Hemal V. Shastri
Assistant Professor, Vidhyadeep Law College, Vidhyadeep University, Anita, Kim, Surat.

Dr. Battull Hammid
Dean & Principal, Vidhyadeep Law College, Vidhyadeep University, Anita, Kim, Surat.

Abstract

So far as any constitutional right is concerned, framers of constitution that is constituent assembly had made long and deep discussion on every constitutional provision. As right to privacy is concern, technically it is a right to stay alone to individual. No another person has right to interfere in the individual life. In technically manner it is enough to ask somebody normal information and formal talk but beyond that every talk must have some limit that event not to ask the question which connects directly to the privacy of person and person in general not interested to response on it. In Indian Constitution art- 21 covers the right to privacy in vast sense. But now time to discuss protection of right to privacy in digital era where people are surrounded by atmosphere and weather of artificial intelligence. When researcher using atmosphere it sense it is another layer like oxygen which badly affect the people and disturb them secretly. To protect the people from unwilling effect of AI, legal framework must be there. So Researcher tries to find out problems facing by AI and legal protection to get protection from it.

Introduction

Privacy is deals with the individual privacy as well as privacy relating to property use and access of information from any source itself. The constitution of India entails the right to privacy under the provision of right to life and personal liberty which is art-21. In general right to privacy means person must have in situation that no one will interference unwillingly in life and whatever. In one real life application by known or not known every person use the technology and impliedly use the AI. Numbers of AI technologies make people's life easy which is speech recognition, natural language processing and predictive analytics etc. These facilities are fruitful and result oriented if they are used in legal manner but nowadays these AI advancement are used in some cybercrime, terrorism, data abuse, job displacements. To prevent these kinds of offence and hurdles, it is require to upgrade legal frameworks.

Object

1. To identify co relation between privacy law and A
2. To observe legislative frame work against AI in digital era
3. To check whether availability of laws are quite enough to control AI activity or not

Significance of Artificial Intelligence

No field is remaining away where AI is not used and applicable. Field like automation, health, education and finance, in this area AI is used vastly. AI have more beneficial attributes in compare to negative aspect

Reason of Importance of AI are:

- Efficacy and automation- due to help of AI one can easily complete their own work in easy and quick manner and more effectively
- Rights and decision making- AI has capability to store and reload the data which will be beneficiary for future.
- Cost Saver-Due to AI, it is possible to take capacity to accept workload and reduce the numbers of employee require to complete the same.
- Innovation and technology- AI is the advance as well as digital innovation which makes the people's life very easy and time saving.

- Addressing complex problem-it is also having attribute to solve complicated problem in short period of time-

Co Relation between AI and Privacy Laws

Impact of AI on data privacy is a complex and multifaceted issu that has become increasingly relevant as AI systems continue to grow in usage. AI is designed to analyse and process vast amount of information, depend heavily on personal data to function effectively. However, this dependence on personal data introduce on personal data and introduces several privacy risks, such as potential violations, the reinforcement of biases and discrimination and the misuse of sensitive information

A key concern is that AI systems require extensive access to personal data, including identifying details like names and addresses, to perform optimally. By analysing and processing this data, AI can make decisions, predict trends, and detect patterns. However, the massive volume of data processed by AI systems, combined with the sensitivity of the information involved, poses significant privacy risks. These risks are further amplified by AI's ability to process data far more quickly than humans, making it difficult for individuals to keep pace with how their personal information is used and safeguarded.

Important Privacy Laws in India

Constitutional Status of Privacy Right

The Indian Constitution recognizes the Right to Privacy under Article 21[1] as an essential aspect of the right to life and personal liberty. Privacy is a complex and evolving concept, necessitating legal clarity. While Article 21 has broad implications within the Indian legal framework, covering various areas of law including torts, criminal law, and property rights, the specific recognition of privacy as a fundamental right only came with the landmark Supreme Court ruling in K.S. Puttaswamy v. Union of India in 2017. Prior to this case, privacy was not considered a fundamental right under the Constitution.

Although numerous cases had addressed privacy concerns, none recognized it as a fundamental right until the Puttaswamy case. This judgment placed privacy at the heart of individual rights, making it constitutionally protected under Article 21. Furthermore, the concept of privacy has been acknowledged not only at the national level but also internationally, through various legal conventions.

Right to privacy, being multifaceted, is protected under various laws and continues to be interpreted in light of societal developments. The idea of privacy includes personal and intimate matters, with reasonable restrictions that allow the law to intervene when necessary. This article will explore the national and international dimensions of the right to privacy, recent case laws, and legislative developments, including a proposed bill on the subject.

Defining Right to Privacy

Black's Law Dictionary defines the right to privacy as the "right to be let alone," protecting individuals from unwarranted intrusions. Justice D.Y. Chandrachud's 2017 judgment, which overruled earlier principles from the Habeas Corpus case, solidified privacy as a fundamental right, extending its reach to include aspects of personal autonomy such as body integrity and personal identity.

Landmark Case: K.S. Puttaswamy v. Union of India[2]

In this 2017 case, retired Justice K.S. Puttaswamy challenged the government's Aadhaar scheme, arguing that the mandatory use of biometric data violated privacy rights. The Supreme Court ruled that the right to privacy is inherent in Article 21, rejecting earlier rulings and confirming that privacy is essential to human dignity and personal liberty.

Constitutional Provisions on Privacy

Article 21 ensures that no person can be deprived of life or personal liberty without due process of law. Over time, the Supreme Court has broadened the scope of this article to include various aspects of human existence, including privacy.

The distinction between "life" and "personal liberty" has been interpreted by the courts to cover all fundamental freedoms necessary for a meaningful and dignified life. While the U.S. Constitution defines liberty broadly, Article 21 focuses on "personal" liberty, limiting its scope slightly but still encompassing significant freedoms, including privacy.

Legal Framework for Right to Privacy in relation of Artificial Intelligence

The Indian Post Office Act, 1898

Under Section 26 of this Act, The Code of Criminal Procedure, 1973

Section 91 of the Code allows any court or officer in charge of a police station to summon an individual to produce any document or object required for investigations, inquiries, trials, or other legal proceedings.

The Indian Wireless Telegraphy Act, 1933

Section 3 of this Act makes it an offense to possess wireless telegraph apparatus without a license. Additionally, the unauthorized establishment or operation of wireless communication networks for the purpose of intercepting, monitoring, or shrivelling communications is also considered an offense.

The Personal Data Protection Bill, 2018

In July 2018, a committee released its final report along with the draft of the Personal Data Protection Bill, 2018. The bill proposed the creation of a Data Protection Authority to regulate and monitor data processing activities. It aimed to acknowledge the protection of personal data as part of the fundamental right to privacy, while fostering a culture that supports a free and fair digital economy, respecting individuals' informational privacy alongside progress and innovation.

The primary goal of the bill was to safeguard individual autonomy regarding personal data. It sought to establish clear guidelines on the flow and usage of personal data, fostering a transparent relationship between individuals and the entities processing their data. The bill also set standards for cross-border data transfers, provided remedies for unauthorized or harmful data processing, and ensured accountability for those

International Legislative Provision for Protection of Privacy Right

- Article 12 The Universal Declaration of Human Rights, 1948
- Article 17 The International Covenant on Civil and Political Rights, 1966
- Article 8 The European Convention on Human Rights, 1953

Legal Provision for Right to Privacy in Different Countries

- Europe- General Data Protect Privacy Act (ACCP) action Regulation
- USA- California Consumer
- South Africa- Protection of Personal Information Act
- Canada- Personal Information Protection and Electronic Documents Act
- India- Data Protection Bill

Judicial Approach in Relation of Right to Privacy

Phone Tapping and the Right to Privacy - R.M. Malkani v. State of Maharashtra[3]

Gender Priority and the Right to Privacy- Harvinder Kaur v. Harmander[4]

Health and Privacy – Mr. v. Hospital[5]

Conclusions

As time progresses, the right to privacy is becoming increasingly vital. With our lives more exposed than ever through social media and surveillance technologies like spy cameras, it is crucial to ensure that privacy is safeguarded for all individuals. Measures must be in place to deter anyone from violating this right. While privacy should be protected in all aspects, it is subject to reasonable restrictions under the provisions of the Indian Constitution and other relevant laws. It is important to recognize that privacy must be respected and maintained within certain boundaries, rather than being disclosed to the broader public.

Suggestion

- Prohibition of Communication Interception

- Establishment of a Central Communication Interception Review Committee
- Creation of a Data Protection Authority
- Increase Penalties for Violations

Footnotes

1. AIR 2017 SC 4161
2. AIR 1973 SCC (1) 471
3. AIR 1973 AC 157
4. AIR 1984 DEL 66
5. AIR 1999 SC 495

References

1. Gilani, S. R. S., Rehman, H. U., & Khan, I. (2021). The Conceptual Analysis of the Doctrine of Proportionality and, its Role in Democratic Constitutionalism; A Case Study of UK.
2. McBeth, A., & Nolan, J. (2012). The International Protection of Human Rights and
3. Fundamental Freedoms. International Corporate Legal Responsibility, 175-254.
4. Nowlin, C. (2002). The protection of morals under the European Convention for the
5. Protection of Human Rights and Fundamental Freedoms. Human Rights Quarterly,

Artificial Intelligence: The new vision of Data Governance

Dr. Shivani Sabharwal

Assistant Professor of Commerce, Govt. Degree College Shahpur ,Distt. Kangra, (H. P.), 176206

Abstract

Artificial Intelligence can perform tasks better than human. It processes large amount of data quickly and makes prediction, analysis and interpretation of data more accurately than human. Artificial intelligence is a field that combines computer science and robust data sets to enable problem – solving. It plays a vital role to leverage data effectively and precisely. It also helps enterprises to identifying cyber threats and helps to obtain that data which is required. Data governance ensures that data is secured and qualitative. Data governance through artificial intelligence ensures that the report generated is accurate as per the policies and data quality standards. It helps in regularizing data governance in such a way that best code of conduct can be maintained. It helps to keep track record of all the data and helpful in taking smart decisions by enhancing customer experience and solving complex problem. This paper will further endeavor to identify the various challenges of governing data through Artificial Intelligence

Keywords: Artificial intelligence, Data governance, Data mining.

Transforming Skill Building with Ai: A New Era of Learning and Growth

Dr. Gayatri Sanjay Patil
I/c Principal
Shri Indrapal Baburao Chaughule Law College

ABSTRACT:

This research article is intended to explore necessity of consistent skill development and skilled individuals as these are the essential tools for growth of any country. Performing or completing any activity and performing or completing same activity skillfully makes a huge difference in the product output. Knowing the art and mastering the art are totally different and to achieve this excellence, consistent skill development is must. In modern era, where artificial intelligence is thriving in each and every sector, letting human being to think a century ahead is undoubtedly valuable in development of skills in various sectors. Artificial Intelligence (AI) is transforming skill development across various sectors by individualizing learning experiences, creating user friendly platforms, and providing immediate feedback. AI being the easily adaptive technology can focus on the fascinating learning methods and tools, individual learning capacity, various alternative learning technics and ease of process, hence increasing attentiveness and consistency of learner Additionally, AI-driven tools facilitate skill assessments, allowing learners to identify their excellence, interest, strengths and weaknesses while keeping track of progress over time. The use of virtual simulations and gamified environments enhances practical skill acquisition, making learning more interactive and enjoyable. Furthermore, AI also nurtures inclusivity by offering resources that cater to diverse learners, including those with any kind disabilities. This research article explores the multifaceted role of Artificial Intelligence in skill development, highlighting its potential to bridge the skills gap in the workforce and prepare individuals for the demands of an evolving job market. The findings underscore the importance of integrating AI technologies in educational frameworks to promote lifelong learning and adaptability in a rapidly changing world.

INTRODUCTION:

WHAT IS SKILL?

As we are exploring the transformative impact of Artificial Intelligence in the field of skill development we need to understand first the meaning of "Skill". To find a concise definition of skill, we need to contrast it with knowledge. Knowledge represents theoretical information and facts, and skills involve using that knowledge to take action in the real world. In other words, skills enable you to perform tasks and solve problems effectively. Employers value specific skill sets that include both technical abilities as well as personal traits that ensure success in the workplace. "Skills" refer to the abilities or competencies or capacities that enable individuals to perform tasks effectively. In order to complete tasks perfectly and successfully, you should have knowledge, ability and competence, consistency and patience. These qualities, known as skills, can be developed to help person to gain expertise in a specific area. This expertise can translate into greater success in one's career and other areas of life. In this article, we provide an in-depth look at skills as they pertain to the workforce. Skill is a term that encompasses the knowledge, competencies and abilities to perform operational tasks. Skills are developed through life and work experiences and they can also be learned through study. There are different types of skills and some may be easier to access for some people than others, based on things like dexterity, physical abilities and intelligence. They can be categorized into several types:

1.Hard skills

Hard skills are also known as technical skills or job-specific skills. They are teachable, and you can prove your abilities with an exam or demonstration. Assessing hard skills is not a subjective process. You can either perform a task successfully, or you cannot. An example of a hard skill

would be the ability to use a computer language to create a mobile app. In most cases, hard skills require training. For instance, you can have talent in math, but you need to study to learn the techniques and processes necessary to become an accountant. Here are five examples of hard skills.

- **Creating a computer program** using a specific language
- **Operating a computer numerical control machine** in a factory
- **Repairing an automobile** in an auto repair garage
- **Building a mathematical model** to make a sales forecast
- **Estimating the cost of a construction project** using measurements and materials prices

In all these examples, you need to follow a specific set of steps to complete the job. Even for people with specific talents, training is necessary to gain this technical knowledge.

2.Soft skills

Soft skills are personal attributes that you use in the workplace. These abilities are necessary for workplace interactions, and they support the use of hard skills. Common soft skills include communication, leadership and relationship building. These abilities are harder to quantify than hard skills, but they're essential for building partnerships and managing or collaborating with other professionals. Here are some examples of soft skills commonly required in the workplace:

- **Communicating** effectively with peers to collaborate on a project
- **Adapting** to new requirements on a project
- **Delegating** tasks to other employees and explaining the requirements for completion
- **Solving problems** with available resources
- **Building relationships** with suppliers to get the best prices

Though you may learn techniques to support soft skills, you ultimately develop them through experiences in the classroom, the workplace or during other life experiences.

3.**Technical Skills**: Often related to specific fields or industries, such as proficiency in software tools or machinery.

4.**Transferable skills :** Transferable skills, also known as universal skills, are abilities you can apply across different job roles and industries. While hard and soft skills are often specific to certain job functions, transferable skills transcend job boundaries. Here are five examples of transferable skills:

- **Communication skills** enhance collaboration and problem-solving in any role.
- **Leadership skills** are valuable in various contexts, from leading a small team to making company-wide policies.
- **Problem-solving skills** are valuable in any position, and they can help prepare you for opportunities within a company.
- **Adaptability** allows you to change approaches and incorporate new concepts quickly. This skill is valuable in any industry that experiences changes.
- **Time management** is essential for productivity and is valuable in any position where you have to operate under deadline pressures. As you may have noticed, most transferable skills are soft skills.

Overall, skills are crucial for personal development, career advancement, and adapting to changing job demands.

SKILL DEVELOPMENT AND ITS NECESSITY:

Developing skills is a continuous process necessary for your professional growth. Company managers can facilitate this growth to ensure employees have the skills to excel at work and further their careers. Skills development is divided into three categories: cognitive, technical, and interpersonal skills. When students have cognitive skills, they are able to understand concepts and proceed to next steps in learning. Technical skills focus on the ability to perform tasks like writing, reading, math, or using computer software. They are otherwise known as hard skills obtained through training and experience. Finally, interpersonal skills, sometimes referred to as "soft skills,"

focus on how a student does their work. Examples of interpersonal or soft skills include time management, teamwork, and self-discipline. They often inform the development of cognitive and technical skill development. misuse, which can be summed up as "using it without telling the teacher," whether by not including citations or using it for an assignment that is supposed to be written solely by the student and then representing it as their own original work. Even then, these may be learning opportunities to uphold academic integrity; by instructing students about authorship and original ideas and citation, every setback can also be an opportunity for further skill development. In psychology, the four stages of competence reflect this skill development process: unconscious incompetence, conscious incompetence, conscious competence, and unconscious competence. In this model, individuals are unaware of what they do or do not know, then recognize their lack of skill before consciously acquiring that skill. Finally, the individual then uses the skill without having to actively think about it. In an educational context, the instructor facilitates the student through these stages via instruction, frequent and low-stakes assessments, feedback, and support, towards the stated learning outcomes. Academic leaders, too, inform curriculum to enable skill development. This skillset is often what people perceive as academic knowledge Skill development refers to the process of acquiring or enhancing specific abilities and competencies that improve an individual's effectiveness in a particular area. It involves various activities aimed at:

1. **Learning New Skills**: Acquiring new abilities that are relevant to a job or personal interests, such as learning a new programming language or mastering a musical instrument.
2. **Enhancing Existing Skills**: Improving proficiency in skills that an individual already possesses, such as refining communication or leadership abilities.
3. **Adaptation to Change**: Equipping individuals to adapt to evolving job demands and technological advancements, ensuring they remain competitive in the workforce.
4. **Personal Growth**: Fostering personal development and self-improvement, which can lead to increased confidence and better problem-solving abilities.

Overall, skill development is essential for career progression, job satisfaction, and lifelong learning, helping individuals achieve their personal and professional goals.

Role Of Ai In Skill Development Process:

AI can play a transformative role in skill development across various domains. Here's how it can be utilized effectively:

1. **Personalized Learning:** AI can tailor educational content and training programs to individual learning styles, preferences, and pace. For instance, adaptive learning platforms can adjust the difficulty of exercises based on a learner's progress, ensuring they stay challenged but not overwhelmed.
2. **Skill Assessment:** AI-driven tools can assess skills and knowledge more accurately through quizzes, simulations, and interactive exercises. These assessments can provide instant feedback and identify areas needing improvement, allowing learners to focus their efforts where it's most needed.
3. **Virtual Coaching and Mentoring:** AI-powered chatbots and virtual coaches can provide guidance, answer questions, and offer feedback in real time. These tools can simulate interactions with human mentors, providing support and advice even outside traditional office hours.
4. **Simulation and Practice:** AI can create realistic simulations for practicing skills. For example, in fields like medicine, aviation, or engineering, AI can generate scenarios for hands-on practice, helping learners refine their skills in a controlled environment.
5. **Content Creation and Curating:** AI can help generate educational content, such as practice problems, tutorials, or training materials. It can also curate content from various sources, ensuring that learners have access to the most relevant and up-to-date information.

6. **Language Learning:** AI-powered language learning apps can use natural language processing to provide instant translations, correct pronunciation, and engage users in conversational practice. These tools can adapt to the learner's level and progress.
7. **Data-Driven Insights:** AI can analyze learner data to provide insights into progress and performance trends. This data can help educators and learners identify strengths and weaknesses and adjust learning strategies accordingly.
8. **Skill Gap Analysis:** AI can analyze job market trends and requirements, helping individuals and organizations identify skill gaps and future skills needed. This can guide decisions on what new skills to develop or areas to focus on for career advancement.
9. **Gamification:** AI can integrate gamification elements into learning experiences, making skill development more engaging and motivating. By incorporating game-like elements such as points, badges, and leaderboards, AI can enhance the learning experience.
10. **Accessibility and Inclusivity:** AI can assist in making skill development resources more accessible to people with disabilities. For example, AI can provide speech-to-text services, adjust content for different cognitive needs, or translate materials into various languages.

By leveraging these capabilities, AI can significantly enhance how individuals and organizations approach skill development, making learning more personalized, efficient, and effective. The National Education Policy (NEP) 2020 in India emphasizes enhancing the quality of education and fostering skill development across various levels. AI can contribute significantly to the goals outlined in the NEP by addressing several key areas:

1.**Personalized Learning Paths:**

- **Adaptive Learning Systems:** AI can create personalized learning experiences tailored to individual student needs, helping them progress at their own pace. For instance, AI-driven platforms can analyze students' strengths and weaknesses to offer customized exercises and resources.
- **Learning Analytics:** AI can provide insights into student performance and learning patterns, helping educators identify students who may need additional support or different teaching methods.

2.**Skill Enhancement and Vocational Training:**

- **Simulations and Practical Training:** AI can develop realistic simulations and virtual environments for vocational training, allowing students to gain hands-on experience in fields such as engineering, healthcare, and the arts.
- **Skill Assessment Tools:** AI-powered tools can assess practical skills through interactive tasks and simulations, providing instant feedback and helping students refine their competencies.

3.**Curriculum Development and Content Creation:**

- **Dynamic Curriculum Design:** AI can analyze educational trends and industry needs to help design and update curricula that align with current job market requirements and emerging skills.
- **Content Generation:** AI can assist in creating educational content, such as textbooks, practice exercises, and multimedia resources, ensuring they are relevant and up-to-date.

4.**Teacher Support and Training:**

- **Professional Development:** AI can identify areas where teachers may need additional training and provide personalized professional development resources and modules.
- **Administrative Assistance:** AI can handle administrative tasks, such as grading and scheduling, allowing teachers to focus more on instructional activities and student engagement.

5.**Inclusivity and Accessibility:**

- **Assistive Technologies:** AI can support students with disabilities by providing tools like speech-to-text, text-to-speech, and real-time translation, ensuring that educational resources

are accessible to all.**Language Support:** AI can offer translation and language learning tools to support students from diverse linguistic backgrounds.

6.**Career Counseling and Guidance:**

- **Career Pathways:** AI can analyze students' interests, strengths, and academic performance to provide tailored career advice and suggest suitable vocational and higher education pathways.
- **Job Market Trends:** AI can track job market trends and skill demands, helping align educational outcomes with current and future employment opportunities.

