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Artificial Intelligence Adoption in Teaching and Research: Transforming Teacher Education in the Digital Era

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Abstract

Education is facing a radical change in terms of technology with the introduction of artificial intelligence (AI) into education. Over the past few years, there has been an ongoing integration of AI-based tools into teaching and research activities at the postsecondary level. One specific area of this transformation is within the field of teacher education; therefore, educators will require knowledge and skills related to digital competency if they are going to successfully integrate technology into their teaching and research activities. The purpose of this study is to assess the adoption and the opportunities that artificial intelligence provides in both teaching and research across teacher education institutions. It employs a descriptive research design that includes both conceptually analysing the relevant literature from AI and related fields of research, in addition to conducting a perception science based survey with teacher educators and B.Ed. student teachers. A structured questionnaire was administered to a sample size of forty (40) respondents regarding their perceptions about using AI technologies and related applications in teaching and research. Overall responses from participants demonstrate that AI- based tools support innovative teaching practices, improve research productivity, and enhance access to digital learning resources. Additionally, respondents indicated that teacher preparation professionals must provide opportunities for teachers to participate in training programs so they are able to effectively utilize AI in their instructional practices. Based on the findings from the study, it is necessary for institutions of higher education to create technology-enhanced teacher preparation programs to promote AI literacy and technology-enhanced digital pedagogy. Overall, AI has the capacity to make a positive impact on the way we deliver education by providing new levels of creativity.

Keywords: Artificial Intelligence Adoption, Teacher Education, Digital Transformation, Educational Innovation, Technology Integration.

1. Introduction

The rapid growth of digital technologies has transformed the education systems globally. With these new

technologies, Artificial Intelligence (AI) has become an important area for research as it could significantly change the way we teach, learn and do research in the future. AI is a type of computer system that is able to complete various activities normally requiring human intelligence such as making decisions, reasoning, identifying patterns, and processing language. AI technologies are increasingly being used to create adaptive learning systems, intelligent tutoring systems, automated assessment systems, and advanced research analytics in the classroom. AI technologies provide opportunities for teachers to enhance their effectiveness and improve the experiences of their students. Teacher preparation programs need to be responsible for developing an educator who will be able to adapt to a rapidly changing technological environment. As classrooms continue to digitize, educators need to develop the skills required to incorporate these new technologies into their teaching and research. AI will provide teachers with several opportunities to innovate their approach to teaching and increase their productivity as researchers. Educators will be able to generate instructional materials, analyze their research and have better access to academic support with the help of AI-based tools.

Educators' readiness to utilize Artificial Intelligence (AI) technology within their professional practice will ultimately determine whether or not AI is successfully adopted into education; as such, educator perceptions towards adopting AI within both teaching and research must be uncovered. This study will investigate both the impact of AI adoption upon teacher education programs, as well as the views of educators regarding the potential of using AI to improve the delivery of instruction and enhance various types of research.

2. Objectives of the Study

The study was conducted with the following objectives:

1. To examine the role of Artificial Intelligence in transforming teaching practices in teacher education institutions.
2. To explore the use of AI technologies in educational research activities.

3. To analyze educators' perceptions regarding the adoption of Artificial Intelligence in teaching and research.
4. To identify the benefits of integrating AI technologies into teacher education programs.
5. To suggest strategies for promoting Artificial Intelligence adoption in teacher education institutions.

3. Review of Related Literature

Numerous research papers have indicated that artificial intelligence is becoming more prevalent within the field of education. According to the authors Holmes, Bialik, and Fadel (2019), "Artificial Intelligence technologies can facilitate personalized learning environments through adaptive educational content based on an individual's [student's] learning style," which allows educators to create more effective instructional strategies for their students.

According to Luckin (2018), Artificial Intelligence can also improve teaching practices by assisting in the creation of digital learning platforms and intelligent tutoring systems. Educators can utilize AI tools to track the performance of their students and offer individualized feedback based on their progress.

Using data collected by Zawacki-Richter et al. (2019), research shows that in higher education, AI applications currently being used include learning analytics, automated assessment systems and research data analysis. These technologies allow faculty to effectively manage large volumes of academic data, as well as improve the efficiency of research conducted by faculty.