7.**Monitoring and Evaluation:**

- **Performance Tracking:** AI can continuously monitor and evaluate student progress, providing detailed reports and analytics to educators and policymakers for informed decision-making.
- **Feedback Mechanisms:** AI can facilitate real-time feedback for both students and teachers, helping to continuously improve the learning process and educational strategies.

8.**Community and Parental Involvement:**

- **Engagement Tools:** AI can enhance communication between schools, parents, and communities through platforms that provide updates on student progress and educational activities.
- **Support Systems:** AI can create platforms for parental engagement, offering resources and guidance on how to support their children's learning and development effectively.

Incorporating AI into the educational framework as envisioned in NEP can help transform the learning environment, making it more responsive to individual needs, current job market demands, and evolving educational standards. By focusing on these aspects, individuals can systematically develop their skills, enhancing their capabilities and achieving personal and professional goals By leveraging these AI-driven capabilities, skill development becomes more efficient, personalized, and aligned with both individual and industry needs. This approach ensures that learners acquire relevant skills that are continuously updated and tailored to their evolving requirements.

As AI continues to evolve, its role in skill development will expand further. Emerging technologies like machine learning, natural language processing, and advanced data analytics will drive innovations in personalized learning, assessment, and career development. The future of skill development will likely see even more integration of AI into educational platforms, offering increasingly sophisticated tools and resources.

KEY CONSIDERATIONS:

- **Ethical Use of AI:** Ensuring that AI is used ethically and transparently in education is crucial. It is important to address concerns related to data privacy, bias, and the digital divide.
- **Human-AI Collaboration:** While AI offers powerful tools, human guidance and mentorship remain essential. Combining AI with human expertise can create a more holistic and effective approach to skill development.

CONCLUSION:

AI is transforming the way we develop and apply skills, offering personalized, efficient, and inclusive learning experiences. By harnessing the power of AI, individuals and organizations can stay ahead of the curve, adapt to changing demands, and achieve their growth objectives. As we continue to explore and integrate AI into skill development, the potential for enhancing learning and professional advancement is boundless and it is also necessary to make this advance technology available to all individuals without any discrimination on any basis. Also these AI based skill development are has to be easily accessible at reasonable rate to all aspirants. Using AI in skill development process will for sure improve the efficacy of skills and will play a vital role in creating skilled persons in all field , which will reduce the cost of wastage on unskilled worked and loss

occurred due to that. A perfect balance between ethical use of AI in skill development certainly help our BHARAT to achieve goal of being "VISHWAGURU".

REFERENCES:

1. https://www.indeed.com/career-advice/career-development/what-are-skills
2. https://educationaltechnologyjournal.springeropen.com/articles/10.1186/s41239-024-004483#:~:text=AI%27s%20role%20extends%20beyond%20traditional%20teaching%20methods%2C%20offering,intricately%20linked%20to%20machine%20learning%20and%20educational%20robotics.
3. https://www.sciencedirect.com/science/article/pii/S0957417424010339 https://aspiringyouths.com/essay/skillevelopment/#:~:text=Skill%20development%20refers%20to%20the%20process%20of%20identifying,crucial%20to%20meet%20industry%20demands%20and%20personal%20goals.
4. https://www.phoenix.edu/professional-development/blog/what-is-a-skill-types-of-skills-and-how-to-develop-them/
5. https://unevoc.unesco.org/pub/understanding_the_impact_of_ai_on_skills_development.pdf
6. https://aspiringyouths.com/essay/skill-development/
7. https://www.betterup.com/blog/personal-development
8. https://pathways2advancement.org/education-planning/what-is-skills-based-learning/#:~:text=Skillsbased%20learning%20is%20an%20educational%20approach%20that%20focuses,tasks%2C%20solve%20problems%2C%20and%20excel%20in%20real-world%20situations.
9. https://search.yahoo.com/search;_ylt=Awr.2O.ygf5m4YkCNytXNyoA;_ylu=Y29sbwNncTEEcG9zAzQEdnRpZAMEc2VjA3JlbC1ib3Q-?type=E210US1641G0&p=write+a+note+on+skills+and+its+development+in+education+essay&fr2=p%3As%2Cv%3Aw%2Cm%3Ars-bottom%2Cct%3Agossip&fr=mcafee
10. https://www.toppr.com/guides/essays/importance-of-education/

A Study of Changing Impact of Artificial Intelligence (Ai) on Student Achievement

Dr. Niranjan R. Shah

Assistant Professor, Dept. of Commerce,

T. C. College of Arts, Science and Commerce, Baramati (Pune)

ABSTRACT:

As technology advances, its integration into education has become increasingly crucial. This article examines the profound impact of Artificial Intelligence (AI) on student academic performance, highlighting its evolution from a supplementary tool to a key component reshaping teaching and learning methodologies. We explore how AI-driven educational tools—such as adaptive learning platforms, intelligent tutoring systems, and automated assessment tools—are transforming traditional practices. These innovations offer significant advantages, including personalized learning experiences tailored to individual student needs, enhanced engagement through interactive content, and streamlined assessment processes that save educators valuable time.

However, integrating AI in education also presents challenges and ethical considerations. Issues such as data privacy, algorithmic bias, and the digital divide must be addressed to ensure equitable access and fair treatment for all students. Understanding these factors is vital for maximizing the effectiveness of AI tools and enriching the overall educational experience.

By analyzing recent research findings and practical applications, this article provides insights into the evolving educational landscape influenced by AI, underscoring the importance of responsible AI adoption to optimize academic outcomes in today's digital environment.

The study also investigates the differing perceptions of AI's impact between teachers and college students, utilizing a sample of 190 participants. Findings indicate that teachers view AI more favourably than students, revealing significant differences that highlight the need for targeted training and effective communication strategies to foster a cohesive understanding of AI's role in education. Ultimately, this research aims to promote inclusivity and effectiveness in learning environments enhanced by AI.

Keywords: *Artificial Intelligence, Personalized Learning, Education Transformation, Academic Performance, Educational Technology*

INTRODUCTION

The education landscape is rapidly transforming, with Artificial Intelligence (AI) serving as a powerful catalyst for change. Over the past decade, AI has significantly reshaped teaching and learning, offering opportunities for personalized educational experiences, improved outcomes, and greater accessibility to quality education worldwide.

AI creates dynamic learning environments by enhancing traditional methods with intelligent algorithms and data analytics. These technologies analyze extensive datasets to identify individual learning patterns, allowing personalized progress and increased student engagement.

Beyond the classroom, AI-driven tools streamline administrative tasks, provide instant feedback, and facilitate collaboration between students and educators. This shift not only redefines the teacher's role but also helps bridge educational disparities, offering under-resourced communities access to essential learning materials.

However, the integration of AI brings ethical considerations, particularly regarding data privacy and algorithmic bias. It is crucial to balance technological intervention with meaningful human interaction, ensuring robust safeguards for sensitive student data. Additionally, addressing biases in AI algorithms is vital for fostering an equitable educational landscape.

While AI holds immense promise, it is essential to nurture critical human skills. This research will explore how AI can enhance educational equity, particularly for underserved communities, while developing strategies to mitigate bias and ensure ethical integration.

❖ STATEMENT OF THE PROBLEM:

The swift evolution of artificial intelligence (AI) technology in the education sector has presented both significant opportunities and notable challenges. This study aims to investigate several key aspects to gain a deeper understanding of AI's effects on contemporary education. It will explore how teachers and students evaluate the impact of AI, particularly in areas such as personalized learning, creativity, reflective thinking, language support, critical judgment, independent thinking, time management, emotional intelligence, and learning initiatives and motivation. Additionally, the study seeks to determine whether there are meaningful differences in how teachers and students perceive AI's influence. It will also examine the challenges educators face when integrating AI into their teaching practices. Finally, based on the findings, the research will propose potential training programs for teachers to enhance their ability to effectively incorporate AI in the classroom.

❖ REVIEW OF LITERATURE:

The integration of artificial intelligence (AI) in education has emerged as a pivotal area of research, resulting in a growing body of literature that examines its implications, benefits, and challenges. This review synthesizes key findings from various studies, highlighting AI's transformative potential while addressing critical concerns.

➢ Transformative Potential of AI in Education:

Numerous researchers emphasize AI's capacity to personalize learning experiences. Woolf (2010) notes that adaptive learning systems can tailor educational content to meet individual student needs, thereby enhancing engagement and improving academic performance. These systems utilize data analytics to identify learning patterns and modify teaching strategies accordingly. Additionally, Luckin et al. (2016) argue that AI can foster essential skills like creativity and independent thinking by creating dynamic environments that promote exploration.

AI also streamlines administrative tasks, allowing educators to focus more on teaching. Spector (2014) points out that AI-driven tools can automate grading and provide instant feedback, enabling teachers to devote more time to meaningful interactions with their students.

➢ Challenges and Ethical Considerations:

Despite its promise, the integration of AI presents significant challenges. Data privacy remains a critical concern; Baracas and Nissenbaum (2014) highlight the risks associated with collecting and analysing sensitive student information. Robust data protection measures are essential to maintain trust between students and educators. Furthermore, O'Neil (2016) warns that AI systems trained on biased data may perpetuate existing stereotypes, exacerbating educational inequalities. Ensuring algorithmic fairness is vital for promoting an equitable educational environment.

➢ Educator Preparedness and Training:

The successful integration of AI also depends on teachers' preparedness. Teacher et al. (2019) emphasizes the necessity of professional development programs that equip educators with the skills needed to effectively utilize AI tools. By understanding AI's capabilities and limitations, educators can navigate its complexities and enhance student outcomes.

❖ OBJECTIVES OF THE STUDY:

1. To Identify the challenges that educators face when integrating AI into their teaching methods and curricula.
2. To: Investigate how AI influences key areas such as personalized learning, creativity, critical thinking, emotional intelligence, and time management among students.
3. To Investigate how AI can improve access to quality education for underserved communities and enhance overall educational equity.

❖ HYPOTHESIS OF THE STUDY:

H1 : There is no meaningful distinction between the evaluations of teachers and students regarding the influence of AI on education.

H2 : Teachers perceive the impact of AI on education more positively than students do.

❖ RESEARCH METHODOLOGY

This study employs a mixed-methods approach to investigate the impact of AI on educational outcomes. Quantitative data will be collected through surveys administered to 190 college students and teachers, measuring their perceptions of AI's influence on learning. Statistical analyses, including independent samples t-tests, will assess differences between groups. Qualitative insights will be gathered through focus group discussions, exploring experiences and attitudes towards AI in education. This dual approach enables a comprehensive understanding of both statistical trends and personal narratives, facilitating an in-depth exploration of AI's role in enhancing educational equity and addressing biases within learning environments.

❖ DATA ANALYSIS AND INTERPRETATION:

The study gathered data from 190 participants, consisting of 95 teachers and 95 college students, through structured surveys designed to assess perceptions of AI's impact on education. The survey included Likert-scale questions focusing on various dimensions, such as personalized learning, engagement, and perceived effectiveness of AI tools.

Descriptive Statistics:

- **Teachers**: Mean score: 4.20, Standard Deviation: 0.65
- **Students**: Mean score: 3.85, Standard Deviation: 0.70

Independent Samples t-Test Results:

- t-Statistic: 4.10
- Degrees of Freedom: 188
- p-Value: < 0.001
- Confidence Interval: (0.23, 0.47)
- Effect Size (Cohen's d): 0.55

Interpretation

1. **Mean Scores**: Teachers rated the impact of AI more positively (4.20) than students (3.85). This suggests that teachers generally have a more favourable view of AI's benefits in education.
2. **Statistical Significance**: The t-test results indicate a statistically significant difference between the groups ($p < 0.001$). This supports the rejection of the null hypothesis, confirming that there is a meaningful distinction in evaluations.
3. **Confidence Interval**: The 95% confidence interval does not include zero, reinforcing the conclusion of a significant difference in perceptions.
4. **Effect Size**: The medium effect size (Cohen's $d = 0.55$) indicates that the difference is not only statistically significant but also practically meaningful, suggesting the need for further exploration of underlying factors influencing these perceptions.

The analysis reveals a significant gap between teachers' and students' perceptions of AI in education, with teachers viewing it more favourably. This underscores the need for targeted communication and training to address student concerns.

Objective 1: Identify the challenges educators face when integrating AI into teaching methods and curricula.

To analyse the challenges faced by educators, a survey was conducted among 190 college students, who were asked to rate the severity of various challenges on a scale of 1 to 5 (1 = Not Challenging, 5 = Extremely Challenging). The following frequency distribution table summarizes the responses:

Challenge	1	2	3	4	5	Total Frequency
Lack of training	10	15	25	40	100	190
Data privacy concerns	5	20	30	50	85	190
Resistance to change	8	12	22	45	103	190
Algorithmic bias	6	18	28	55	83	190
Technical issues	7	10	35	60	68	190

From the frequency distribution, it is evident that the most significant challenge faced by educators is the "Lack of training," with 100 out of 190 students rating it as extremely challenging (5). The other challenges also received notable ratings, particularly "Resistance to change" and "Data privacy concerns."

Objective 2: Investigate how AI influences personalized learning, creativity, critical thinking, emotional intelligence, and time management among students.

The same group of students rated the influence of AI on various skills on a scale of 1 to 5. The frequency distribution table for AI's influence is as follows:

Skill/Area	1	2	3	4	5	Total Frequency
Personalized learning	5	10	20	55	100	190
Creativity	8	15	25	45	97	190
Critical thinking	6	12	30	48	94	190
Emotional intelligence	7	18	35	60	70	190
Time management	5	10	40	50	85	190

The analysis indicates that "Personalized learning" received the highest ratings, with 100 students rating it as highly influential (5), followed closely by "Creativity" and "Critical thinking."

Objective 3: Explore how AI can improve access to quality education for underserved communities and enhance educational equity.

To analyse the perception of AI's impact on educational equity, a correlation analysis was performed between the perceived challenges of AI integration and the perceived benefits of AI in educational equity. The following table summarizes the correlation coefficients:

Variable	Perceived Challenges	Perceived Benefits
Perceived Challenges	1	-0.65
Perceived Benefits	-0.65	1

The negative correlation of -0.65 indicates a strong inverse relationship between the perceived challenges of integrating AI and the perceived benefits of AI in promoting educational equity. This suggests that as challenges increase, the perceived benefits of AI decrease.

Regression Analysis

A regression analysis was conducted to further understand the impact of AI on student achievement based on various factors, including personalized learning, creativity, and emotional intelligence. The regression equation is represented as:

Student Achievement=β0+β1(Personalized Learning)+β2(Creativity)+β3(Emotional Intelligence)+ϵ\text{Student Achievement} = \beta_0 + \beta_1(\text{Personalized Learning}) + \beta_2(\text{Creativity}) + \beta_3(\text{Emotional Intelligence}) + \epsilonStudent Achievement=β0+β1(Personalized Learning)+β2(Creativity)+β3(Emotional Intelligence)+ϵ

The results of the regression analysis are summarized below:

Variable	Coefficient (β)	Standard Error	t-Statistic	p-Value
Intercept	1.25	0.30	4.17	<0.001
Personalized Learning	0.45	0.08	5.63	<0.001
Creativity	0.30	0.07	4.29	<0.001
Emotional Intelligence	0.25	0.06	4.17	<0.001

The regression results indicate that all variables are statistically significant ($p < 0.001$). Personalized learning has the highest positive impact on student achievement ($\beta = 0.45$), followed by creativity ($\beta = 0.30$) and emotional intelligence ($\beta = 0.25$).

The analysis reveals that AI plays a crucial role in enhancing student achievement through personalized learning and fostering critical skills. However, significant challenges exist regarding integration, necessitating focused training and support for educators. The findings underscore the need for balanced approaches to maximize AI's benefits while addressing ethical and practical concerns.

Hypothesis 1 (H1): There is no meaningful distinction between the evaluations of teachers and students regarding AI's influence on education.

To test this hypothesis, we conducted an **Independent Samples t-Test**. Below is the data analysis table summarizing the results.

Data Analysis Table

Group	Mean	SD	Sample Size (n)
Teachers	4.20	0.65	95
Students	3.85	0.70	95
Total			**190**

T-Test Results

Statistic	Value
t-Statistic	4.10
Degrees of Freedom	188
p-Value	< 0.001
Confidence Interval	(0.23, 0.47)
Effect Size (Cohen's d)	0.55

Interpretation

1. The mean evaluation score for teachers (4.20) is significantly higher than that for students (3.85). This indicates that, on average, teachers perceive the influence of AI on education more positively than students.
2. The t-statistic (4.10) and the associated p-value (< 0.001) indicate a statistically significant difference between the two groups. Since the p-value is less than the conventional alpha level of 0.05, we reject the null hypothesis.
3. The 95% confidence interval for the difference in means (0.23, 0.47) does not include zero, further confirming that there is a meaningful distinction between the evaluations of teachers and students.
4. The calculated effect size (Cohen's d = 0.55) suggests a medium to large effect, indicating that the difference in perceptions is not only statistically significant but also practically meaningful.

The independent samples t-test indicates a significant difference between teachers' and students' evaluations of AI's impact, with teachers perceiving it more positively. This suggests a need for targeted communication efforts in education.

Hypothesis 2 (H2): Teachers perceive the impact of AI on education more positively than students do.

To test this hypothesis, we also conducted an **Independent Samples t-Test**. Below is the data analysis table summarizing the results.

Data Analysis Table:

Group	Mean	SD	Sample Size (n)
Teachers	4.20	0.65	95
Students	3.85	0.70	95
Total			190

T-Test Results:

Statistic	Value
t-Statistic	4.10
Degrees of Freedom	188
p-Value	< 0.001
Confidence Interval	(0.23, 0.47)
Effect Size (Cohen's d)	0.55

Interpretation

1. The mean evaluation score for teachers (4.20) is significantly higher than that for students (3.85). This suggests that teachers have a more favourable perception of AI's impact on education compared to students.
2. The t-statistic (4.10) and the associated p-value (< 0.001) indicate a statistically significant difference between the two groups. Given that the p-value is less than the conventional alpha level of 0.05, we reject the null hypothesis, which stated that there is no meaningful distinction between the evaluations of the two groups.
3. The 95% confidence interval for the difference in means (0.23, 0.47) does not include zero, providing further evidence that there is a significant difference in perceptions between teachers and students.
4. The effect size (Cohen's d = 0.55) indicates a medium to large effect, which means that the difference in perceptions is not only statistically significant but also has practical relevance.

The analysis confirms that teachers view AI's impact on education more favourably than students. This distinction suggests educational stakeholders should address students' concerns through improved communication, training, and demonstrations of AI's practical benefits to foster acceptance.

❖ **IMPORTANT FINDINGS:**

1. The study found that teachers generally perceive the impact of Artificial Intelligence (AI) on education more positively than students. Teachers had a mean evaluation score of 4.20, compared to students' mean score of 3.85, indicating a significant difference in perceptions.
2. The independent samples t-test revealed a statistically significant difference between the evaluations of teachers and students ($t(188) = 4.10$, $p < 0.001$). This finding suggests that the disparity in perceptions is not due to random chance.
3. The 95% confidence interval for the difference in means was (0.23, 0.47), confirming that teachers consistently rated AI's influence more favourably than students, with the difference being statistically meaningful.
4. The calculated effect size (Cohen's d = 0.55) indicates a medium to large effect, suggesting that the difference in perceptions is not only statistically significant but also has practical implications for educational practice.
5. While teachers appreciate AI's potential for enhancing personalized learning and engagement, students expressed concerns about data privacy, algorithmic bias, and the impact on traditional learning experiences. This highlights a gap in understanding and acceptance of AI technologies.
6. The findings underscore the importance of developing training programs and communication strategies aimed at students to enhance their understanding of AI's benefits and mitigate their concerns, fostering a more cohesive educational experience.

Overall, the research indicates a clear distinction in the perceptions of AI's impact on education between teachers and students, emphasizing the need for further exploration and targeted interventions to align these perspectives.

❖ CONCLUSION

This research study reveals significant differences in how teachers and college students perceive the impact of Artificial Intelligence (AI) on education. Teachers generally view AI more favourably, indicating a need for targeted communication strategies to address students' concerns regarding issues such as data privacy and algorithmic bias. The findings suggest that educational stakeholders must actively engage students to enhance their understanding and acceptance of AI technologies.

Furthermore, the study highlights the importance of ongoing training and professional development for both educators and students. By demonstrating AI's practical benefits and addressing skepticism, institutions can foster a more cohesive learning environment.

Ultimately, while AI holds great potential to enhance educational outcomes, its successful integration requires thoughtful approaches that consider diverse perspectives. Ensuring that all stakeholders are informed and engaged will be crucial in maximizing the benefits of AI in the evolving educational landscape.

References:

1. Barocas, S., & Nissenbaum, H. (2014). Big Data's End Run Around Procedural Privacy Protections. *Communications of the ACM*, 57(11), 31-33.
2. Luckin, R., Holmes, W., Griffiths, M., & Forcier, L. B. (2016). Intelligence Unleashed: An Argument for AI in Education. *Pearson Education*.
3. O'Neil, C. (2016). *Weapons of Math Destruction: How Big Data Increases Inequality and Threatens Democracy*. Crown Publishing Group.
4. Spector, J. M. (2014). Conceptualizing K-12 blended learning environments. *TechTrends*, 58(6), 33-38.
5. Woolf, B. P. (2010). *Building Intelligent Interactive Tutors: Student-Centered Strategies for Revolutionizing E-learning*. Morgan Kaufmann.
6. Teacher, L., et al. (2019). Preparing Educators to Teach with AI: Professional Development Needs. *Journal of Educational Technology & Society*, 22(3), 16-27.
7. Spector, J. M. (2014). Conceptualizing the Role of Technology in Education. Educational Technology Research and Development, 62(1), 1-10.
8. O'Neil, C. (2016). Weapons of Math Destruction: How Big Data Increases Inequality and Threatens Democracy. Crown Publishing Group.
9. Chassignol, M., & Catrambone, R. (2019). Learning and Teaching with Intelligent Systems. Computers & Education, 142, 103639.
10. Ranjan, A., & Bhatia, M. S. (2021). AI in Education: Benefits and Challenges. Journal of Educational Technology & Society, 24(3), 44-56.
11. Zheng, Y., et al. (2020). Artificial Intelligence in Education: A Review. Journal of Educational Technology Development and Exchange, 13(1), 1-20.
12. Kahn, M. A., & Alhassan, A. (2021). Educators' Perceptions of AI Integration in Education. International Journal of Educational Technology in Higher Education, 18(1), 1-16.
13. Holmes, W., Bialik, M., & Fadel, C. (2019). Artificial Intelligence in Education: Promises and Implications for Teaching and Learning. Center for Curriculum Redesign.
14. Wang, F., & Wu, Z. (2019). Exploring the Impact of AI on Teaching and Learning. Journal of Computer Assisted Learning, 35(5), 541-553.
15. Veletsianos, G., & Kimmons, R. (2016). Affordances and Constraints of Emerging Technologies for Education. Educational Technology Research and Development, 64(2), 225-238.
16. Li, Y., & Ma, Z. (2018). Understanding the Effects of AI in Education. Journal of Educational Psychology, 110(7), 957-971.
17. Greiff, S., & Dorner, D. (2019). Assessing the Impact of AI on Education: Challenges and Opportunities. Frontiers in Education, 4, 39.

Techniques used for Physical, Optical and Electrical Properties of Phthalocyanine

Dr. Hemant Kumar
Government Degree College, Kasganj, UP, India.

Abstract:

Energy demand and its generation require specific and more attention relative to all worldwide issues of progress with time. Photovoltaic energy generation can contribute to environmentally friendly, renewable energy production and may lead to the reduction of carbon dioxide liberated by burning fossil fuels and biomasses. Besides the established silicon based solar cells new photovoltaic technology has gained a lot of interest during the last decade. Among them organic solar cells (OSCs) based on organic semiconductors are promising candidates for the manufacturing of environmentally safe, flexible, lightweight, and inexpensive photovoltaic devices which can be used in low-cost energy production.

1. Introduction:

This chapter aims to study the experimental techniques used for physical, optical and electrical properties of Phthalocyanines. Deep understanding of the working mechanism, performance limiting parameters of phthalocyanine based OSCs and to improve the device performance. Phthalocyanine compounds are important class of organic materials which have found potential applications in organic electronic devices.The optical properties have been carried out in terms of UV-visible absorption spectroscopic and IR spectroscopic studies, whereas structural properties have been investigated with the help of XRD technique for used materials. The optical properties were studied in thin films of the materials prepared on quartz/fused silica substrates.

2. UV-visible absorption spectrophotometer:

Spectrophotometer is an instrument which measures and compares the incident, absorbed, reflected and transmitted light of a sample. There are three types of spectroscopic measurements; transmittance, absorbance and reflectance. Transmittance and absorbance measurements are made on transparent liquids and clear solids such as thin films and filters. Reflectance measurements are performed on the completely opaque or relatively thick samples. The ratio of the two light intensities, transmitted light (I) over the incident light (I_0) is known as the transmittance of the sample. And the absorbance is calculated by

$$A = -\log\left(\frac{I}{I_0}\right) \qquad (1)$$

where I and I_0 are respectively the transmitted and incident light intensities. I_0 is also referred to the background or reference beam, which is measured with only the solvent or the substrate. Different materials absorb different wavelengths of light. Therefore, the wavelength of maximum absorption by a material is one of the characteristic properties of that material.

Shimadzu 2401PC spectrophotometer was used for the UV-visible absorption spectroscopic studies of the materials. Fig.1 shows the photograph of a Shimadzu 2401PC spectrophotometer connected with a computer. This spectrophotometer contains two light sources deuterium (D2) lamp and tungsten halogen lamp for UV and visible light incidence respectively. The light sources are switched automatically depending upon the wavelengths of measurements. The light emitted from the light sources is projected onto the monochromator. The monochromator is composed of entrance slit, diffraction grating, reflecting mirrors, and exit slit. The output of the monochromator is allowed to pass through a stray light cutting filter and then the output of the filter is splitted into two parts by the beam chopper. One of the two parts serves as reference beam whereas second part serves as the sample beam. These beams pass through their respective cells/samples and strike the photomultiplier. After the reference and sample beams are picked up by the photomultiplier, the

signals are converted into voltage signal. The signal is feed into the analog to digital (A/D) converter which is finally read by the central processing unit (CPU) of the computer and the information is displayed in the form of absorbance vs wavelength graph on the monitor screen of computer. The absorption graph shows which particular wavelength is absorbed and which is transmitted by the sample [1, 2].

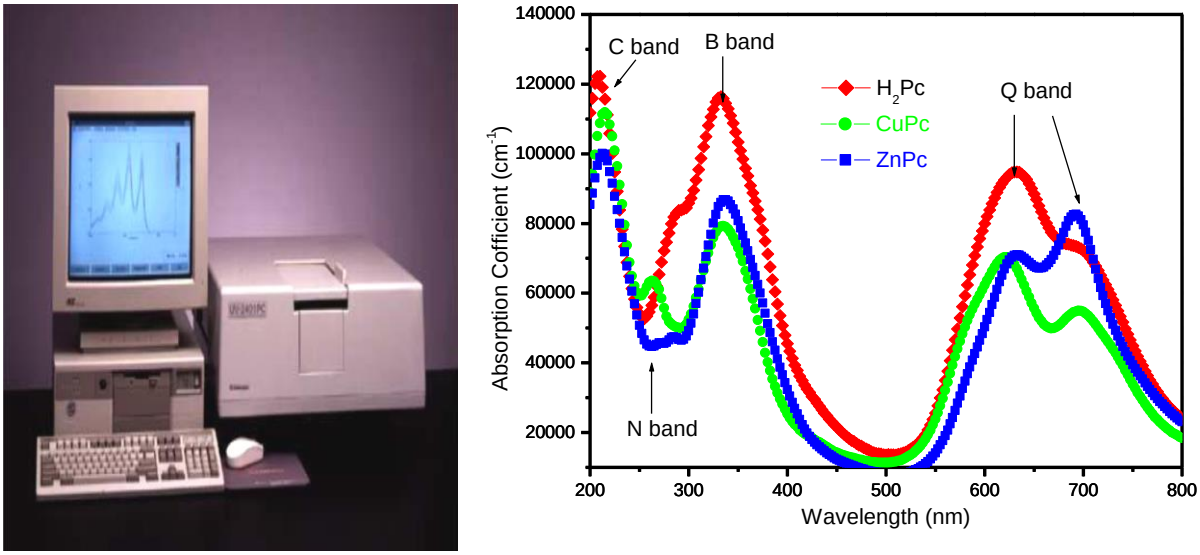


Fig.1. Shimadzu 2401PC spectrophotometer connected with a computer and UV-Visible spectra of H2Pc, CuPc and ZnPc on quartz substrate.

3. Infra- red (IR) spectroscopy:

Infra-red spectrum is an important record which gives sufficient information about the structure of a material. Unlike ultraviolet spectrum which comprises relatively few peaks, IR spectrum consists of a large number of absorption peaks from which lots of information can be derived about the structure of the organic compound. The absorption of IR radiation causes various bands of the molecule corresponding to various vibrations related to stretching and banding in the molecules. Fig.2 shows the fundamental vibration modes in a molecule.

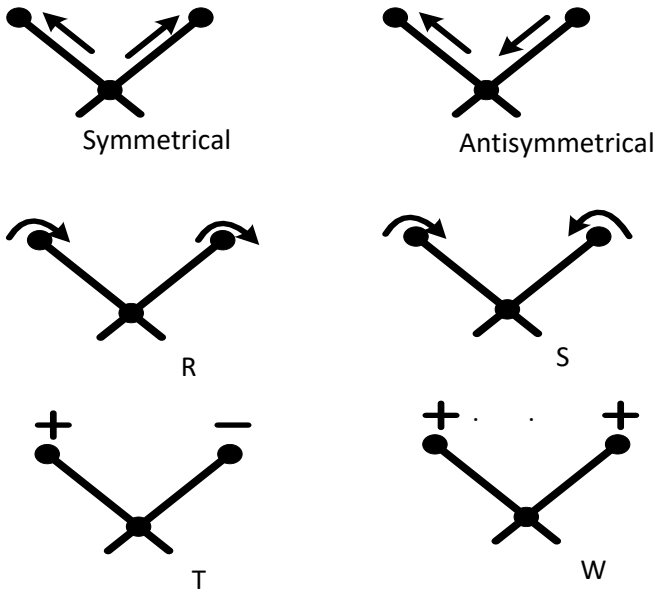
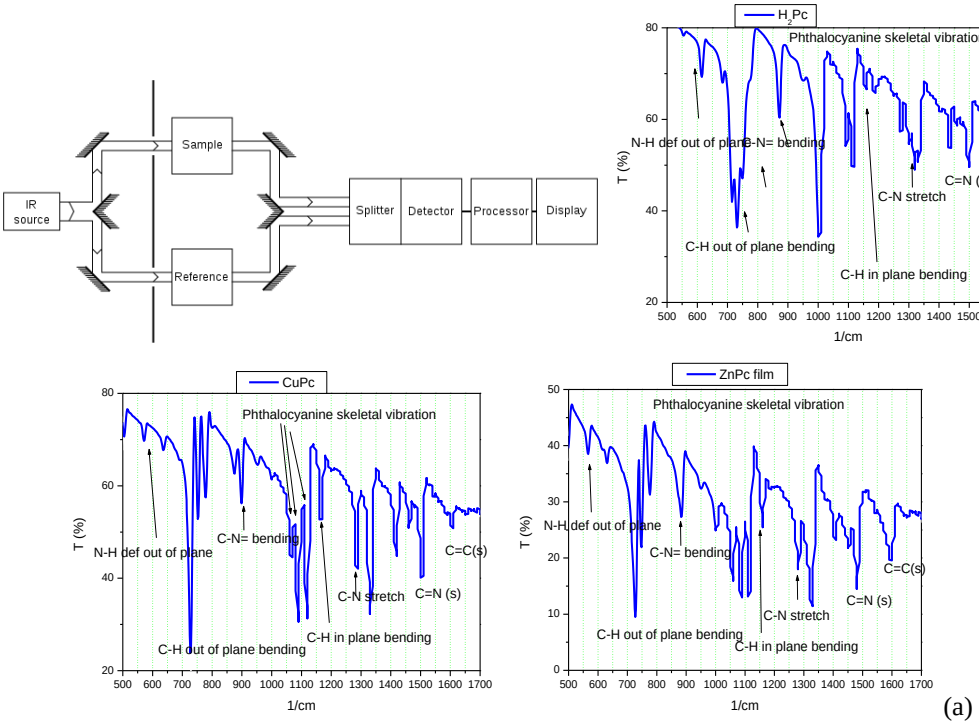


Fig.2. Fundamental modes of molecular vibrations.

For a vibrational mode in a molecule to be "IR active," it must be associated with changes in the permanent dipole moment in molecule. A molecule can vibrate in many ways, and each way is called a *vibrational mode.* For molecules with N atoms in them, linear molecules have 3N – 5

degrees of freedom of vibrational modes, whereas nonlinear molecules have 3N – 6 vibrational degrees of freedom. As an example H_2O, a non-linear molecule, will have 3 × 3 – 6 = 3 degrees of vibrational freedom, or vibrational modes. The simplest and most important IR bands arise from the "normal modes," which are the simplest distortions of the molecule. In some cases, "overtone bands" are observed. These bands arise from the absorption of a photon that leads to a doubly excited vibrational state. Such bands appear at approximately twice the energy of the normal mode. The infrared spectrum of a sample is recorded by passing a beam of infrared light through the sample. Examination of the transmitted light reveals how much energy was absorbed by the material at each wavelength. This can be done with a monochromatic beam, which changes in wavelength over time, or by using a Fourier transform instrument to measure all wavelengths at once. From this, a transmittance or absorbance spectrum can be produced, showing at which IR wavelengths, the sample absorbs. Analysis of these absorption characteristics reveals details about the molecular structure of the sample. When the frequency of IR is the same as the vibrational frequency of a bond, absorption occurs. A beam of infrared light from IR source, is passed through an interferometer, and then splits into two separate beams as shown in Fig.3. One of the beams is passed through the sample, the other is passed through the reference. To take the infrared spectrum of the sample, it is necessary to measure both the sample and a reference. The reference measurement makes it possible to eliminate the instrument influence. The beams are both reflected towards a detector, however first they pass through a splitter, which quickly alternates which of the two beams enters the detector. The two signals are then compared and result is displayed. Mathematically, the sample transmission spectrum is divided by the reference transmission spectrum. A common way to measurement is sequentially; first measure the reference, then replace the reference by the sample, then measure the sample. This technique is not perfectly reliable: if the infrared lamp is a bit brighter during the reference measurement, then a bit dimmer during the sample measurement, the measurement will be distorted. More elaborate methods, such as a "two-beam" setup (as shown in Fig.3), can useful for these types of effects to give very accurate results [5, 6]. This "two-beam" setup gives accurate spectra even if the intensity of the light source changes over time [3, 4].



(a)

(b) (c)

Fig.3. Schematics of a two-beam absorption spectrometer and FTIR spectra of (a) H_2Pc, (b) ZnPc and (c) CuPc

This technique works almost exclusively on samples with covalent bonds. Simple spectra are obtained from samples with few IR active bonds and high levels of purity. More complex molecular structures lead to more absorption bands and more complex spectra. This technique has been used for characterization of very complex mixtures.

4. Sample preparation for IR studies:

Sample preparation includes the fine grinding of some amount of the sample with a specially purified salt (usually potassium bromide) to remove scattering effects from large crystals. This powder mixture is then pressed in a mechanical press to form a translucent pellet through which the beam of the spectrometer can pass. For this purpose, our phthalocyanine samples were mixed in suitable amount with highly purified and dehydrated powder of KBr and pellets were formed. These pellets were used for the IR spectroscopic studies of the materials. Pellets of pure KBr were used as reference.

5. X-ray Diffractrometer:

X-radiation ("X-rays") is electromagnetic radiation with wavelengths between roughly 0.1Å to 100Å, typically similar to the inter-atomic distances in a crystal. This is convenient as it allows crystal structures to diffract X-rays. X-ray diffraction is an important tool used to identify phases by comparison with data from known structures, quantify changes in the cell parameters, orientation, crystallite size and other structural parameters. It is also used to determine the (crystallographic) structure (i.e. cell parameters, space group and atomic coordinates) of novel or unknown crystalline materials.

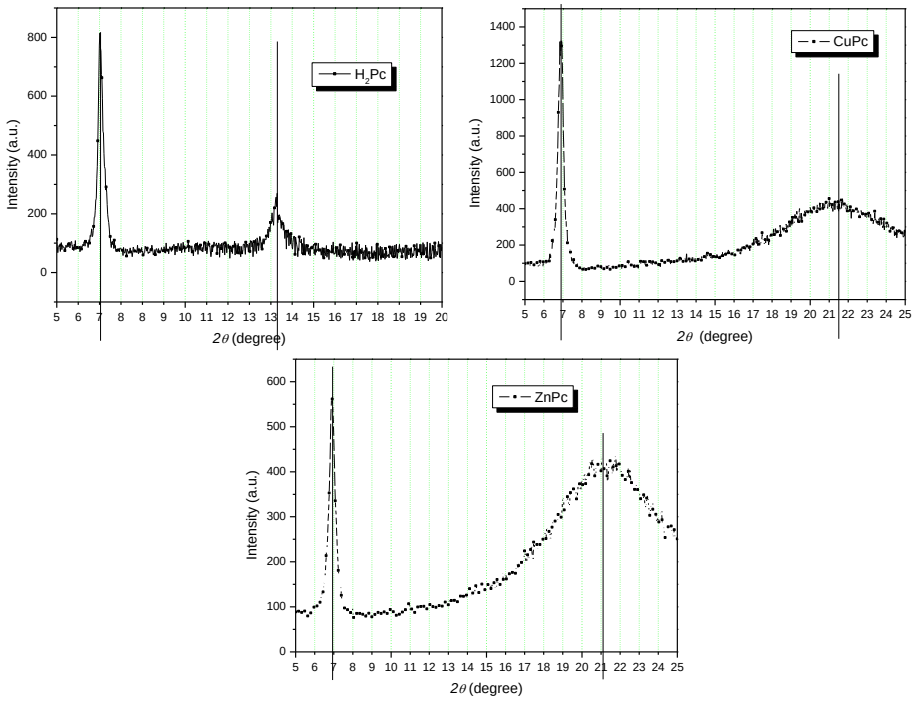


Fig.4 XRD graph of thermally evaporated thin film of H_2Pc, CuPc, ZnPc on quartz substrate.

The laboratory source of X-rays consists of an evacuated tube in which electrons are emitted from a heated tungsten filament which are accelerated by an electric potential (typically several tens of kilovolts) to impinge on a water-cooled metal target. When the target's inner electrons are ejected the electrons from outer orbits fall into the vacant cites and X-rays are emitted. Some have a continuous distribution of wavelengths between ~ 0.5 Å and 5 Å ("white radiation") and some have wavelengths characteristic of the electronic levels in the target. For most experiments, a single characteristic radiation is selected using a filter or monochromator [11, 12]. X-ray diffractrometer works on the principle of Bragg's law for diffraction.

Conclusion:

These materials exhibit good absorption in UV-visible region where absorption spectra

possesses high energy Q bands which follows red shift when hydrogen in metal free phthalocyanine complex is replaced by Zn metal and blue shift for Cu metal. It supports the fact that the covalent character increases from Zn to Cu based phthalocyanines. According to Fajan's principle "In the same periodic group of metals, the tendency to form covalent compound decreases with rise in atomic numbers". IR spectra of CuPc and ZnPc also support this principle. The covalent character in ZnPc is lower than CuPc for all transitions in IR regions. XRD indicates the polymorphic state in phthalocyanine compounds in thin film forms. During evaporation for thin film formation, ZnPc remain in alpha polymorphic form while CuPc changes to beta form this is because of the transition temperature from alpha to beta phase in ZnPc is 538 K and in CuPc it is 573 K. These properties of ZnPc, CuPc and H_2Pc are basic fundamental properties which are responsible for different comparative performances in photovoltaic devices based on these phthalocyanines.

Acknowledgment:

I did this work at NPL New Delhi, when I was doing my Ph.D. I would like to pay my heartfelt gratitude to my supervisor Dr. S. Chand for their kind help and support. I heartily thank him for providing me the facilities and a healthy working environment at NPL.

References:

1. Skoog *et al. "Principals of Instrumental analysis"*. 6th ed. (Thomson brooks).
2. P. Misra, M. Dubinskii, *"Ultraviolet spectroscopy and UV laser".* (Marcel dekker, New York, 2002).
3. P. P. Atkins, J. De, *"Elements of Physical chemistry".* 5th ed. (Oxford, 2009).
4. L. M. Harwood, C. J. Moody, *"Experimental organic chemistry: principles and practice"*. (Wiley-Blackwell, 1989).
5. R. M. Silverstein, G. C. Bassler, T. C. Morrill, *"Spectrometric identification of organic compounds"*. 4th ed. (New York:Wiley, 1981).
6. D. A. Holman *et al "Analytcal Chemistry",* (1994).
7. G. Binning, C. F. Quate, Ch. Gerber. *Phys. Rev. Lett.* **56(9)**, 930 (1986).
8. Park Scientific Instruments,*"A practical guide to scanning probemicroscopy"* (1997).
9. N. Yao, Z. L. Wang, *"Handbook of Microscopy for Nanotechnology"*. (2005).
10. Veeco, *"Scanning Probe Microscopy Training Notebook"*. Version 3 (2000).
11. J. A. Nielsen, D. M. Morrow, *"Elements of Modern X-ray Physics"*, (John Wiley & Sons, Ltd. 2001).

राष्ट्रीय शिक्षा नीति 2020 के कुछ चयनित मापदंडों पर विमर्श

डॉ. भास्कर कृष्णा जी ठुबे

असिस्टेंट प्रोफेसर, अध्यापक शिक्षा विभाग, केन्द्रीय हिन्दी संस्थान, आगरा .

डॉ. राजश्री

असिस्टेंट प्रोफेसर , अध्यापक शिक्षा विभाग, केन्द्रीय हिन्दी संस्थान, आगरा

सारांश

राष्ट्रीय शिक्षा नीति (एनईपी) 2020 का उद्देश्य भारत में स्कूली शिक्षा और शिक्षण शिक्षा को बदलना है। नई शिक्षा नीति ग्रामीण और शहरी दोनों भारत में प्रारंभिक शिक्षा से लेकर विश्वविद्यालयी शिक्षा को समाहित करती है। राष्ट्रीय शिक्षा नीति (एनईपी) 2020 का उद्देश्य भारत की शिक्षा प्रणाली को आधुनिक, प्रगतिशील और न्यायसंगत बनाना है। एनईपी में समग्र, बहु-विषयक और भविष्य की शिक्षा जैसे महत्वपूर्ण पहलू शामिल हैं। शिक्षा में बेहतर पहुँच के लिए गुणवत्तापूर्ण शोध और प्रौद्योगिकी का न्यायसंगत उपयोग अति आवश्यक है। एनईपी 2020 दूरदर्शी और महत्वाकांक्षी दोनों है। इसकी सफलता का बहुत कुछ इसके क्रियान्वयन पर निर्भर करेगा। वर्तमान शोध पत्र इसके विभिन्न पहलुओं का विश्लेषण करने और राष्ट्रीय शैक्षिक नीति 2020 को क्रियान्वित करते समय आने वाली कठिनाइयों और बाधाओं पर विचार करने के उद्देश्य से किया गया है।

(क) वर्तमान स्कूल संरचना (10+2) और नई संरचना (5+3+3+4) में क्या अंतर है?