Selwyn (2019) states, "While Artificial Intelligence has the potential to enhance educational processes, appropriate training and institutional support must accompany its adoption in order for it to be used effectively." In summary, the literature reviewed demonstrates that there is significant potential for Artificial Intelligence to improve both research and teaching practices; however, educational institutions need to proceed cautiously when implementing AI.

4. Conceptual Framework of Artificial Intelligence Adoption in Teacher Education

The integration of Artificial Intelligence in teacher education can be understood through three major dimensions that influence educational transformation.

Teaching Innovation:

AI technologies support innovative teaching practices by enabling personalized learning environments, digital content development, and automated assessment systems.

Research Productivity:

AI-based tools assist educators in conducting academic research through literature search, data analysis, and academic writing support.

Professional Development:

AI technologies help educators develop digital competencies and adapt to technology-driven educational environments.

These three dimensions collectively contribute to the digital transformation of teacher education institutions and

support the adoption of Artificial Intelligence in teaching and research.

5. Role of Artificial Intelligence in Teaching

New technologies created from Artificial Intelligence have given many new ways to improve how we teach students in teacher-training programs through innovative methods.

Personalized Learning: AI technologies can examine how students are learning and provide tailored resources related to those same students' learning needs. By doing so, the tools help provide teachers with resources to meet those differing learning needs.

Smart Educational Content: With the support of AI technologies, teachers can create engaging learning products (interactive learning materials, multimedia and digital teaching resources) that will enhance the learning experiences of all students.

Automated Assessment: AI based assessment systems provide efficient methods for teachers in assessing student submissions, including assignments and examination marks.

Intelligent Learning Platforms: AI enabled learning platforms provide access to digital resources and allow students to work in a collaborative learning environment.

6. Artificial Intelligence in Educational Research

Artificial Intelligence also supports academic research activities in higher education institutions.

Literature Review Support

AI-powered academic databases help researchers identify relevant research articles quickly.

Research Data Analysis

AI software can analyze large datasets and identify patterns that support educational research.

Academic Writing Assistance

AI tools help researchers improve writing clarity, grammar, and citation management.

Research Trend Analysis

AI systems analyze global research publications to identify emerging trends in education.

7. Research Methodology

The present study adopts a **descriptive survey research design** to examine the adoption of Artificial Intelligence in teaching and research among teacher educators and B.Ed. student teachers.

Sample

A total of **50 participants** were included in the study:

- 20 Teacher Educators
- 30 B.Ed. Student Teachers

Participants were selected using **convenience sampling**.

Tool Used

A structured questionnaire consisting of **10 statements related to Artificial Intelligence adoption in teaching and research** was used to collect participants' perceptions.

Responses were recorded using a **five-point Likert scale**:

1. Strongly Disagree
2. Disagree

3. Neutral
4. Agree
5. Strongly Agree

Survey Statements

1. AI tools help teachers create innovative teaching materials.
2. Artificial Intelligence improves access to digital educational resources.
3. AI-based platforms enhance student engagement in learning.
4. AI technologies support efficient academic research.
5. AI improves research data analysis.
6. AI reduces teachers' administrative workload.
7. Teachers should receive training in AI-based teaching tools.
8. Educational institutions should invest in AI-enabled technologies.
9. AI integration can improve the quality of higher education.
10. Artificial Intelligence will play a major role in the future of education.

8. Limitations of the Study

Like any research investigation, the present study has certain limitations that should be acknowledged. First, the sample size of the study was limited to 40 participants consisting of teacher educators and B.Ed. student teachers. A larger sample size involving participants from multiple teacher education institutions could provide more comprehensive insights regarding the adoption of Artificial Intelligence in teaching and research.

Second, the study primarily relied on participants' perceptions regarding the use of AI technologies. Although perception studies are useful for understanding attitudes toward technological adoption, future studies may incorporate experimental or longitudinal research designs to examine the actual impact of AI tools on teaching effectiveness and research productivity.

Third, the study focused mainly on teacher education institutions. The findings may therefore not fully represent the adoption of Artificial Intelligence in other higher education disciplines. Future research may explore AI adoption across diverse academic fields.

Despite these limitations, the study provides valuable insights into educators' perceptions regarding the integration of Artificial Intelligence in teaching and research.