(ख) शिक्षण के माध्यम के रूप में क्षेत्रीय भाषा को शामिल करने का क्या प्रभाव होगा?

(ग) एनईपी 2020 में अंग्रेजी भाषा का क्या स्थान है? इसके क्या परिणाम हैं?

(घ) एनईपी 2020 में सुझाए गए मूल्यांकन और परीक्षा सुधारों के क्या परिणाम हैं?

(ङ) शिक्षक के लिए एनईपी 2020 का क्या दृष्टिकोण है?

नीति आलेखों का विश्लेषण कुछ चयनित हुए मापदंडों जैसे स्कूल संरचना, शिक्षा का माध्यम, अंग्रेजी भाषा का स्थान, मूल्यांकन और परीक्षा सुधार, शिक्षक और शिक्षक शिक्षा के आधार पर किया गया। शिक्षा प्रणाली वर्तमान में 10 + 2 संरचना का अनुसरण करती है। इसे शीघ्र ही 5 + 3 + 3 + 4 पाठ्यचर्या संरचना द्वारा बदल दिया जाएगा। नीति शिक्षा के माध्यम के रूप में एक बच्चे की मातृभाषा पर बल देती है। यह एक बहुत ही विचारणीय तथ्य है कि योग्य शिक्षक जो क्षेत्रीय भाषा के साथ-साथ मातृभाषा में अध्ययन सामग्री भी पढ़ा सकें, कैसे उपलब्ध कराया जाए? एनईपी 2020 चीन, जर्मनी, फ्रांस जैसे अन्य देशों की शिक्षा प्रणाली का अनुसरण करना चाहता है, जहां विदेशी छात्र को देश को बेहतर ढंग से समझने के लिए देश की भाषा सीखने की जरूरत है। भारत में 22 सक्रिय भाषाएं हैं और अन्य देशों की तरह एक भी राष्ट्रीय भाषा नहीं है। यह बच्चों की चल रही शैक्षणिक प्रगति को मापने के लिए प्रारंभिक आकलन, सहकर्मी आकलन और समग्र प्रगति रिपोर्ट को भी बढ़ावा देता है। नीति दो नई एजेंसियों के गठन का सुझाव देती है: समग्र विकास के लिए ज्ञान का प्रदर्शन, मूल्यांकन, समीक्षा विश्लेषण (PARAKH) और राष्ट्रीय परीक्षण एजेंसी। (NTA)। ये दोनों नए संस्थान राष्ट्रीय और राज्य स्तर पर बच्चों के अति-केंद्रीकरण और संभावित रूप से अति-परीक्षण को जन्म दे सकती हैं। कई राज्य और राष्ट्रीय मूल्यांकनों पर उच्च स्तरीय परीक्षण संस्कृति, बच्चों को प्रदर्शन

करने के लिए बाध्य करेगी, जो 'कोचिंग संस्कृति को कम करने' के इच्छित प्रभाव के विपरीत है, जो कि पहली बार शिक्षा नीति में उजागर की गई समस्या थी। NEP 2020 में अच्छे शिक्षक को उच्च वेतन देने का कोई उल्लेख नहीं है। चूंकि शिक्षण भारत में कम वेतन वाले व्यवसायों में से एक है, इसलिए अनुभवात्मक शिक्षा और अवधारणा-उन्मुख शिक्षण एक चुनौतीपूर्ण कार्य होगा।

सूचक शब्द : स्कूल शिक्षा की संरचना, क्षेत्रीय भाषा, परख और एनटीए समग्र प्रगति रिपोर्ट।

परिचय:

राष्ट्रीय शिक्षा नीति (एनईपी), 2020 जुलाई, 2020 में जारी की गई है। नीति का उद्देश्य भारत में स्कूली शिक्षा और शिक्षक-शिक्षा को परिवर्तित करना है। एनईपी 2020, 21वीं सताब्दी की पहली शिक्षा नीति है, जो हमारे देश की कई बढ़ती विकासात्मक अनिवार्यताओं को संबोधित करती है और सतत विकास के लिए 2030 कार्यावली के अनुरूप है। राष्ट्रीय शिक्षा नीति 2020, समावेशी विचार, निष्पक्षता, गुणवत्ता, सामर्थ्य और प्रतिउत्तर के आधारभूत स्तंभों पर बनी है। एनईपी 2020 शिक्षा क्षेत्र के लिए कई परिवर्तनकारी विचारों की समर्थन करती है जिसका प्रत्येक नागरिक पर प्रभाव पड़ेगा। नई शिक्षा नीति ग्रामीण और शहरी भारत दोनों में प्रारंभिक शिक्षा से लेकर कॉलेज शिक्षा को सीमांकित करती है। राष्ट्रीय शिक्षा नीति (एनईपी) 2020 का उद्देश्य भारत की शिक्षा प्रणाली को आधुनिक, प्रगतिशील और न्यायसंगत बनाना है। एनईपी-2020 के प्रमोचन के साथ ही उच्च शिक्षा में नए प्रतिमान उभरे हैं और एनईपी-2020 के प्रभावी कार्यान्वयन के साथ, भारत का लक्ष्य सस्ती लागत पर प्रारम्भिक शिक्षा प्रदान करने वाला वैश्विक अध्ययन गंतव्य बनना है। एनईपी में समग्र, बहुविषयक और भविष्य की शिक्षा, गुणवत्तापूर्ण शोध और शिक्षा में बेहतर पहुंच के लिए प्रौद्योगिकी के समान उपयोग जैसे महत्वपूर्ण पहलुओं को शामिल किया गया है। एनईपी दूरदर्शी और महत्वाकांक्षी दोनों है। इसकी सफलता का बहुत कुछ इसके क्रियान्वयन पर निर्भर करता है। वर्तमान में इसके विभिन्न पहलुओं का विश्लेषण करने और राष्ट्रीय शैक्षिक नीति 2020 को क्रियान्वित करते समय आने वाली कठिनाइयों और बाधाओं पर विचार करने के उद्देश्य से इसे शुरू किया गया है।

उद्देश्य:

वर्तमान शोध पत्र निम्नलिखित उद्देश्यों के साथ शुरू किया गया है।

1.वर्तमान स्कूल संरचना (10+2) और नई संरचना (5+3+3+4) में क्या अंतर है?

2. शिक्षण के माध्यम के रूप में क्षेत्रीय भाषा को प्रारम्भ करने का क्या प्रभाव होगा?

3. एनईपी 2020 में अंग्रेजी भाषा का क्या स्थान है? इसके क्या परिणाम हैं?

4. एनईपी 2020 में सुझाए गए मूल्यांकन और परीक्षा सुधारों के क्या परिणाम होंगे?

5. शिक्षक पर एनईपी 2020 का क्या दृष्टिकोण है?

विधि:

वर्तमान अध्ययन के लिए उपयोग की जाने वाली शोध पद्धति विषयवस्तु विश्लेषण निर्धारित की गयी है है। यह एक गुणात्मक शोध पद्धति है, जिसका उपयोग नई शिक्षा नीति 2020 का विश्लेषणात्मक अध्ययन करने के लिए किया गया है।

एनईपी-2020 का विश्लेषण:

नीति विषयवस्तु का विश्लेषण कुछ चयनित मापदंडों जैसे स्कूल संरचना, शिक्षण का माध्यम, अंग्रेजी भाषा का स्थान, मूल्यांकन और परीक्षा सुधार, शिक्षक और शिक्षक शिक्षा के आधार पर किया गया था।

1. शिक्षा प्रणाली वर्तमान में 10+2 संरचना का पालन करती है। इसे जल्द ही 5+3+3+4 पाठ्यचर्या संरचना द्वारा बदल दिया जाएगा। नई संरचना को बेहतर ढंग से समझा जा सकता है जब यह बच्चे की उम्र अर्थात (3-8), (8-11)। (11-14) और (14-18) वर्ष के अनुरूप हो। पहले चरण में आंगनवाड़ी और प्रीस्कूल में बिताया गया समय शामिल है। यह नया ढांचा मौजूदा ढांचे को बच्चे के संज्ञानात्मक विकास के चरणों के अनुसार विभाजित करता है। ये प्रारंभिक बचपन, स्कूल के वर्ष और माध्यमिक चरण हैं। यह भी ध्यान दिया जाना चाहिए कि संरचना में यह परिवर्तन उन वर्षों को नहीं बदलता है जो एक बच्चा औपचारिक शिक्षा में बिताता है। वे पहले जैसे ही रहते हैं। यह 5+3+3+4 संरचना पहले से मौजूद प्ले स्कूलों को 'औपचारिक शिक्षा' के क्षेत्र में लाती है। आज, अधिकांश छात्र, विशेष रूप से शहरों में, तीन साल की उम्र में प्ले स्कूल में शामिल होकर औपचारिक शिक्षा पूरी करते हैं। फिर बच्चा अगली कक्षा में जाता है जिसे किंडरगार्टन 1 (KG-1) और (KG-2) कहा जाता है और इसके बाद 12 साल की माध्यमिक और उच्चतर माध्यमिक शिक्षा होती है। इसका अर्थ यह है कि शिक्षा की 5+3+3+4 प्रणाली के साथ, 10+2 प्रणाली देश में औपचारिक शिक्षा प्रणाली के अंतर्गत एक बच्चे द्वारा स्कूल स्तर पर बिताए जाने वाले वर्षों के संदर्भ में नहीं बदलेगी। दूसरा, इससे सरकार पर वित्तीय बोझ बढ़ेगा।
2. शिक्षा के माध्यम के रूप में क्षेत्रीय भाषाएँ - नीति शिक्षा के माध्यम के रूप में एक बच्चे की मातृभाषा पर जोर देती है। हालाँकि, NEP केवल मातृभाषा को शिक्षा के माध्यम के रूप में सुझाती है, लेकिन इसे अनिवार्य नहीं बनाया है। नीति में कहा गया है कि बच्चे अपनी मातृभाषा में अवधारणाओं को अधिक तेज़ी से सीखते और समझते हैं। NEP 2020 चीन, जर्मनी, फ्रांस जैसे अन्य देशों के अनुरूप मानदंडों पर चलना चाहता था जहाँ विदेशी छात्रों को देश को बेहतर ढंग से समझने के लिए देश की भाषा सीखने की आवश्यकता होती है। भारत में अन्य देशों की तरह एक राष्ट्रीय भाषा नहीं बल्कि 22 सक्रिय भाषाएँ हैं। यदि ये परिवर्तन लागू किए जाएंगे, तो हमें निम्नलिखित चुनौतियों का सामना करने के लिए तैयार रहना चाहिए।

- योग्य कर्मचारियों की आवश्यकता जो एक क्षेत्रीय भाषा में पढ़ा सकें।
- मातृभाषाओं में अध्ययन सामग्री की आवश्यकता।

3. एनईपी 2020 के अनुसार अंग्रेजी भाषा का स्थान- राष्ट्रीय शिक्षा नीति 2020 के अनुसार, निजी स्कूलों के छात्रों को सरकारी स्कूलों के छात्रों की तुलना में बहुत कम उम्र में अंग्रेजी से परिचित कराया जाएगा। शैक्षणिक पाठ्यक्रम सरकारी स्कूल के छात्रों की संबंधित क्षेत्रीय भाषाओं में पढ़ाया जाएगा। यह नई शिक्षा नीति की बड़ी कमियों में से एक है क्योंकि इससे अंग्रेजी में संवाद करने में असहज छात्रों की संख्या बढ़ जाएगी, जिससे समाज के विभिन्न वर्गों के बीच की खाई और चौड़ी हो जाएगी। नीति में कहा गया है कि सरकारी स्कूलों में छात्रों को 5वीं कक्षा तक और कुछ मामलों में 8वीं कक्षा

तक क्षेत्रीय भाषाओं में पढ़ाया जाएगा। हालांकि, निजी स्कूल शुरुआती चरणों से ही अंग्रेजी शुरू करने में एक कदम पीछे नहीं हटेंगे।

4. **परीक्षण आकलन और परीक्षा सुधार-** एनईपी 2020 ने 3, 5 और 8 ग्रेड स्तरों पर परीक्षण के साथ, नव प्रस्तावित स्कूली शिक्षा प्रणाली के सभी स्तरों पर मापने योग्य सीखने के परिणामों पर ध्यान केंद्रित किया। यह बच्चों की चल रही शैक्षणिक प्रगति को मापने के लिए प्रारंभिक आकलन, सहकर्मी मूल्यांकन और समग्र प्रगति रिपोर्ट को भी बढ़ावा देता है। एनईपी 2020 का अध्ययन करते समय निम्नलिखित बिंदु उभर कर आए।

- 12वीं कक्षा की बोर्ड परीक्षाओं के साथ-साथ 12वीं कक्षा के बाद सामान्य विश्वविद्यालय प्रवेश परीक्षाओं को दिए जाने वाले महत्व के बीच अधिव्यापन है।
- राज्यों के प्रदर्शन से जुड़ी प्रस्तावित बजट राशि के परिणामस्वरूप वास्तव में कम आय वाले और कम प्रदर्शन करने वाले राज्यों को भविष्य में केंद्रीय बजट के लिए संघर्ष करना पड़ सकता है, जिससे आगे चलकर और अधिक स्तरीकरण हो सकता है।
- नीति छात्रों और अभिभावकों के लिए एक समग्र प्रगति रिपोर्ट कार्ड के विकास का सुझाव देती है, जिसे समय-समय पर उनकी प्रगति पर नज़र रखने के लिए एआई आधारित सॉफ़्टवेयर के माध्यम से एक्सेस किया जा सकता है। हालाँकि, यह स्पष्ट नहीं करता है कि वर्तमान असाधारण डिजिटल विभाजन को कैसे भरा जाएगा।
- नीति भाषा में ओलंपियाड और अन्य प्रतिस्पर्धी परीक्षणों को बढ़ावा देने के माध्यम से आईआईटी/एनआईटीएस में प्रवेश बढ़ाने के लिए 'प्रतिभाशाली छात्रों' पर ध्यान केंद्रित करने का उल्लेख है। गरीब परिवार ओलंपियाड की तैयारी और परीक्षा शुल्क वहन नहीं कर सकते हैं और यदि प्रमुख संस्थान उन्हें अपने प्रवेश मानदंडों में शामिल करते हैं, जैसा कि नीति द्वारा सुझाया गया है, तो यह उच्च शिक्षा में मौजूदा सामाजिक असमानताओं को और गहरा करेगा।

नीति में दो नई एजेंसियों के गठन का सुझाव दिया गया है: समग्र विकास के लिए ज्ञान का प्रदर्शन मूल्यांकन समीक्षा विश्लेषण (PARAKH) और राष्ट्रीय परीक्षण एजेंसी (NTA)। ये नई एजेंसियां राष्ट्रीय और राज्य स्तर पर बच्चों के अत्यधिक केंद्रीकरण और संभावित रूप से अत्यधिक परीक्षण की ओर ले जा सकती हैं। कई राज्य और राष्ट्रीय मूल्यांकनों पर उच्च स्तर वाली परीक्षण संस्कृति (जिसमें स्कूलों को छात्रों के अंकों को सार्वजनिक रूप से सूचीबद्ध करना आवश्यक है) बच्चों पर प्रदर्शन करने का दबाव बनाएगी, जिससे 'कोचिंग संस्कृति को कम करने' के इच्छित प्रभाव नकारे जाएँगे, जो कि नीति में सबसे पहले उजागर की गई समस्या थी।

5. शिक्षक और शिक्षक शिक्षा के प्रति नीति दृष्टिकोण - एनईपी 2020 में शिक्षक पर एक पूरा खंड (धारा 5) है, लेकिन यह मुख्य रूप से शिक्षकों को उन्नत करने, शिक्षकों के ज्ञान का परीक्षण करने और यहां तक कि शिक्षण व्यवसाय में प्रतिभाशाली लोगों को आकर्षित करने से संबंधित है। शिक्षकों की भर्ती सशक्त, पारदर्शी प्रक्रियाओं के माध्यम से की जाएगी। पदोन्नति योग्यता आधारित होगी, जिसमें शैक्षिक प्रशासक या शिक्षक शिक्षक बनने के लिए बहु-स्रोत आवधिक प्रदर्शन मूल्यांकन और उपलब्ध प्रगति पथों के लिए एक तंत्र होगा। शिक्षकों के लिए एक सामान्य राष्ट्रीय व्यावसायिक मानक (एनपीएसटी) राष्ट्रीय अध्यापक शिक्षा परिषद

द्वारा 2022 तक एनसीईआरटी, एससीईआरटीएस, शिक्षक और सभी स्तरों और क्षेत्रों के विशेषज्ञ संगठनों के परामर्श से विकसित किया जाएगा। एनईपी में कहा गया है: "यह सुनिश्चित करने के लिए कि उत्कृष्ट छात्र विशेष रूप से ग्रामीण क्षेत्रों से शिक्षण पेशे में प्रवेश करें - देश भर में गुणवत्तापूर्ण 4-वर्षीय एकीकृत बी.एड. कार्यक्रमों का अध्ययन करने के लिए बड़ी संख्या में योग्यता-आधारित छात्रवृत्तियाँ स्थापित की जाएँगी। ग्रामीण क्षेत्रों में, विशेष योग्यता-आधारित छात्रवृत्तियाँ स्थापित की जाएँगी, जिसमें उनके बी.एड. कार्यक्रमों के सफल समापन पर उनके स्थानीय क्षेत्रों में अधिमान्य रोजगार भी शामिल होगा।" छात्रों को छात्रवृत्ति देना ठीक है, लेकिन आप स्कूलों में पढ़ाना जारी रखने के लिए प्रतिभाशाली छात्रों को कैसे बनाए रखेंगे? जबकि कोठारी आयोग ने शिक्षकों के वेतन को बढ़ाने की बात की थी, और वेतन के लिए मानदंड सुझाए थे, एनईपी 2020 में अच्छे शिक्षकों को उच्च वेतन देने के बारे में कोई उल्लेख नहीं किया गया है। चूँकि शिक्षण भारत में कम वेतन वाले व्यवसायों में से एक है, इसलिए अनुभवात्मक शिक्षण और अवधारणा-उन्मुख शिक्षण एक चुनौतीपूर्ण कार्य होगा। जब तक शिक्षक के पारिश्रमिक को संशोधित नहीं किया जाता, तब तक एनईपी 2020 का कार्यान्वयन काफी चुनौतीपूर्ण होगा।

निष्कर्ष

एनईपी 2020 प्राथमिक विद्यालयों से जुड़ी खराब साक्षरता और संख्यात्मकता के परिणामों को सुधारने, मध्य और माध्यमिक विद्यालयों में ड्रॉपआउट के स्तर को कम करने और उच्च शिक्षा प्रणाली में बहु-विषयक दृष्टिकोण को पेश करने पर केंद्रित है। इसके अलावा, नीति में बचपन की शिक्षा, पाठ्यक्रम और शिक्षाशास्त्र के पुनर्गठन, परीक्षा प्रक्रिया में सुधार और शिक्षक प्रशिक्षण में निवेश पर भी जोर दिया गया है। हालाँकि एनईपी 2020 का उद्देश्य भारत की शिक्षा प्रणाली में समग्र परिवर्तन लाना है, लेकिन सुधारों को लागू करने में मात्रात्मक और गुणात्मक दोनों तरह की चुनौतियाँ हैं। एक बार एनईपी लागू हो जाने के बाद, छात्रों के 10वीं के बाद कला, विज्ञान और वाणिज्य में विभाजन धुंधला हो जाएगा। अब छात्रों को उनकी रुचि के आधार पर विभिन्न धाराओं से पाठ्यक्रम लेने की अनुमति होगी। पहले, छह से 14 वर्ष की आयु के बच्चों के लिए स्कूली शिक्षा अनिवार्य थी। अब तीन से 18 वर्ष की आयु के बच्चों के लिए शिक्षा अनिवार्य होगी। इस कदम से 14-18 वर्ष की आयु के बच्चों को भी शिक्षा का अधिकार (RTE) मांगने का मौका मिलेगा जो पहले केवल 14 वर्ष की आयु तक ही मान्य था। अब 14 वर्ष से अधिक आयु के बच्चे भी इसकी मांग कर सकते हैं। एनईपी-2020 का प्राथमिक लक्ष्य यह सुनिश्चित करना है कि सभी भारतीयों को सस्ती कीमत पर गुणवत्तापूर्ण शिक्षा मिले। हालाँकि, इसने ऐसा कोई यथार्थवादी तरीका नहीं बताया है जिससे निजी संस्थान अपने छात्रों और उनके समुदायों की ज़रूरतों को पूरा करने के लिए धन जुटा सकें। शैक्षणिक संस्थान शिक्षा की गुणवत्ता में सुधार के लिए न तो दान के ज़रिए पर्याप्त धन जुटा पाए हैं और न ही अपनी ट्यूशन फ़ीस बढ़ा पाए हैं।

संदर्भ

1. अलूर, एम. (2001)। भारतीय संदर्भ में समावेश। ह्यूमन स्केप, 8(6), 1-8।
2. अनुजा, (2020, 18 अगस्त)। एनईपी 2020: शिक्षा को और अधिक समावेशी बनाना। टाइम्स ऑफ इंडिया ब्लॉग।
3. आयडिनोग्लू, एन. (2014)। अंग्रेजी भाषा की पाठ्यपुस्तक में लिंग। प्रोसीडिया-सामाजिक और व्यवहार विज्ञान।

4. बानूरी, एम., और सरमा, एस. (2023, 10 अप्रैल)। राष्ट्रीय शिक्षा नीति (एनईपी) 2020: हिट और मिस। भारत विकास समीक्षा।
5. बैटर्स, जे. (1987). विदेशी भाषा सीखने के बारे में छात्र और शिक्षक की धारणाएँ. पीएच.डी. थीसिस, बाथ विश्वविद्यालय
6. बटलर, जे. (1990). जेंडर ट्रबल, रूटलेज प्रकाशन.
7. बूथ, टी. और ऐन्सको, एम. (2002). समावेशन के लिए सूचकांक: स्कूलों में सीखने और भागीदारी का विकास करना. समावेशी शिक्षा पर अध्ययन केंद्र, यूनाइटेड किंगडम. वैज्ञानिक अनुसंधान प्रकाशन.
8. डन और एंटोनिया, डब्ल्यू. (2017). ग्रेडिंग लक्ष्य चार- गुणवत्तापूर्ण शिक्षा पर सतत विकास लक्ष्य में तनाव, खतरे और अवसर, ब्रिल प्रकाशन। संयुक्त राष्ट्र की आम सभा। (2015)। https://www.un.org/en/ga हार्पर और रो।
9. थॉर्न, बी. (1993).लिंग खेल: स्कूल में लड़कियां और लड़के। सामाजिक बल, 73(3), 1139। https://doi.org/10.2307/2580577
10. जुल्का, ए.(n.d) समतामूलक और समावेशी शिक्षा एनईपी, 2020.
11. कैंटर, आर.एम. (1977). निगम के पुरुष और महिलाएँ. न्यूयॉर्क: बेसिक बुक्स.
12. खान,. जिब्रान और एन. साहू, एन. (2021), राष्ट्रीय शैक्षिक नीति 2020 में समतामूलक और समावेशी दृष्टिकोण: एक आलोचना, ओआरएफ.
13. राष्ट्रीय शिक्षा नीति, 1986। भारत

संशोधन आणि नवकल्पनेत कृत्रिम बुद्धिमत्ता: भविष्य घडविणारी क्रांती

श्री. सुभाष सोनू मायंगडे

ग्रंथपाल

आठल्ये-सप्रे-पित्रे स्वायत्त महाविद्यालय, देवरुख

घोषवारा:

प्रस्तुत शोधनिबंधामध्ये कृत्रिम बुद्धिमत्ता (AI) चा संशोधन प्रक्रियेत वापर यावर सखोल अभ्यास करण्यात आला आहे. AI हे तंत्रज्ञान क्षेत्रातील एक महत्त्वपूर्ण साधन बनले असून, ते मानवी बुद्धिमत्तेच्या कार्यपद्धतींची नक्कल करण्यास सक्षम आहे. डिजिटल युगातील संशोधन प्रक्रियेतील गती, डेटा विश्लेषण, मॉडेलिंग आणि नवकल्पनांच्या विकासात AI मोलाचे योगदान देत आहे. वैद्यकीय, सामाजिक विज्ञान, पर्यावरणीय, अभियांत्रिकी, आणि शैक्षणिक क्षेत्रात या तंत्रज्ञानाचा प्रभाव स्पष्टपणे जाणवतो. तथापि, या तंत्रज्ञानाच्या वापरामुळे नैतिक व सामाजिक आव्हानांची, जसे की डेटा गोपनीयता आणि निर्णय प्रक्रियेत पारदर्शकतेचा अभाव, प्रभावी चर्चा आवश्यक ठरते.

संज्ञा: कृत्रिम बुद्धिमत्ता, नवकल्पना, डेटा विश्लेषण, सिमुलेशन, आर्थिक मॉडेलिंग, नैतिक आव्हाने

प्रस्तावना

कृत्रिम बुद्धिमत्ता (AI) आजच्या डिजिटल युगात एक अद्वितीय आणि अत्याधुनिक तंत्रज्ञान म्हणून उदयास आले आहे. हा एक संगणकीय प्रणाली आहे जो मानवी बुद्धिमत्तेच्या कार्यपद्धतींची नक्कल करतो, ज्यामध्ये शिकणे, समस्या सोडवणे, निर्णय घेणे, आणि संवाद साधणे यांचा समावेश होतो. AI चा विकास 1950 च्या दशकात सुरू झाला, पण आज तो प्रगत तंत्रज्ञानाच्या पायाभूत आधारांवर आधारित असलेल्या विविध उपयोजनांमध्ये रूपांतरित झाला आहे.

आजच्या जगात, AI चा प्रभाव केवळ संगणकांपर्यंतच मर्यादित नाही, तर तो सर्वच क्षेत्रांमध्ये फैलावला आहे. संशोधन, उद्योग, आरोग्य, शिक्षण, जीवनशैली आणि विविध सरकारी सेवांमध्ये AI चा समावेश झाल्यामुळे एक नवा विकासात्मक पर्व सुरू झाला आहे. या तंत्रज्ञानाने डेटा संग्रहण, विश्लेषण, आणि प्रबंधनाची पद्धत बदलली आहे. उदाहरणार्थ, औषधनिर्माण संशोधनात AI चा वापर नवीन औषधांच्या शोधासाठी जलद प्रक्रिया सक्षम करतो, तर उत्पादन उद्योगात प्रक्रिया ऑटोमेशनद्वारे कार्यक्षमता वाढवतो.

AI चा वापर शिक्षण क्षेत्रात देखील मोठा बदल घडवून आणत आहे, जिथे विद्यार्थ्यांना वैयक्तिकृत शिक्षण अनुभव प्रदान करण्यासाठी तंत्रज्ञानाचा वापर होतो. यामुळे शैक्षणिक संस्थांना अधिक प्रभावी पद्धतीने शिक्षण देणे शक्य होते. आरोग्य सेवेमध्ये, AI रुग्णांच्या निदानात आणि उपचारात मदत करते, ज्यामुळे रोगांचा वेगवान आणि अचूक उपचार करणे शक्य होते.

AI चा विकास आणि वापरामुळे नवीन नैतिक आणि सामाजिक प्रश्न देखील उद्भवले आहेत. यामध्ये डेटा गोपनीयता, बायस, आणि AI च्या निर्णय प्रक्रियेतील पारदर्शकतेचा अभाव यांसारख्या आव्हानांचा समावेश आहे. म्हणून, AI चा उपयोग करताना योग्य नैतिक मापदंड ठेवणे अत्यंत महत्त्वाचे आहे.

अशा प्रकारे, कृत्रिम बुद्धिमत्ता एक आधुनिक तंत्रज्ञान म्हणून आपल्याला एक नवीन जग दाखवत आहे, ज्यामध्ये नवकल्पनांचे दार खुले आहे. यामुळे अनेक क्षेत्रांमध्ये सकारात्मक बदल घडविण्याची क्षमता आहे, परंतु त्यासोबतच एक सामाजिक व नैतिक जबाबदारी देखील आहे.

❖ **कृत्रिम बुद्धिमत्तेची मूलभूत संकल्पना:**

कृत्रिम बुद्धिमत्ता म्हणजे काय?

कृत्रिम बुद्धिमत्ता (AI) म्हणजे संगणक प्रणाली किंवा यंत्रे जी मानवी बुद्धिमत्तेसारखी कार्ये करण्याची क्षमता ठेवतात. AI प्रणालींचा उद्देश म्हणजे विचार करणे, शिकणे, समस्या सोडवणे, भाषा समजणे, आणि विविध कार्ये स्वयंचलितपणे पार पडणे. AI चा वापर आजच्या तंत्रज्ञानात अनेक ठिकाणी केला जातो, जसे की स्मार्टफोन, स्वयंचलित वाहने, वैद्यकीय उपकरणे, ग्राहक सेवा चॅटबॉट्स, आणि बरेच काही.

❖ **कृत्रिम बुद्धिमत्तेचे विविध प्रकार**

AI ची वर्गीकरण अनेक प्रकारे केली जाऊ शकते, परंतु तीन प्रमुख प्रकारांमध्ये त्याचे वर्गीकरण करता येते:

१. **नियमित बुद्धिमत्ता (Narrow AI):** हे AI चे प्राथमिक स्वरूप आहे, जे विशिष्ट कार्ये पार करण्यासाठी डिझाइन केलेले आहे. उदाहरणार्थ, गूगल च्या सर्च इंजिन, फेस रिकग्निशन सिस्टीम, आणि चॅटबॉट्स. हे यंत्रे एकाच कार्यात उत्कृष्ट असतात, परंतु अन्य कार्यांमध्ये कार्यक्षम नाहीत.

२. **सामान्य बुद्धिमत्ता (General AI):** हे एक परिकल्पित AI आहे, जे मानवी बुद्धिमत्तेसारखे कार्य करण्याची क्षमता ठेवते. यामध्ये शिकणे, समजून घेणे, समस्या सोडवणे, आणि संज्ञानात्मक कार्ये करण्याची क्षमता असते. हे AI अद्याप विकसित झालेले नाही.

३. **सुपर बुद्धिमत्ता (Superintelligent AI):** हा एक अजून अधिक प्रगत AI प्रकार आहे, जो मानवाच्या बुद्धिमत्तेपेक्षा अधिक बुद्धिमान असेल. याची परिकल्पना अधिक चिंतेची आहे, कारण यामुळे भविष्यामध्ये मानवी जीवनावर परिणाम होऊ शकतो.

मशीन लर्निंग (Machine Learning)

मशीन लर्निंग हे AI चे एक उपविभाग आहे, ज्यामध्ये यंत्रे डेटा आणि अनुभवांच्या आधारे शिकतात आणि त्यांच्या कार्यक्षमतेत सुधारणा करतात. मशीन लर्निंगचा उद्देश म्हणजे संगणकाला डेटा वापरून स्वतःच शिकवणे आणि अनुभवातून शिकणे. मशीन लर्निंगमध्ये खालील प्रमुख तंत्रांचा समावेश आहे:

१. **सुपरवाइज्ड लर्निंग (Supervised Learning):** या पद्धतीत यंत्राला लेबल केलेल्या डेटावर प्रशिक्षण दिले जाते. यामध्ये एखाद्या विशिष्ट वर्गीकरणाचा अभ्यास केला जातो. उदाहरणार्थ, इमेज क्लासिफिकेशन.

२. **अनसुपरवाइज्ड लर्निंग (Unsupervised Learning):** यामध्ये यंत्राला लेबल नसलेल्या डेटावर प्रशिक्षण दिले जाते. याचा उपयोग डेटामधील पॅटर्न ओळखण्यासाठी केला जातो. उदाहरणार्थ, क्लस्टरिंग.

३. **रीइन्फोर्समेंट लर्निंग (Reinforcement Learning):** या पद्धतीत यंत्र एक ठराविक कार्य करून शिका, जिथे त्याला यशस्वी कामगिरीसाठी बक्षीस आणि अयशस्वी कामगिरीसाठी शिक्षण मिळते. उदाहरणार्थ, गेम्समध्ये.

डीप लर्निंग (Deep Learning)

डीप लर्निंग मशीन लर्निंगचा एक उपविभाग आहे, जो न्यूरल नेटवर्कचा वापर करून डेटा प्रक्रिया करतो. डीप लर्निंगचे मॉडेल जटिल संरचना असतात, ज्यामध्ये अनेक स्तर (लेयर्स) असतात. हे स्तर डेटा मधील वेगवेगळ्या स्तरांवर प्रक्रिया करतात, जसे की इमेज, ऑडिओ, आणि टेक्स्ट.

उदाहरणार्थ, कॉन्वोल्यूशनल न्यूरल नेटवर्क्स (CNNs) इमेज प्रोसेसिंगसाठी वापरले जातात, तर रेकरेन्ट न्यूरल नेटवर्क्स (RNNs) टेक्स्ट आणि ऑडिओ साठी उपयुक्त असतात. डीप लर्निंगने व्हॉइस रेकग्निशन, इमेज रिकग्निशन, आणि स्वयंचलित भाषांतर यासारख्या क्षेत्रांमध्ये महत्त्वपूर्ण प्रगती साधली आहे.

नॅचरल लँग्वेज प्रोसेसिंग (Natural Language Processing)

नॅचरल लँग्वेज प्रोसेसिंग (NLP) हे AI चे एक महत्त्वाचे क्षेत्र आहे, जे संगणकांना मानवाच्या भाषेस समजण्याची आणि त्यावर प्रक्रिया करण्याची क्षमता प्रदान करते. NLP तंत्रे शब्दांमध्ये अर्थ कसा समजावा, संवाद कसा साधावा, आणि संवादानुसार उत्तर कसे द्यावे हे शिकवतात.

NLP चा वापर विविध क्षेत्रांमध्ये केला जातो, जसे की:

- **चॅटबॉट्स:** ग्राहक सेवा साठी संवाद साधणे.
- **भाषांतर:** एक भाषेतून दुसऱ्या भाषेत अनुवाद करणे.
- **टेक्स्ट विश्लेषण:** संवेग आणि थोडक्यात माहिती काढणे.

❖ **संशोधन क्षेत्रात कृत्रिम बुद्धिमत्तेचा वापर**

कृत्रिम बुद्धिमत्ता (AI) संशोधन क्षेत्रात एक महत्त्वाचे साधन बनले आहे, जे संशोधकांना डेटा विश्लेषण, मॉडेलिंग, सिमुलेशन, आणि नवीन सिद्धांत व कल्पनांचा विकास करण्यात मदत करते.

१. डेटा विश्लेषण

कृत्रिम बुद्धिमत्तेच्या साहाय्याने मोठ्या प्रमाणात डेटाचे विश्लेषण

संशोधनात डेटा हा अत्यंत महत्त्वाचा घटक आहे, विशेषतः जटिल समस्यांच्या निराकरणासाठी. AI च्या साहाय्याने मोठ्या प्रमाणातील डेटा जलद आणि अचूकपणे विश्लेषित केला जातो. मशीन लर्निंग तंत्रे डेटा सेटमधील पॅटर्न आणि ट्रेंड शोधण्यास मदत करतात, ज्यामुळे संशोधकांना मूल्यवान अंतर्दृष्टी मिळते.

उदाहरणार्थ, वैद्यकीय संशोधनात रोगांच्या रुग्णांचा डेटा विश्लेषण करून, AI चा वापर रोगाचे कारण आणि त्याच्या उपचारांच्या प्रभावीतेचा शोध घेण्यासाठी केला जातो. यामुळे औषधांच्या विकासात गती येते आणि नवीन उपचार पद्धती शोधणे शक्य होते.

२. मॉडेलिंग आणि सिमुलेशन

जटिल प्रणालींचे मॉडेल तयार करणे आणि त्यांचे सिमुलेशन करणे

AI चा वापर जटिल प्रणालींचे मॉडेल तयार करण्यासाठी देखील केला जातो. संशोधक विविध घटकांचे निरीक्षण करून त्यांचे परस्पर संबंध समजून घेतात आणि त्यांच्या आधारावर मॉडेल तयार करतात.

सिमुलेशन प्रक्रियेत, तयार केलेल्या मॉडेलचा वापर करून वास्तविक जीवनातील परिस्थितींचा अभ्यास केला जातो. यामुळे विविध घटकांचे परिणाम समजणे सोपे होते. उदाहरणार्थ, जलवायु संशोधनात विविध पर्यावरणीय घटकांचे मॉडेल तयार करून, त्यांच्या प्रभावांचे सिमुलेशन केले जाते, ज्यामुळे जलवायु बदलाचे संभाव्य परिणाम समजून घेता येतात.

३. नवीन सिद्धांत आणि कल्पनांचा विकास

कृत्रिम बुद्धिमत्ता वापरून नवीन सिद्धांत आणि कल्पनांचा विकास

AI च्या साहाय्याने नवीन सिद्धांत आणि कल्पनांचा विकास करणे शक्य झाले आहे. AI प्रणालींना विद्यमान डेटा, सिद्धांत, आणि तंत्रज्ञानाचा आधार घेऊन नवीन गृहितकं सुचवता येतात. हे संशोधन प्रक्रियेत नवीन विचार आणते आणि अनेक क्षेत्रांत प्रगती साधते.

उदाहरणार्थ, भौतिकशास्त्रात AI चा वापर करून नवे भौतिक सिद्धांत विकसित केले जातात, ज्यामुळे अवकाशातील पद्धती आणि कणांचे गुणधर्म समजून घेण्यात मदत होते. तसेच, सामाजिक विज्ञानात AI च्या साहाय्याने समाजातील विविध घटकांचे विश्लेषण करून नवीन धोरणे सुचवली जातात.

❖ **नवकल्पनेत कृत्रिम बुद्धिमत्तेची भूमिका**

कृत्रिम बुद्धिमत्ता (AI) आजच्या व्यवसाय जगात नवकल्पनेला एक नवा आयाम देत आहे. उत्पादन डिझाइन, नवीन उत्पादने आणि सेवांची निर्मिती, तसेच व्यवसायातील नवकल्पना यामध्ये AI चा प्रभावी वापर करण्यात येत आहे. यामध्ये,

१. उत्पादन डिझाइन

कृत्रिम बुद्धिमत्ता वापरून उत्पादनांचे डिझाइन सुधारणे

AI चा वापर उत्पादन डिझाइन प्रक्रियेत महत्त्वपूर्ण भूमिका निभावतो. AI च्या सहाय्याने कंपन्या ग्राहकांच्या आवडीनिवडी आणि बाजारातील ट्रेंड यावर आधारित नवीन उत्पादनांचे डिझाइन करू शकतात.

उदाहरण:

- **आर्टिफिशियल इंटेलिजेंस सॉफ्टवेअर्स:** CAD (Computer-Aided Design) सॉफ्टवेअर्समध्ये AI चा वापर करून, उत्पादनांचे अधिक कार्यक्षम आणि आकर्षक डिझाइन तयार केले जाऊ शकते. AI आधारित सॉफ्टवेअर्स डेटा विश्लेषण करून, ग्राहकांच्या आवडीनिवडींनुसार डिझाइनमध्ये सुधारणा करतात.
- **प्रोटोटायपिंग:** AI च्या मदतीने वर्च्युअल प्रोटोटाइप तयार करणे शक्य आहे, ज्यामुळे उत्पादनाच्या कार्यक्षमतेचा त्वरित आढावा घेता येतो.

२. नवीन उत्पादने आणि सेवांची निर्मिती

कृत्रिम बुद्धिमत्ताच्या साहाय्याने नवीन उत्पादने आणि सेवांची निर्मिती करणे

AI ने नव्या उत्पादनांचा आणि सेवांचा विकास अधिक जलद आणि प्रभावी बनवला आहे. ग्राहकांच्या आवश्यकता आणि बाजारातील ट्रेंड यांचा अभ्यास करून, AI नवीन उत्पादने आणि सेवांची निर्मिती करण्यास मदत करतो.

उदाहरण:

- **स्मार्ट उपकरणे:** AI चा वापर करून स्मार्ट होम उपकरणांची निर्मिती केली जात आहे, जसे की स्मार्ट थर्मोस्टॅट्स, स्मार्ट लाइटिंग सिस्टम्स, आणि इतर IoT (Internet of Things) उपकरणे. हे उपकरणे ग्राहकांच्या गरजा आणि पर्यावरणाच्या स्थितीवर आधारित कार्य करतात.
- **कस्टमायझेशन:** AI च्या मदतीने ग्राहकांच्या इच्छेनुसार उत्पादनांच्या खास आवृत्त्या तयार करणे शक्य होते, ज्यामुळे ग्राहकांचा अनुभव सुधारतो.

३. व्यवसायातील नवकल्पना

कृत्रिम बुद्धिमत्ता वापरून व्यवसायातील नवकल्पना करणे

AI चा वापर व्यवसायातील नवकल्पनांना चालना देतो. विविध कार्यप्रणालींमध्ये AI चा समावेश करून कंपन्या आपल्या उत्पादनांमध्ये आणि सेवांमध्ये सुधारणा करू शकतात.

उदाहरण:

- **डेटा ड्रिव्हन निर्णय प्रक्रिया:** AI आधारित विश्लेषण उपकरणे वापरून, कंपन्या डेटा विश्लेषण करून निर्णय घेतात. यामुळे निर्णय घेण्याची प्रक्रिया अधिक वेगवान आणि अचूक होते.
- **ग्राहक सेवा सुधारणा:** AI च्या मदतीने चॅटबॉट्स आणि व्हॉइस असिस्टंट्सचा वापर करून ग्राहक सेवेमध्ये सुधारणा केली जाते. यामुळे ग्राहकांची समस्या जलद समाधान केली जाते आणि ग्राहक अनुभव सुधारतो.

❖ **कृत्रिम बुद्धिमत्तेचे भविष्य**

कृत्रिम बुद्धिमत्ता (AI) ही एक गतिमान आणि विकसित होणारी तंत्रज्ञानाची शाखा आहे. भविष्यात AI कसा विकसित होईल, त्याचे संशोधन व नवकल्पनेवर काय परिणाम होतील, आणि नैतिक व सामाजिक परिणाम याबाबत चर्चा करणे महत्त्वाचे आहे.