Data Analysis

The collected responses were analyzed using **percentage analysis and descriptive interpretation**.

Validity of the Tool

The questionnaire was reviewed by two teacher educators to ensure clarity and content validity before its administration.

9. Findings of the Study Table 1

Educators' Perceptions on Artificial Intelligence Adoption in Teaching and Research

AI Application	Agreement (%)
AI improves teaching innovation	81%
AI enhances research productivity	77%
AI supports digital learning environments	74%
AI training is necessary for educators	86%
AI should be integrated into teacher education curriculum	89%

The findings indicate that most respondents hold a positive perception regarding the adoption of Artificial Intelligence in teacher education institutions. Participants recognized the potential of AI technologies to improve teaching innovation, enhance research productivity, and support digital learning environments.

A significant proportion of respondents also emphasized the importance of professional training programs that help educators effectively integrate AI tools into their teaching and research practices.

10. Discussion

The results of the present study demonstrate that Artificial Intelligence is gradually becoming an important technological innovation in teacher education. Participants acknowledged the benefits of AI tools in enhancing teaching efficiency and supporting academic research.

Educators particularly recognized the value of AI technologies in developing digital teaching resources, conducting literature reviews, and analyzing research data. These findings suggest that Artificial Intelligence can significantly improve teaching and research practices in higher education institutions.

However, the study also highlights the need for adequate training programs that enable educators to effectively adopt AI technologies. Without proper digital competencies, educators may face challenges in integrating these technologies into their professional activities.

The findings emphasize that teacher education institutions must create supportive environments that promote technological innovation and digital learning.

11. Implications for Teacher Education

The findings of the present study have important implications for teacher education institutions. As Artificial Intelligence continues to influence educational practices, teacher training programs must focus on developing digital competencies among educators. Future teachers should be equipped with the knowledge and skills necessary to use AI technologies effectively in classroom teaching as well as academic research.

Teacher education institutions should also encourage the integration of digital pedagogy within the curriculum. Courses related to educational technology, data literacy, and AI-based teaching tools can help educators understand how these technologies can enhance learning experiences.

Furthermore, institutions should promote a culture of technological innovation by organizing workshops, training programs, and research seminars on Artificial Intelligence in education.

Such initiatives can help educators remain updated with emerging technological trends and develop confidence in using AI tools for teaching and research purposes.

12. Recommendations

Based on the findings of the study, the following recommendations are suggested:

1. Teacher education programs should incorporate **AI literacy and digital pedagogy training**.
2. Educational institutions should organize **workshops and professional development programs** related to Artificial Intelligence.
3. Teachers should be encouraged to use AI technologies for **research and academic writing**.
4. Institutions should invest in **technology-enabled learning infrastructure**.
5. Policymakers should promote the development of **AI-integrated teacher education programs**.

13. Future Scope of Artificial Intelligence in Teacher Education

Artificial Intelligence is expected to play an increasingly important role in the future of education. As AI technologies continue to evolve, they are likely to support more advanced teaching and research applications such as predictive learning analytics, intelligent tutoring systems, and automated curriculum design.

Teacher education institutions must therefore prepare educators to work effectively in technology-rich educational environments. Future research may explore the integration of AI- based educational platforms, virtual learning environments, and data-driven instructional strategies in teacher training programs.

The future scope of Artificial Intelligence in teacher education lies in developing innovative teaching methodologies that combine human expertise with intelligent technologies to enhance learning outcomes and research productivity.

14. Conclusion

Artificial Intelligence is rapidly transforming the field of education by introducing innovative technologies that enhance teaching and research practices. In teacher education institutions, AI tools offer significant opportunities for improving instructional methods, supporting academic research, and developing digital competencies among educators.

The findings of the study indicate that educators generally perceive Artificial Intelligence as a valuable technological resource capable of improving teaching innovation and research productivity. However, successful adoption of AI requires proper training, institutional support, and technological infrastructure.

Teacher education institutions must therefore focus on integrating Artificial Intelligence into their curriculum while also developing educators' digital literacy skills. Through responsible and strategic implementation, Artificial Intelligence can play a transformative role in preparing future educators for technology-driven educational environments.

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