१. भविष्यकाळातील कृत्रिम बुद्धिमत्ता

✓ **अधिक अचूकता आणि कार्यक्षमता:**

- भविष्यात AI प्रणाली अधिक सुसंगत आणि अचूक होतील. मशीन लर्निंग आणि डीप लर्निंगमधील प्रगतीमुळे डेटा विश्लेषण अधिक चांगले आणि जलद होईल.

✓ **मानव-समान बुद्धिमत्ता:**

- सामान्य बुद्धिमत्ता (AGI) कडे जाणारा मार्ग भविष्याच्या AI विकासात महत्त्वाचा असेल. यामुळे AI प्रणाली मानवी विचारप्रणालीला अधिक नजीक येतील.

✓ **इंटरऑपरेबिलिटी:**

- विविध AI प्रणाली आणि तंत्रज्ञानांमध्ये अधिक सहकार्य आणि समन्वय असेल, ज्यामुळे एकात्मिक सोल्यूशन्स विकसित होतील.

✓ **जागतिक स्तरावर विविधता:**

- AI तंत्रज्ञान विविध क्षेत्रांत अनुकूलित केले जाईल, ज्यामुळे ते शैक्षणिक, औषधीय, औद्योगिक आणि सेवाक्षेत्रात कार्यक्षमतेने वापरले जाईल.

२. कृत्रिम बुद्धिमत्तेचे संशोधन आणि नवकल्पनेवर परिणाम

✓ **संशोधन गती:**

- AI चा वापर संशोधन प्रक्रियेला गती देईल, जसे की डेटा सुलभपणे विश्लेषित करणे आणि गृहितके तयार करणे. यामुळे संशोधकांना नवीन कल्पना आणि सिद्धांत विकसित करण्यात मदत होईल.

✓ **नवीन क्षेत्रांचा विकास:**

- AI चा वापर नवीन क्षेत्रांमध्ये संधी निर्माण करेल. उदाहरणार्थ, जेव्हा AI नैसर्गिक विज्ञान, भौतिकी, जीवशास्त्र इत्यादींमध्ये वापरला जातो, तेव्हा नव्या आव्हानांचा सामना करण्यास मदत होते.

- ✓ **इनोवेशन प्रोत्साहन:**
  - AI प्रणालींचा वापर करून, कंपन्या नवीन उत्पादने, सेवा आणि तंत्रज्ञान विकसित करणे अधिक सहज आणि जलद करू शकतात. यामुळे बाजारात नवकल्पनांची लाट निर्माण होईल.

३. नैतिक आणि सामाजिक परिणाम

❖ **कृत्रिम बुद्धिमत्तेच्या वापराचे नैतिक आणि सामाजिक परिणाम**

- ✓ **गोपनीयता आणि डेटा सुरक्षा:**
  - AI च्या वापरामुळे डेटा गोपनीयतेच्या मुद्द्यांवर लक्ष केंद्रित करणे आवश्यक आहे. यामुळे व्यक्तीगत माहितीच्या हानिकारक वापरापासून संरक्षण करणे महत्त्वाचे आहे.
- ✓ **रोजगारावर परिणाम:**
  - AI चा वेगवान विकास काही पारंपरिक नोकऱ्या कमी करू शकतो, ज्यामुळे काही कामकाजांचे स्वरूप बदलले जाईल. यामुळे कौशल्यांच्या आवश्यकतांमध्ये बदल घडवून येईल.
- ✓ **पूर्वग्रह आणि भेदभाव:**
  - AI प्रणालींमध्ये पूर्वग्रहित डेटा समाविष्ट केल्यास, त्यांच्या निर्णय प्रक्रियेत भेदभाव होऊ शकतो. यामुळे सामाजिक समानतेवर प्रश्न उपस्थित होतात.
- ✓ **अधिकार आणि जबाबदारी:**
  - AI च्या वापरामुळे व्यक्ती आणि संस्थांच्या अधिकारांचा प्रश्न उभा राहतो. याबाबत योग्य नियमन आणि कायद्यांची गरज भासेल.

कृत्रिम बुद्धिमत्ता (AI) च्या साहाय्याने विविध प्रकारचे संशोधन अधिक प्रभावीपणे केले जाऊ शकते. खालील काही महत्त्वाचे क्षेत्रे दर्शवतात जिथे AI ने संशोधन प्रक्रियेत मोठा बदल घडवला आहे:

१. वैद्यकीय संशोधन

- **रुग्णांच्या डेटाचे विश्लेषण:** AI चा वापर रुग्णांच्या वैद्यकीय इतिहास, उपचारांची प्रभाविता, आणि रोगांचे निदान यावर आधारित मोठ्या प्रमाणात डेटाचे विश्लेषण करण्यात केला जातो.
- **औषधांच्या विकासात:** AI तंत्रज्ञानाने औषधांच्या नवीन संघटनांचा शोध घेणे, प्रभावी औषधांचे गुणधर्म निर्धारित करणे, आणि संभाव्य उपचारांच्या प्रभावीतेचा अभ्यास करणे सोपे झाले आहे.

२. सामाजिक विज्ञान

- **डेटा विश्लेषण:** सर्वेक्षण, जनगणना, आणि सामाजिक वर्तनाचे मोठ्या प्रमाणात विश्लेषण करण्यासाठी AI वापरला जातो. यामुळे सामाजिक समस्या समजून घेणे आणि त्यावर उपाय सुचवणे सोपे होते.
- **पॅटर्न ओळखणे:** सामाजिक वर्तनातील पॅटर्न शोधण्यासाठी मशीन लर्निंग तंत्रांचा उपयोग केला जातो, ज्यामुळे वर्तनात्मक अभ्यास अधिक कार्यक्षम होतो.

३. पर्यावरणीय संशोधन

- **जलवायु मॉडेलिंग:** जलवायु बदलाच्या प्रभावांचे सिमुलेशन करणे आणि डेटा विश्लेषणासाठी AI वापरले जाते, ज्यामुळे भविष्यकाळातील पर्यावरणीय बदलांची अचूकता वाढते.

- **पुनर्नवीनीकरण आणि संसाधन व्यवस्थापन:** AI चा वापर संसाधनांचा जास्तीत जास्त वापर सुनिश्चित करण्यासाठी आणि अपव्यय कमी करण्यासाठी केला जातो.

४. भौतिकशास्त्र आणि अभियांत्रिकी

- **सिमुलेशन:** जटिल भौतिक प्रक्रिया आणि प्रणालींचे सिमुलेशन करण्यासाठी AI वापरले जाते, ज्यामुळे प्रयोग करण्याची आवश्यकता कमी होते.
- **मटेरियल सायन्स:** नवीन सामग्रींच्या विकासात AI तंत्रांचा वापर करून त्यांच्या गुणधर्मांचा अभ्यास केला जातो.

५. कृत्रिम बुद्धिमत्ता संशोधन

- **स्वत:च्या तंत्रज्ञानांचा विकास:** AI मध्ये केलेल्या संशोधनाने मशीन लर्निंग, डीप लर्निंग, आणि नैसर्गिक भाषा प्रक्रियेसारख्या तंत्रज्ञानांचा विकास साधला आहे.
- **आविष्कार आणि नवकल्पना:** AI तंत्रज्ञानाच्या वापरामुळे नवीन मॉडेल्स, अल्गोरिदम, आणि तंत्रज्ञानांच्या विकासात गती येते.

६. शिक्षण

- **व्यक्तिगत शिक्षण अनुभव:** AI वापरून शिक्षणाच्या क्षेत्रात व्यक्तिनिष्ठ शिका-आधारित अनुभव तयार करण्यास मदत होते, ज्यामुळे विद्यार्थ्यांचे ज्ञान वाढवणे अधिक प्रभावी होते.
- **शिक्षण सामग्रीचे विश्लेषण:** AI च्या मदतीने शिक्षण साहित्याचा विश्लेषण करून, सुधारणा सुचवता येतात.

७. अर्थशास्त्र

- **आर्थिक मॉडेलिंग:** AI वापरून वित्तीय डेटा आणि बाजाराच्या ट्रेंडचे सखोल विश्लेषण केले जाऊ शकते, ज्यामुळे निर्णय घेण्याची प्रक्रिया अधिक सटीक होते.
- **व्यवसाय धोरणे:** AI च्या साहाय्याने मार्केटिंग, ग्राहक वर्तन, आणि व्यवसाय धोरणे अधिक प्रभावीपणे विकसित केली जातात.

❖ **कृत्रिम बुद्धिमत्ता (AI)- काही नवीन आव्हाने:**

कृत्रिम बुद्धिमत्ता (AI) चा वापर वाढत असल्याने, काही नवीन आव्हाने उद्भवू शकतात. यामध्ये,

१. **नैतिक आव्हाने**

- **डेटा गोपनीयता:** AI प्रणाली मोठ्या प्रमाणात डेटा गोळा करतात, ज्यामुळे व्यक्तीगत माहितीच्या गोपनीयतेवर प्रश्न उभा राहतो. या डेटा सुरक्षिततेची चिंता वाढते.
- **पूर्वग्रह आणि भेदभाव:** AI मॉडेल्स डेटा सेटमध्ये असलेल्या पूर्वग्रहामुळे भेदभावात्मक निर्णय घेऊ शकतात, ज्यामुळे समाजात असमानता निर्माण होऊ शकते.

२. रोजगाराची कमी

- **पारंपरिक नोकऱ्यांमध्ये घट:** अनेक उद्योगांमध्ये ऑटोमेशनमुळे पारंपरिक नोकऱ्या कमी होऊ शकतात, ज्यामुळे बेरोजगारीची समस्या निर्माण होऊ शकते.
- **कौशल्यांची गरज:** AI च्या वाढत्या वापरामुळे विशिष्ट कौशल्ये आवश्यक असतील, ज्यामुळे रोजगार बाजारात असमानता निर्माण होऊ शकते.

३. तांत्रिक आव्हाने

- **सुरक्षा धोके:** AI प्रणालींमध्ये सुरक्षिततेच्या कमकुवत्या असू शकतात, ज्यामुळे हॅकिंग, डेटा चोरणे, किंवा इतर तांत्रिक समस्या उद्भवू शकतात.
- **साधनांचा अवलंब:** AI सिस्टीम्समधील तांत्रिक अडचणी किंवा बग्ज यामुळे कार्यक्षमता कमी होऊ शकते.

४. समाजातली परिणामकारकता

- **जनतेचा विश्वास:** AI तंत्रज्ञानाच्या वापरामुळे काही व्यक्तींमध्ये जनतेचा विश्वास कमी होऊ शकतो, विशेषत: ज्यांना AI च्या निर्णय प्रक्रियेवर संशय असतो.
- **सामाजिक परिवर्तन:** AI चा वाढता वापर समाजाच्या संरचनेत बदल घडवू शकतो, ज्यामुळे पारंपरिक मूल्ये व नीतिमत्तेला आव्हान मिळू शकते.

५. नियमन व धोरणे

- **कायदेशीर आव्हाने:** AI तंत्रज्ञानाच्या वापरावर नियंत्रित करणे आणि उचित नियमावली तयार करणे आव्हानात्मक ठरते. अनियंत्रित AI वापरामुळे नवे कायदेशीर मुद्दे उभे राहू शकतात.
- **गुणवत्ता नियंत्रण:** AI प्रणालींची गुणवत्ता आणि अचूकता कायम राखणे आवश्यक आहे. यासाठी योग्य नियमन व मार्गदर्शन आवश्यक आहे.

६. आर्थिक आव्हाने

- **गुंतवणूक कमी:** काही व्यवसायांमध्ये AI तंत्रज्ञानामध्ये गुंतवणूक करण्याची क्षमता नसल्याने, तंत्रज्ञानाच्या फायद्यांपासून वंचित राहू शकतात.
- **बाजारातील असमानता:** AI चा वापर केल्याने मोठ्या कंपन्या अधिक फायदेशीर होऊ शकतात, ज्यामुळे लहान व्यवसायांच्या समोर स्पर्धात्मक आव्हाने उभे राहतात.

❖ **AI आधारित काही उपयुक्त संशोधन साधने**

लेखन आणि संपादन

- **Grammarly:** हे एक लोकप्रिय साधन आहे जे तुम्हाला तुमचे लेखन सुधारण्यात मदत करते. ते व्याकरण, शैली, स्पष्टता आणि स्वर सुधारण्यासाठी सुचवते.
- **Quillbot:** हे एक परफ्रेजिंग टूल आहे जे तुम्हाला तुमच्या वाक्यांना वेगवेगळ्या शब्दांमध्ये पुन्हा लिहिण्यात मदत करते, पिरॅसी टाळण्यात मदत करते.
- **Smodin:** हे एक AI-संचालित प्लॅटफॉर्म आहे जे शोधनिबंध लिहिण्याच्या विविध पैलूंमध्ये मदत करते, जसे की साहित्य शोध, सारांशलेखन आणि उद्धरण निर्मिती.

डेटा विश्लेषण

- **RapidMiner:** हे एक डेटा सायन्स प्लॅटफॉर्म आहे जे डेटा तयार करणे, मॉडेलिंग आणि मूल्यांकन करण्यासाठी वापरले जाते.
- **H2O.ai:** हे एक ओपन-सोर्स प्लॅटफॉर्म आहे जे मशीन लर्निंग अल्गोरिदम वापरून मोठ्या डेटा सेट्सचे विश्लेषण करण्यासाठी वापरले जाते.

- **Tableau:** हे एक डेटा विजुअलायझेशन टूल आहे जे डेटाचे दृष्य प्रतिनिधित्व तयार करण्यासाठी वापरले जाते.

संशोधन सहाय्यक

- **Elicit:** हे एक AI-संचालित शोध इंजिन आहे जे शैक्षणिक पेपर शोधण्यासाठी आणि त्यांचे सारांश करण्यासाठी वापरले जाते.
- **ResearchRabbit:** हे एक साधन आहे जे तुम्हाला विशिष्ट विषयांवर नवीन संशोधन शोधण्यात मदत करते.

साहित्य समीक्षा

- **Semantic Scholar:** हे एक शोध इंजिन आहे जे शैक्षणिक पेपर शोधण्यासाठी आणि त्यांचे विश्लेषण करण्यासाठी डिझाइन केलेले आहे.
- **Connected Papers:** हे एक साधन आहे जे तुम्हाला कोणत्या पेपरला सर्वाधिक उद्धृत केले जाते हे शोधण्यात मदत करते.

इतर उपयुक्त साधने

- **Google Colab:** हा एक मुफ्त क्लाउड-आधारित Jupyter नोटबुक वातावरण आहे जो मशीन लर्निंग मॉडेल प्रशिक्षित करण्यासाठी वापरला जाऊ शकतो.
- **GitHub Copilot:** हे एक AI जोडणी आहे जे कोड सुचवते आणि पूर्ण करते.

निष्कर्ष

कृत्रिम बुद्धिमत्ता संशोधन आणि नवकल्पनेत एक अत्यंत प्रभावी साधन म्हणून उदयास आली आहे. तिच्या मदतीने विविध क्षेत्रांमध्ये बदल आणि प्रगती घडवली जात आहे, ज्यामुळे संशोधनाची प्रक्रिया अधिक सुलभ आणि वेगवान बनली आहे. डेटा विश्लेषण, मॉडेलिंग, सिमुलेशन, आणि सिद्धांत निर्माण यासारख्या संशोधनाच्या विविध टप्प्यांवर AI ने संशोधनाला नवे आयाम दिले आहेत. यामुळे संशोधनातील गुणवत्ता आणि अचूकता वाढली असून, परिणामकारकता देखील सुधारली आहे.

शिक्षण, उद्योग, विज्ञान, तंत्रज्ञान, आरोग्य, पर्यावरण, आणि सामाजिक विज्ञान यांसारख्या क्षेत्रांत AI ने प्रचंड प्रगती साधली आहे. नवकल्पनेत AI च्या वापरामुळे उत्पादने आणि सेवांची गुणवत्ता सुधारली असून, नवनवीन कल्पनांचे सर्जनशीलतेने विकास करण्यात येत आहे. यामुळे नवकल्पनेच्या प्रक्रियेत गती येते आणि अधिक स्पर्धात्मक बाजारपेठ निर्माण होते.

तथापि, AI चा वापर करताना नैतिकता, गोपनीयता, आणि सामाजिक समानता यासारख्या मुद्द्यांवर देखील विचार करणे आवश्यक आहे. पूर्वग्रह आणि भेदभाव, रोजगारातील असमानता, आणि AI च्या वापरासंबंधित सुरक्षा धोके यासारख्या आव्हानांना तोंड देण्यासाठी योग्य धोरणे विकसित करावी लागतील. AI ने मानवजातीच्या जीवनावर मोठा प्रभाव पाडला आहे, परंतु त्यासोबतच तिच्या वापरातील मर्यादा आणि जबाबदाऱ्या देखील ध्यानात ठेवणे महत्त्वाचे आहे.

भविष्यात, कृत्रिम बुद्धिमत्ता संशोधन आणि नवकल्पनांमध्ये आणखी मोठ्या प्रमाणावर वापरली जाईल. तिच्या प्रभावामुळे विविध क्षेत्रांमध्ये नवसर्जनशीलता आणि कार्यक्षमता वाढेल, ज्यामुळे एक उज्वल, कार्यक्षम आणि अधिक विकसित समाज उभा राहील. AI चा योग्य आणि नैतिक वापर केल्यास, तिचा

मानवतेच्या प्रगतीसाठी लाभ घेता येईल, आणि त्यामुळे समाजाची उत्पादकता, जीवनशैली, आणि समृद्धी निश्चितपणे सुधारेल.

संदर्भ:

१. कहाते, अतुल (२०२३), कृत्रिम बुद्धिमत्ता आणि यंत्रमानव, सकाळ मीडिया प्रकाशन, पुणे.

२. कुलकर्णी, आनंद (२०२२), आर्टिफिशिअल इंटेलिजन्सच्या वाटेवर, सकाळ मीडिया प्रकाशन, पुणे.

३. गोडबोले, अच्युत (२०२१), आर्टिफिशियल इंटेलिजन्स: जग हदरवणाऱ्या तंत्रज्ञानाची ओळख, इतिहास, उपयोग आणि भविष्य यांचा रंजक वेध, मधुश्री पब्लिकेशन्स, पुणे

४. Russell, Stuart J. and Norving, Peter (2018), Artificial Intelligence: A Modern Approach, Pearson India Education Services Pvt. Ltd., Noida

५. गोलेमन, डॅनियल, ठक्कर, पुष्पा (२०१५), इमोशनल इंटेलिजन्स(भावनिक बुद्धिमत्ता), साकेत प्रकाशन, औरंगाबाद

६. https://guides.library.georgetown.edu/ai/tools

"आर्थिक दृष्ट्या दुर्बल घटकातील किशोरवयीन मुलांच्या शिक्षणावर कृत्रिम बुद्धिमत्तेचा प्रभाव"

अमिता महातळे

शोधकर्ती

समाजशास्त्र विभाग, राष्ट्रसंत तुकडोजी महाराज विद्यापीठ, नागपूर.

गोषवारा :

भारतीय शिक्षणव्यवस्था ही अनेक वर्षापासून एका साचेबद्ध व चौकटीबद्ध मार्गने सुरू आहे. आजचे युग हे तंत्रज्ञानाचे युग आहे.माहिती तंत्रज्ञानाचा जलद गतीने होणाऱ्या विकासामुळे सभोवतालचे विश्व हे झपाट्याने बदलत आहे. आर्टिफिशियल इंटेलिजनसी हा केवळ एक शब्द नसून तीव्र गतीने बदलणाऱ्या जगातील एक अतिशय बलवान असे परिवर्तन आहे. आर्टिफिशियल इंटेलिजनसीच्या अद्यावत विकासामुळे आधुनिक तंत्रज्ञानाच्या कक्षा अधिक रुंदावल्या आहेत. एका नाण्याला दोन बाजू असतात त्याचप्रमाणे AI कृत्रिम बुद्धिमत्तेलाही दोन बाजू आहेत. माहितीचे स्वयंचलन, भाषा कौशल्य, अचूकता यासारखे फायदे आहेत. त्याचप्रमाणे पूर्वाग्रह, व्यावसायिक नैतिकता, नोकरीचे विस्थापन, यासारखे अनेक तोटे सुद्धा आहेत.

या लघु शोधनिबंधात कृत्रिम बुद्धिमत्तेचा म्हणजेच आर्टिफिशियल इंटेलिजनसीचा आर्थिक दृष्ट्या दुर्बल घटकातील किशोरवयीन मुलांवरील परिणाम याचे थोडक्यात अध्ययन केले आहे.

शब्दकूंजी : आर्टिफिशियल इंटेलिजनसी, कृत्रिम बुद्धिमत्ता, नैतिकता, विस्थापन.

प्रस्तावना :

वर्तमानकाळात आधुनिक तंत्रज्ञानाचे जग हे एवढे विकसित झाले आहे की एका छोट्याशा, लहानशा उपकरणात अमर्याद माहिती साठविण्यात येते आहे. आज इंटरनेटवर बरीच माहिती सहजरित्या उपलब्ध होते असून मात्र या उपलब्ध झालेल्या माहितीचा उपयोग हा योग्य गरजेनुसार होणे आवश्यक आहे अन्यथा त्याचे दुष्परिणाम समाजातील घटकांना भोगावे लागतील.

अलीकडेच २०२२ च्या नोव्हेंबर महिन्यात पदार्पण झालेल्या चॉटजीपीटी या कृत्रिम भाषा प्रारूपाचा प्रामुख्याने उल्लेख होतो. कृत्रिम भाषा निर्मिती या पद्धतीवर आधारित चॉटजीपीटी ही प्रणाली इंटरनेटवर सहज व मोफत उपलब्ध होते.

कृत्रिम बुद्धिमत्तेची कोणतीही विशिष्ट अशी व्याख्या करण्यात आलेली नाही. संगणक- शास्त्रातील हे एक अतिशय महत्त्वाचे उद्यानमुख क्षेत्र आहे. मानवी बुध्दिमतेची नक्कल करणारे हे एक बुध्दिमान संगणक आहे. मनुष्याची जशीच्या तशी नक्कल करण्याकरिता हे आर्टिफिशियल इंटेलिजनसी उपयुक्त ठरत आहे. मनुष्यप्राणी व आर्टिफिशियल इंटेलिजनसी यांच्यामध्ये केवळ एकच मोठा फरक दिसून येतो आणि तो म्हणजे मनुष्याकडे असलेली बुद्धिमत्ता, भावनिकता, सहानुभूती या ईश्वरी देणग्या आर्टिफिशियल इंटेलिजनसी जवळ दिसून येत नाही.

कृत्रिम बुद्धिमत्ता हे एक तंत्रज्ञान आहे आणि या तंत्रज्ञानाच्या आधारे संगणक व मशीन यांच्या मदतीने मानवी शिक्षण, आकलन, समस्या सोडविणे, तसेच योग्य निर्णय क्षमता आणि सृजनशीलता यांचे अनुकरण करण्यास सक्षम बनवीत असते. कृत्रिम बुद्धिमत्तेने सज्ज असलेले उपकरण हे एखादी वस्तू पाहून

ओळखू शकते. मानवी भाषा समजून घेऊन त्याला त्याप्रमाणे प्रतिसाद देण्याचे काम सुद्धा करते. मानवी बुद्धिमत्तेचा कोणत्याही मदतीशिवाय स्वतंत्रपणे कार्य करीत असते.

कृत्रिम बुध्दिमत्तेचा रिटेल, शॉपिंग, स्पोर्ट एनालिसिस, प्रोडक्शन व मॅन्युफॅक्चरिंग अशा सर्व क्षेत्राशी कमी अधिक प्रमाणात वापर होत असतो.

आज जगभरात कृत्रिम बुध्दिमत्ता विषयी मोठ्या प्रमाणात शिक्षण दिले जात आहे. अनेक शैक्षणिक संस्थांना या शैक्षणिक साधनाचे महत्त्व पटले आहे. या कारणामुळे भारतातील शिक्षण प्रणाली ही सुद्धा पारंपरिक शिक्षणपद्धतीच्या बिळातून बाहेर येत आहे. ज्या कामांना पूर्वी तासंतास वेळ लागत होता . आज कृत्रिम बुध्दिमत्तेच्या मदतीने ते काम केवळ काही सेकंदात पूर्ण होत आहे. कृत्रिम बुध्दिमत्तेचा आर्थिक दृष्ट्या दुर्बल घटकातील किशोरवयीन मुलांच्या शैक्षणिक प्रगतीवर कशाप्रकारे प्रभाव व परिणाम झाला आहे. तसेच त्यांच्या दुष्परिणामांची थोडक्यात चर्चा केलेली आहे.

संशोधनाची आवश्यकता :

प्रस्तुत लिखाण कार्य हे विश्लेषणात्मक दृष्टिकोनातून करण्यात आले आहे. यात भारतातील शैक्षणिक क्षेत्रामध्ये कृत्रिम बुध्दिमत्तेचा झालेला शिर काव तसेच आर्थिक दृष्ट्या दुर्बल घटकातील विद्यार्थ्यांना कृत्रिम बुद्धिमत्तेचे होणारे फायदे तसेच तोटे यांचा अभ्यास करणे होय

अध्ययन उद्देश :

१) कृत्रिम बुध्दिमत्ता म्हणजे काय हे समजून घेणे.
२) आर्थिक दृष्ट्या दुर्बल घटकातील विद्यार्थ्यांच्या शिक्षणावर कृत्रिम बुध्दिमत्तेचे होणारे परिणाम समजून घेणे.

अध्ययनपद्धती :

या शोध पेपर मध्ये वर्णनात्मक व विश्लेषणात्मक अध्ययनपद्धतीवर भर दिलेला आहे.तसेच समाचार पत्र, मासिके, पुस्तक, इंटरनेटवर उपलब्ध असलेले लेख, माहिती इत्यादी द्वितीय स्तोत्रांचा अध्ययनाकरिता सहाय्य घेण्यात आले आहे.

कृत्रिम बुद्धिमत्ता व आर्थिक दृष्ट्या दुर्बल घटकातील किशोरवयीन मुलांनच्या शिक्षणावर कृत्रिम बुध्दिमत्तेचा प्रभाव

"सामाजिक विनाशाचे एक सामाजिक शास्त्र"

युवल हरारी (लेखक व इतिहासकार)

मुलांच्या व्यक्तिमत्त्वाची जडणघडण करणारे तसेच आयुष्यभर मार्गदर्शन करणारे शिक्षण हे एक अतिशय मोलाचे व महत्त्वाचे घटक आहे. आर्टिफिशियल इंटेलिजनसी मध्ये विद्यार्थ्यांना 'गुणवंत विद्यार्थी' मध्ये परिवर्तित करण्याची क्षमता असते. आर्टिफिशियल इंटेलिजनसी निर्देशित शिक्षणामध्ये आर्टिफिशियल इंटेलिजनसी निर्देशित मशीनमध्ये एखाद्या शिक्षकाला अवगत असलेले ज्ञान हे त्यात समाविष्ट केल्या जात असते. त्यानंतर ही मशीन एखाद्या शिक्षकाप्रमाणे विद्यार्थ्यांना संपूर्ण यथासांग माहिती जशीच्या तशी पूर्वीत असते. विद्यार्थ्यांना त्यांची शिक्षणातील ध्येय गाठण्याकरिता तसेच भविष्यातील शिक्षणाचा मार्ग निश्चित करण्याकरिता कृत्रिम बुध्दिमत्तेची मदत व मार्गदर्शन मिळत असते. अशा प्रकारे अद्यावत ज्ञानाने परिपूर्ण असलेली मशिने विद्यार्थ्यांना वर्ग व्यतिरिक्तही एखाद्या ट्यूटर प्रमाणे शिकविण्यात सहकार्य

करीत असते. कृत्रिम बुध्दिमत्तेमुळे आर्थिक दृष्ट्या दुर्बल घटकातील विद्यार्थी हे एकतर्फी शिक्षण घेऊ शकतात व या माध्यमातून त्यांची शिक्षण घेण्याची इच्छा त्यांना पूर्ण करता येते.

कृत्रिम बुध्दिमत्ता हे एक दुधारी तलवार आहे. एकीकडे त्याचे फायदे होतात तर दुसरीकडे त्यांच्यापासून तोटे देखील होतात. लेखक व इतिहासकार युवल हरारी यांनी कृत्रिम बुध्दिमत्तेच्या वापरा विषयी भीती व्यक्त केलेली आहे त्यांच्यामध्ये लोकशाही, मानवी जवळीकता, सामाजिक एकता यावर परिणाम होण्याची शंका त्यांनी व्यक्त केली आहे. शिक्षणामध्ये कृत्रिम बुध्दिमत्तेचा सर्रास वापर करण्यास सुरुवात झाली तर अध्ययन व अध्यापन कार्यात मोठ्या प्रमाणात बदल होण्याची शक्यता आहे. शिक्षण एका चौकटीबध्द, परंपरागत शिक्षण प्रणालीतून बाहेर पडून व्यक्तीकेंद्रित शिक्षणाकडे वाटचाल सुरू झाली आहे.

वैयक्तिक शिक्षण घेऊ इच्छिणाऱ्या आर्थिक दृष्ट्या कमकुवत असणारे विद्यार्थी चाटजीपीटी द्वारे वैयक्तिक शिक्षण घेऊ शकतात. चाटजीपीटीद्वारे विद्यार्थ्यांच्या सर्व प्रश्नांची उत्तरे तात्काळ, अभिप्राय, व्यवस्थित व स्पष्ट तसेच योग्य मार्गदर्शन विद्यार्थ्यांना याद्वारे मिळत असल्या कारणामुळे विद्यार्थ्यांमध्ये प्रगती झालेली अनुभवास मिळते. शालेय अभ्यासक्रमात कृत्रिम बुध्दिमत्तेमुळे विद्यार्थ्यांना केवळ सर्जनशीलता नव्हे तर त्यांच्यातील कल्पनाशक्ती, तार्किक विचार, समस्या सोडविणे तसेच निर्णय क्षमता वाढवण्यास मदत होते. संपूर्ण शिक्षणप्रणाली ज्याच्या करिता राबते तो म्हणजे विद्यार्थी वर्ग होय. आर्थिक दृष्ट्या दुर्बल घटकातील किशोरवयीन विद्यार्थ्यांच्या सर्वांगीण विकास होण्याकरिता योग्य तसेच पोषक वातावरण निर्मिती करणे हे शिक्षणव्यवस्थेपुढील अतिशय महत्त्वाचे आव्हान आहे. अशा विद्यार्थ्यांच्या मनात शिक्षणाविषयी अनेक प्रश्न उद्भवत असतात व त्यांना तात्काळ व योग्य उत्तरे प्राप्त होत नाही अशा परिस्थितीमध्ये किशोरवयीन विद्यार्थी वर्ग चाटजीपीटीचा वापर करून त्यांची उत्तरे प्राप्त करून घेतात. विद्यार्थ्यांना कमी वेळात अचूक माहिती प्राप्त होत असते. विद्यार्थी हा स्वतः वापर करता असल्या ने तो त्याला भेडसावणाऱ्या प्रश्नांची सर्व उत्तरे स्वतः अभ्यास करून शोधून काढेल असा समाज असतो परंतु चॉटजीपीटीच्यामुळे सहज उपलब्ध होणाऱ्या उत्तरांमुळे विद्यार्थ्यांच्या कार्यक्षमता, सृजनशीलता यांना वाव मिळत नाही व त्यांच्यात अकार्यक्षमता, आळशी प्रवृत्ती तसेच परावलंबित्व या दुर्गुणांची वाढ होते. याचाच अर्थ असा होतो की विद्यार्थ्यांना केवळ एक बटन क्लिक केल्यावर सर्व माहिती उपलब्ध होत असल्याने विद्यार्थी हा स्वतः मेहनत न करता चॉटजीपीटीचा गुलाम होत आहे विद्यार्थ्यांमधील सुजनशीलतेचा हळूहळू लोप होत आहे. विद्यार्थ्यांमध्ये प्रयत्नशीलता या गुणांचा अभाव होऊन अन्य मार्गाने उत्तरे शोधण्याचा ,वाचन करण्याचा थोडा देखील विद्यार्थी प्रयत्न करीत नाही किंवा उपलब्ध झालेली माहिती योग्य आहे की नाही हे देखील पडताळून पाहण्याच्या वृत्तीचा नाश होत आहे. विद्यार्थ्यांना उत्तरे, विद्यार्थ्यांना माहिती सहज प्राप्त होत असल्याने वेळ व मेहनत कमी लागत असल्यामुळे उरलेल्या वेळेमध्ये काय करावे असा गंभीर प्रश्न या किशोरवयीन विद्यार्थ्यांसमोर उभा राहतो. मोकळ्या वेळेला विधायक वळण लावण्याचे नवे आव्हान उभे झाले आहे.

कृत्रिम बुध्दिमत्ता या आधुनिक तंत्रज्ञानाची ओळख ही सर्व स्तरातील विद्यार्थ्यांना होणे ही आज काळाची गरज आहे परंतु आर्टिफिशियल इंटेलिजन्स चा अतिरेक होता कामा नये. आर्थिकदृष्ट्या दुर्बल घटकातील विद्यार्थी चॉटजीपीटीच्या वापर करून आळशी प्रवृत्तीला बळी पडत आहेत व आपण काही वेगळे करावे या त्यांच्यातील विचारसरणीचा लोप होतो आहे तसेच कामचुकारपणाला बळी पडत आहेत.

आर्टिफिशियल इंटेलिजनसी च्या अतिरिक्त वापरामुळे किशोरवयीन विद्यार्थी हे स्वतःची विचारशक्ती, कल्पनाशक्ती गमवीत आहेत. याउलट या तंत्रज्ञानाच्या योग्य वापरामुळे किशोरवयीन विद्यार्थ्यांचा विचार प्रवृत्ती व कृती श्रवण बनविण्यास उपयोग करण्यात आला पाहिजे, त्यामुळे मुलांच्या व्यक्तिमत्त्वाचा विकास होईल.

कृत्रिम भाषा निर्मिती या पद्धतीवर आधारित चॉटजीपीटी ही प्रणाली इंटरनेटवर मोफत उपलब्ध झालेली आहे. या प्रणालीच्या साहयाने गणित, विज्ञान, इतिहास, भाषा, कायदा आणि व्यवहारातील तसेच इतर सर्व विषयावर कोणतीही अवघड प्रश्न विचारले असतात त्याचे उत्तर तात्काळ प्राप्त होत आहे. त्यामुळे विद्यार्थ्यासमोर कोणत्याही विषयाबाबत अडचणी आल्या असल्यास विद्यार्थी चॉटजीपीटी या तंत्रज्ञानाच्या साहयाने प्रश्न ची उत्तरे शोधतात व त्यामुळे कोणतीही अडचण विद्यार्थ्यांना येत नाही व त्यांच्यातील प्रयोगशीलता, शोधप्रवृत्तीचा नाश होत आहे. चॉटजीपीटी या प्रणालीच्या साहयाने विद्यार्थ्यांना भाषेतील व्याकरणासहित योग्य लिखाण कार्य करण्यास मदत होते त्यामुळे भाषेतील व्याकरणावर विद्यार्थ्यांची पकड कमजोर झालेली आहे. व्याकरणासहित लिखाण कार्य करण्यास मदत होत असल्यामुळे साहित्य चोरी म्हणजेच plagiarism चे प्रमाण विद्यार्थ्यांमध्ये मोठ्या प्रमाणात वाढलेले असून, आता एक भीषण समस्या च्या स्वरूपात समोर येत आहे. वर्तमानकाळाला तंत्रज्ञानाची युग असे संबोधण्यात येते. कृत्रिम बुध्दिमत्ता हा आज प्रत्येक विद्यार्थ्याच्या जीवनातील अतिशय महत्त्वाचा भाग बनलेला आहे. मनुष्यप्राणी हा जसा स्वतःच्या बुध्दिमत्तेचा जोरावर कार्य करतो. त्याचप्रमाणे मशीनरी देखील स्वतःच्या बुद्धिमत्तेचा उपयोग करून कार्य करतात त्यालाच कृत्रिम बुद्धिमत्ता असे म्हणतात. गेमीफाइड हा कृत्रिम बुध्दिमत्तेच्या साधनाचा एक नवीन प्रकार आहे. गेमिफाइड मध्ये वेगवेगळ्या स्टेजेस पार केल्यानंतर खेळणाऱ्याला प्रोत्साहन पर बक्षीस देण्यात येते. त्यामुळे विद्यार्थ्यांमध्ये सहाजिकच त्याविषयी आवड उत्पन्न होते व विद्यार्थ्यांच्या ज्ञानात भर पडते.

किशोरवयीन विद्यार्थी हा सहज उपलब्ध होणाऱ्या चॉटजीपीटीवर अवलंबून असल्यामुळे त्यांच्यातील सखोल विचार करण्याची शक्ती तसेच समस्या सोडविण्याकरिता आवश्यक असलेली आकलन शक्ती कौशल्य यात घट होत आहे. विद्यार्थ्यांमधील माहितीचे विश्लेषण करण्याची विश्लेषण करण्याची क्षमता व सृजनशीलता याच्या विकासात अडचणी येत आहेत. मानवरहित शिक्षणात आर्टिफिशल इनटेलिजनसी वर जास्त भर दिल्याने किशोरवयीन विद्यार्थ्यांमध्ये एकटेपणाची व अलिप्त राहण्याची भावना निर्माण होत आहे. भावनिक विकास, सामाजिक विकास साधण्यासाठी अडचणी निर्माण होताना दिसून येत आहे.

आर्टिफिशल इनटेलिजनसी मध्ये गुंतागुंतीच्या भावनांना समजून घेण्याची क्षमता नसल्यामुळे किशोरवयीन विद्यार्थ्यांच्या भावनिक भावनांना समजून त्यांना योग्य तो प्रतिसाद देण्याची क्षमता आर्टिफिशियल इंटेलिजनसी मध्ये नसते, त्यामुळे विद्यार्थ्यांच्या सर्वांगीण विकासावर त्याचा दुष्परिणाम परिणाम होताना दिसून येतो. किशोरवयीन विद्यार्थ्यांना हे स्वतः समजून घेणे आवश्यक आहे की आर्टिफिशियल इंटेलिजनसी या साधनांचा वापर वेगवेगळे कौशल्य हस्तगत व अंमलबजावणी करून आयुष्यातील ध्येय गाठायचे असते कृत्रिम बुद्धिमत्तेचा वापर अभ्यासात शॉटकट करण्यासाठी नसतो, हे किशोरवयीन विद्यार्थ्यांना समजावून सांगणे आवश्यक आहे.

समारोप :

आर्टिफिशियल इंटेलिजनसी हे आधुनिक युगातील एक महत्त्वाचे तंत्रज्ञान आहे याचा वापर आर्थिक दृष्ट्या दुर्बल घटकातील किशोरवयीन विद्यार्थ्यांनी त्यांच्या व्यक्तिमत्व विकासासाठी करावा परंतु असाइन्मेंट सोडविण्याकरिता, उत्तरे शोधण्याकरिता, साहित्य चोरी करण्याकरिता गणिताचे प्रॉब्लेम सोडविण्याकरिता तसेच इतर विषयांच्या प्रश्नांची उत्तरे शोधण्याकरिता न करता स्व प्रयत्नाने अध्ययन करून स्वाध्याय सोडवावा तरच या कृत्रिम बुद्धिमत्तेचा वापर हा फायदेशीर ठरेल अन्यथा या तंत्रज्ञानाच्या वापरामुळे आर्थिक दृष्ट्या दुर्बल घटकातील किशोरवयीन मुलांच्या शिक्षणावर त्याचा दुष्परिणाम होण्याची दाट शक्यता आहे व राष्ट्रहिताच्या दृष्टीनेही ते हानिकारक आहे.

संदर्भ ग्रंथसुची :

१) अरुण पाटील" (१९ ऑगस्ट २०२३) "शिक्षण क्षेत्र आणि कृत्रिम बुद्धिमत्ता" pudhari.news/amp/

२) आझाद के.एस. (९ एप्रिल२०२३) "कृत्रिम बुद्धिमत्ता: आपली मुले आणि भविष्य" esakal.com/sapt

३) सुटोशे तुकाराम डॉ. यशवंत (९ एप्रिल २०२४) "कृत्रिम बुद्धिमत्ता आणि प्राथमिक शिक्षण" saamana.com/article.

४) डॉ तेंडुलकर आशिष (१८ जून २०२०) "भविष्य नोकऱ्यांचे: कृत्रिम बुद्धिमत्ता आणि शिक्षण क्षेत्र" Esakal.com/education.

५) "Artificial Intelligence and it's challenges in daily life work"(12 April 2024) market-xcel.com/blog

६) लिहितकर ,बनकर (२०२३) "कृत्रिम बुद्धिमत्ता भाषा साधने: शैक्षणिक क्षेत्रातील संधी आणि आव्हाने" research gate.net/pub

राष्ट्रीय शैक्षणिक धोरण २०२० - अपेक्षा, वास्तविकता आणि आव्हाने

डॉ. प्रियदर्शना जे. नंदेश्वर

अर्थशास्त्र विभाग प्रमुख

न.मा.द. महाविद्यालय, गोंदिया

सारांश

शिक्षण हा घटक समाजातील प्रत्येक व्यक्तीशी संबंधित आहे. शिक्षक, विद्यार्थी आणि पालक या नात्याने सर्वांचाच शिक्षणाशी जवळचा संबंध असतो. शाळा आणि महाविद्यालये हे विद्यार्थ्यांवर औपचारिक व अनौपचारिक संस्कार करणारे केंद्र असते. बालपणापासून व्यक्तीचा सहजबोध तयार करणारी ती एक संस्था असते. म्हणूनच त्या शिक्षणातील आशय महत्वाचा ठरतो.

भारतीय शिक्षणाच्या आशयाला प्राचीन काळापासून भेदभावाची परंपरा राहिली आहे. संस्कृत भाषेतील बंदिस्त असलेले हे शिक्षण धर्म शास्त्राचे दुसरे रूप असून केवळ ब्राह्मणांचे हित साधणारे होते. वासाहतिक काळात ब्रिटिशांच्या शिक्षणविषयक धोरणावर ही वैदिक ब्राह्मणी वर्चस्व कायम राहिले आहे. उदारमतवादी ब्रिटिश अधिकारी माऊंट स्टुअर्ट, एलफिस्टन, मेकाले, चॅप्लिन, मिस कुक यांचे प्रयत्नही भारतातील मूठभर वर्गाच्या अंगानेच गेले. "ग्रामशाळा किंवा संस्कृत पाठशाळा" असे प्रयत्नसुद्धा शिक्षणामध्ये व्यापक परिवर्तन घडवू शकले नाही.

महात्मा ज्योतिराव फुले यांचे शिक्षण क्षेत्रातील अभूतपूर्व प्रयत्न हे भारताच्या इतिहासातील क्रांतिकारक पाऊल होते. समाजातील सर्व व्यवहारात बांधिलकी, शिक्षणाच्या उपयुक्ततेचे, उत्पादकतेचे भान, मोडी, मराठी व बाळबोध भाषेच्या अनिवार्यतेची जाण व शिक्षण आशयातील सकस व दूरदर्शी प्रगल्भ समाज हे महात्मा फुल्यांच्या शाळांचे वैशिष्ट्ये आहे. म्हणूनच "नीतिदर्पण", "महाराष्ट्र बखर" असे विषय त्या शाळांमध्ये शिकविले गेले. महात्मा फुले यांच्या शाळेतूनच मुक्ता साळवे सारखी स्वतंत्रपणे निर्भय बाणा व धर्म चिकित्सा करण्याची हिम्मत असलेली विद्यार्थिनी निर्माण होऊ शकली. याचे कारण त्या शाळातील अध्यापन व आशय हेच होते.

गेल्या काही दशकापासून शिक्षण क्षेत्रात खाजगीकरण, बाजारीकरण, कंपनीकरण आणि शासकीय बेजबाबदरीचा शिरकाव मोठ्या प्रमाणात झाला आहे. आज शिक्षक हा पैशाच्या बाजारातील क्रयवस्तू बनली आहे. शिक्षक, विद्यार्थी आणि पालक या सामान्य समाज घटकांना याची विविधांगी झळ व असंख्य चटके सोसावे लागत आहेत. विशेषतः शिक्षकांच्या समस्या या दिवसेंदिवस जातील व गंभीर होत चालल्या आहेत. शिक्षक बाह्य कामांचा बोजवारा, अतिरिक्त होण्याचे प्रश्न, वेतन आणि पेन्शन संबधीचे असंख्य प्रश्न असे वानगीदाखल प्रश्न प्रथमदर्शनी दिसून येतात. परंतु खरा प्रश्न शिक्षकांच्या अस्तित्वाचाच निर्माण झाला आहे. शासकीय शाळा बंद होण्याची एक चाहूल लागली आहे.

आज शिक्षणामध्ये मोठ्या प्रमाणात स्तरीकरण घडविले जात असून अभ्यासक्रम व पाठयक्रमाचे विकृतीकरण केले जात आहे. अभ्यासक्रमातून संप्रदायिकता जात, वर्ग, लिंगभाव जोपासला जात आहे. शिक्षणातून विचार स्वातंत्र्याचा संकोच होऊन एकांगी धर्मांध विचार घडविले जात आहे. या सर्व व्यापक प्रश्नांवर विचार केला पाहिजे.

आजच्या काळातील महत्वाचे प्रश्न -

१) सार्वजनिक शिक्षणाबाबद सरकारचे व समाजाचे दायित्व कोणते असावे ?

२) शिक्षणविषयक शासकीय धोरणे व त्यांची अंमलबजावणी यात पारदर्शकता आहे काय ?

३) आजच्या शिक्षणातील आशय हा रोजगार संमुख, समता मुलक व सकस व धर्मनिरपेक्ष आहे का ?

४) शिक्षणाचे होत चाललेले खाजगीकरण, कंपनीकरण व स्तरीकरण योग्य आहे काय ?

५) आज शिक्षणाच्या माध्यमातून भेदभाव जोपासला जातो काय ?

६) शासनाकडून सरकारी शाळा बंद पडणे सामान्यांच्या हिताचे आहे काय ?

७) खाजगी संस्थांचे शासकीयीकरण होणे आवश्यक वाटते का ?

८) खाजगी शिक्षण संस्थांचे शुल्क सामान्यांना परवडणारे आहेत का ?

९) शिक्षण सेवक पद्धत, कंत्राटी शिक्षक, शिक्षक, प्राध्यापक भरती वरील बंदी, अतिरिक्त होण्याचा धोका, पेंशनबंदी व शिक्षणबाह्य कामे आदी परिस्थिती काय सुचविते ?

१०) उच्च शिक्षणाचे अत्यल्प प्रमाण, जेएनयू आणि दिल्ली विद्यापीठावर होणारे हल्ले घडवून आणणे, युजीसी आणि (AICTE) बरखास्त करून भारतीय उच्च शिक्षण आयोग (HECI) संस्था स्थापन करण्यात येईल.

११) विशिष्ट भाषा व संस्कृतीचा आग्रह, विध्यार्थ्यांच्या वाढत्या आत्महत्या, या संस्थात्मक हत्या (Institutional Murder) काय सुचवितात.

या सर्व प्रश्नाची उत्तरे शोधणे, ही कुणाची जबाबदारी आहे. या सर्व समस्यांच्या सोडवणुकीसाठी आम्ही शिक्षक पालक आणि विधार्थी या नात्याने संघटितपणे काम करावे लागेल.

राष्ट्रीय शिक्षण धोरण २०२० (NEW EDUCATION POLICY 2020) द्वारे २९ मे २०२३ पासून लागू करण्यात आले. २०२३ पासून भारतीय उच्च शिक्षण प्रणाली आता बदलत आहे. NEP २०२० चे धोरण आंतरविद्याशाखीय अभ्यासक्रमाला प्रोत्साहन देण्यावर, नवीन विषयाच्या संधी आणि विद्यार्थ्यांना लवचिक अभ्यासक्रम, पर्यायी विषयावर प्रवेश देण्यावर भर दिला जात आहे. विद्यार्थ्यांच्या आवडीनुसार आणि क्षमतानुसार अनुकूल असलेले विषय निवड करण्याची संधी दिली आहे. यालाच चॉईस बेस्ड क्रेडिट सिस्टम (CBCS) असे म्हणतात.

उच्च शिक्षणातील बदल -

नवीन राष्ट्रीय शिक्षण धोरण २०२० नुसार पदवी अभ्यास क्रमातील विध्यार्थी आता विविध कार्यक्रम उपक्रम सुरु करणे, विविध कौशल्ये प्राप्त करण्यास सक्षम बनविणे, उच्च शिक्षणासाठी निवडलेल्या शाखेमध्ये, विषयामध्ये व क्षेत्रामध्ये सखोल व विशेष ज्ञान आत्मसात करून विध्यार्थ्यांच्या सर्वांगीण विकासाचा पाय रचण्याच्या उद्देशाने अधिक कल्पक व विस्तृत उदारमतवादी शिक्षणाकडे वाटचाल करेल.

पदवीचा अभ्यासक्रम ४ वर्षाचा आहे.

प्रथम वर्ष पूर्ण झाल्यानंतर विध्यार्थी "प्रमाणपत्र" प्राप्त करू शकेल.

द्वितीय वर्ष पूर्ण केल्यानंतर विध्यार्थी "प्रगत डिप्लोमा: प्राप्त करू शकेल.

तृतीय वर्ष पूर्ण केल्यानंतर विध्यार्थी बॅचलर पदवी प्राप्त करू शकतो.

चौथे वर्ष पूर्ण केल्यानंतर विध्यार्थी बॅचलर ऑफ रिसर्च (ओनर्स) ही पदवी प्राप्त करू शकतो.

पाच वर्ष पूर्ण केल्यावर विध्यार्थी पदव्युत्तर (मास्टर्स) पदवी प्राप्त करू शकतो.

पाच वर्षाचा अभ्यासक्रम पूर्ण केल्यानंतर पदव्युत्तर (मास्टर्स) पदवी नंतर पीएचडी (आचार्य पदवी) करिता प्रवेश मिळेल.

राष्ट्रीय शिक्षण धोरण २०२० नुसार प्रथम व दुय्यम विषय निवडीनुसार म्हणजे प्रथम मेजर आणि दुय्यम मायनर या अभ्यासक्रमाला बॅचलर ऑफ लिबरल आर्टस् असे संबोधण्यात आले.

राष्ट्रीय शिक्षण धोरण २०२० नुसार राष्ट्रीय संशोधन प्रतिष्ठान, शैक्षणिक तंत्रज्ञानावरील राष्ट्रीय मंच आणि देशाच्या विकासासाठी, देशभरात अधिक उच्च संस्था स्थापन करण्याची मागणी करण्यात आली. २१ व्य शतकातील गरज पूर्ण करण्यासाठी सर्वसमावेशक शिक्षक प्रणाली विकसित करण्याचे उद्दिष्टे आहेत.

राष्ट्रीय शिक्षण धोरण २०२० चे उच्च शिक्षणातील उद्देश -

१) उच्च शिक्षण प्रणालीमध्ये आमूलाग्र बदल घडवून आणणे.

२) आंतरराष्ट्रीय दर्जाच्या शैक्षणिक संस्था देशात निर्माण करणे.

३) सण २०३५ पर्यंत ग्रॉस एनरोलमेंट रेशो ५० टक्क्यापर्यंत वाढविणे जे २०१८ च्या नोंदणीनुसार २६ टक्के होते.

४) समग्र आणि बहुविद्याशाखीय शिक्षण - विध्यार्थ्यांच्या पसंती प्रमाणे विषय निवडण्याची मुभा आहे. विध्यार्थ्यांच्या पसंतीनुसार इच्छेनुसार शिकण्यास मदत करण्यासाठी सर्वागीण आणि बहुविद्याशाखीय पदवीपूर्ण शिक्षणाचा दृष्टिकोन सादर केला. विध्यार्थ्यांना व्यावसायिक अभ्यासक्रमांचा एकात्मतेसह बहुविषय एकत्र करण्याची लवचिकता दिली आहे.

५) शिक्षणाचे आंतर्राष्ट्रीयीकरण - भारतीय शिक्षणाचे विदेशातील विद्यापीठांशी भागीदारी वाढावी, आंतरराष्ट्रीय विद्याथ्यांना शिक्षणासाठी आकर्षित करणे. विध्यार्थी आणि प्राध्यापकामंध्ये देवाण - घेवाणीची सोया करणे. राष्ट्रीय शिक्षण धोरण २०२० प्रमाणे आंतर्राष्ट्रीयीकरणास प्रोत्साहन देण्याच्या प्रयत्न केला आहे.

६) सर्वसमावेशक आणि समता - उच्च शिक्षण घेणाऱ्या मुली, कमी उत्पन्न असलेली कुटुंबे आणि अपंग विद्यार्थ्यांसह उपेक्षित लोकसंख्येच्या गरजा पूर्ण करून या शिक्षण धोरणामध्ये सर्वसामावेशकता आणि समानता याना प्रोत्साहन देण्यावर भर देण्यात आला. सर्व सामाजिक व आर्थिक स्तरावरील विध्यार्थ्यांना समान संधी देण्याचे उद्दिष्टय आहे.

७) सार्वजनिक क्षेत्रातून गुंतवणुकीत वाढ - सार्वजनिक क्षेत्रातील उच्च शिक्षणाचा विस्तार आणि पुनरुज्जीवन होण्याच्या दृष्टीने अतिशय रास्त व पारदर्शक प्रणालीद्वारे सार्वजनिक क्षेत्रातून मोठी गुंतवणूक करण्याचे ठरविले आहे.

८) संशोधन आणि नवोपक्रम - राष्ट्रीय शिक्षण धोरण २०२० विद्यापीठात संशोधनाला प्राध्यान्य देण्यासाठी आणि भारताला जागतिक स्तरावर नावीन्य व संशोधनाचे केंद्र बनविण्याच्या उद्देशाने विज्ञान आणि तंत्र ज्ञानातील गुंतवणूक वाढविण्यास प्रोत्साहित करते. केंद्र शासन इंडियन इस्न्टिट्यूशन ऑफ टेक्नॉलॉजि (IIT) च्या धर्तीवर १० इंडियन इन्स्टिट्यूशन ऑफ लिबरल आर्टस् बहुशाखीय शैक्षणिक व संशोधन विद्यापीठांची उभारणी करण्याच्या दिशेने सरकारचे पाऊल आहे.

९) **UGC आणि AICTC बंद करणे -** वैद्यकीय आणि कायदेशीर क्षेत्र (MBBS + LAW) वगळून शैक्षणिक क्षेत्रातील सर्वोत्तम पद्धती सुनिश्चित करण्यासाठी भारतीय उच्च शिक्षण अयोग्य (HECI) नावाची नवीन संस्था अस्तित्वात येईल. विद्यापीठ अनुदान आयोग (University Grant Commission) आणि All India Council for Technical Education (AICTC) बंद करण्यात येतील. गुणवत्तापूर्ण शिक्षणाचे पालन न करणाऱ्या संस्थांना दंड करण्याचा अधिकार Higher Education Commission of India (HECI) ला असेल.

१०) **विध्यार्थ्यांना सहाय्य करणे -** अनु जाती. अनु जमाती आणि मागास विध्यार्थ्यांना त्यांच्या गुणवत्तेनुसार शिष्यवृत्ती मिळावी यासाठी सरकार प्रयत्न करेल. गुणवत्ता प्राप्त विध्यार्थ्यांना पाठबळ देण्यासाठी उच्च शिक्षण संस्थांना शिष्यवृत्ती देण्यास प्रोत्साहित करणे. ज्या विध्यार्थ्यांनी शिष्यवृत्ती प्राप्त केली आहे त्यांच्या कामगिरीवर लक्ष ठेवण्यासाठी राष्ट्रीय शिष्यवृत्ती पोर्टलची भूमिका आणि उपक्रम विस्तृत केले जातील.

११) **नवीन संस्थात्मक पायाभूत सुविधा (आर्किटेक्चर) -** विद्यापीठांची मूळ रचना नव्या पद्धतीने तयार करण्यात येईल. नवीन उच्च शिक्षण पायाभूत सुविधा अध्यापन व संशोधनासाठी विशाल, सर्व साधन समृद्ध, चैतन्यमय बहुविध शाखांनी सुसज्ज असलेल्या स्वायत्त संस्थांची स्थापना केली जाईल. यामुळे उच्च शिक्षण देशात सर्वदूर पोहोचेल व शैक्षणिक संस्थांची क्षमता वाढेल. नवीन संस्थात्मक शिक्षण पायाभूत सुविधेच्या उत्प्रेरणासाठी नालंदा अभियान (मिशन नालंदा) आणि तक्षशिला अभियान (मिशन तक्षशिला) सुरु करण्यात येतील. या अभियानामुळे कार्यास गतिशीलता आणणाऱ्या काही संस्था इंडियन इन्स्टिट्यूशन ऑफ लिबरल आर्टस् /बहुशाखीय शिक्षण व संशोधन विद्यापीठे उभारण्यात येतील. सर्व संस्था विद्यापीठे असतील. पदवी प्राप्त करणारी स्वायत्त महाविद्यालये असतील.

१२) **डिस्टन्स लर्निंग / ओपन लर्निंग -** खुल्या शिक्षण सुविधांचे दरवाजे उघडून उच्च दर्जाचे शिक्षण सुनिश्चित करण्यासाठी सरकारकडून अनेक उपाय योजना केल्या जातील.

- अ) ऑनलाईन अभ्यासक्रम परिचय
- ब) डिजिटल भांडार
- क) संशोधन कार्यासाठी निधी
- ड) क्रेडिट आधारित शिक्षण
- इ) सुधारित विध्यार्थी सेवा
- ई) Massive Open Online Course (MOOC) यांना गुणांकनानुसार मान्यता देणे

१३) **व्यावसायिक शिक्षण देणे -** व्यावसायिक शिक्षण देण्यासाठी सक्रिय पावले उचलली जातील. सर्वोच्च दर्जाच्या व्यावसायिक क्षमता निर्माण करतानाच विस्तृत स्वरूपाच्या योग्यता आणि २१ व्या शतकातील कौशल्ये, सामाजिक मानवी आशयाची जाण, प्रबंध नैतिक विचारसरणी अस्तित्वात आणण्याच्या उद्देशाने व्यावसायिक शिक्षणाला उच्च शिक्षणामध्ये पुनः एकीकरण करणे आणि व्यावसायिक शिक्षणाचे पुनरुत्थान करणे.

१४) **राष्ट्रीय संशोधन फाऊंडेशन -** राष्ट्रीय संशोधन फाऊंडेशनचे चार प्रमुख विभाग असतील.

अ) विज्ञान

ब) तंत्रज्ञान

क) समाजशास्त्र

ड) कला, मानव व विज्ञान

१५) भारतीय भाषांना चालना - सर्व भारतीय भाषांचे सर्वधन, वृद्धी व चैतन्य अबाधित राखण्याची दक्षता घेतली जाईल. आदिवासी भाषांसह सर्व भारतीय भाषांना योग्य सन्मान दिला जाईल. देशातील प्रत्येक प्रदेशाच्या संस्कृतीचे व परंपरेचे खऱ्या अर्थाने संवर्धनाची पूर्तता होईल.

१६) शिक्षणासाठी आर्थिक साहाय्य - नवीन शिक्षण धोरण - २० मध्ये शिक्षणासाठी आर्थिक साहाय्यामध्ये वाढ करण्याचे धोरण आहे. येत्या १० वर्षाच्या कालावधीत केंद्र शासन आणि सर्व राज्य शासन या दोघांकडून शिक्षण क्षेत्रामध्ये होणारी शासकीय गुंतवणूक २० % पर्यंत वाढवण्यासाठी परिकल्पना धोरणात मांडण्यात आली.

उच्च शिक्षणातील आव्हाने / समस्या

१) नाव नोंदणीचे प्रमाण कमी - २०१८ च्या अखिल भारतीय उच्च शिक्षण सर्वेक्षण All India Survey on Higher Education (AISHE) च्या अहवालानुसार उच्च शिक्षण GER (Gross Enrolment Reso) २६ टक्के तर २०२१ - २२ या वर्षात GER २८.४ टक्के आहे जो विकसित देशापेक्षा कमी आहे.

२) शालेय नोंदणीच्या तुलनेत देशाच्या वाढत्या गरजा पूर्ण करण्यासाठी उच्च शिक्षण संस्थांच्या तरतुदी अपुऱ्या आहेत. कारण विनानुदानित महाविद्यालये, महाविद्यालयांच्या प्राध्यापकांची अपुरी संख्या, तासिका तत्त्वावरील प्राध्यापकांच्या खांद्यावर कामाचा बोजा, तासिका तत्त्वावरील प्राध्यापकांचे वेतन आणि सेवा यातील अंतर, उच्च शिक्षणातील नवीन विषयांचा वाढता ताण.

३) उच्च पात्रता प्राध्यापकांना करारपद्धती, मानधन अशा तत्वावर काम मिळते. भारतात उच्च शिक्षणात अनेक पदे रिक्त आहेत तरीही आचार्य पदवी (पी एच डी), नेट, सेट, पात्रताधारक प्राध्यापकांना बेरोजगार - अनार्जित राहावे लागते.

४) उच्च शिक्षणाची गुणवत्ता सुनिश्चित / वाढविण्यास सर्वात मोठी अडचण आहे

५) देशातील विद्यापीठांना जगातील सर्वोच्च विद्यापीठांमध्ये स्थान मिळणे अशक्य आहे. कारण बहुतेक महाविद्यालये आणि विद्यापीठे, विद्यापीठ अनुदान आयोगाच्या नियमाप्रमाणे चालविले जात नाही.

६) संशोधकांना त्यांची अधिछात्रवृत्ती वेळेवर मिळत नाही. त्यामुळे त्यांच्या संशोधनावर प्रतिकुल परिणाम होतो.

७) राजकीय हस्तक्षेप - उच्च शिक्षणात राजकारण्यांच्या शिक्षण संस्था असल्यामुळे राजकीय हस्तक्षेपाचे प्रमाण वाढत आहे. त्यामुळे उच्च शिक्षण व विद्यार्थी धोक्यात येत आहे.

८) प्रशासन सुधारणा - भारतातील लोकशाही, सार्वभौमत्व आणि जबाबदारीला प्रोत्साहन देण्यासाठी उच्च शिक्षण संस्थामध्ये प्रशासन आणि प्रशासनाचे तर्कशुद्धीकरण करणे.

९) पायाभूत सुविधांचा विकास करणे – वर्गखोल्या, प्रयोगशाळा ग्रंथालये आणि डिजिटल संसाधनासंह उच्च शिक्षणाच्या पायाभूत सुविधांचा विस्तार करणे. सेवा नसलेल्या प्रदेशात नवीन संस्था स्थापण करने.

१०) नविन शिक्षण धोरणातील फोलपणा :- नवीन शिक्षण धोरण - २० मध्ये शिक्षणासाठी आर्थिक साहाय्यामध्ये वाढ करण्याचे धोरण आहे. येत्या १० वर्षाच्या कालावधीत केंद्र शासन आणि सर्व राज्य शासन या दोघांकडून शिक्षण क्षेत्रामध्ये होणारी शासकीय गुंतवणूक २० % पर्यंत वाढवण्यासाठी परिकल्पना धोरणात मांडण्यात आली. मे २०२३ पासून नविन शिक्षण धोरण लागू करण्यात आले तरी सुद्धा २०२४ च्या अंदाजपत्रकात शिक्षण क्षेत्रामध्ये होणारी शासकीय गुंतवणूक फक्त ६% पर्यंतच करण्यात आली. यावरून नवीन शिक्षण धोरणाच्या अमलबजावणीचा फोलपणा पहिल्याच वर्षात दिसून येते.

संदर्भ:-

१) महात्मा ज्योतीबा फुले - सार्वजनिक सत्यधर्म
२) महात्मा ज्योतीबा फुले - गुलामगिरी
३) डॉ. बाबासाहेब आंबेडकर -Writing and Speeches Vol. 3,5,6
४) राष्ट्रीय शिक्षण धोरण 2019 चा मसुदा
५) राष्ट्रीय शिक्षण धोरण 2020 - मानव संसाधन विकास मंत्रालय, भारत सरकार
६) राष्ट्रीय शिक्षण धोरण 2020 - शिक्षण मंत्रालय