



---

## Significance of Artificial Intelligence in Teacher Education

**Jyotirmoy Rit**

M.Ed. Scholar, Ramakrishna Mission Sikshanamandira, Belur Math, Howrah, West Bengal, India

Email – ritjyotirmoy2508@gmail.com, Orcid id- 0009-0007-3861-9553

**Dr. Pradip Kumar Sengupta**

Associate Professor, Ramakrishna Mission Sikshanamandira, Belur Math, Howrah, West Bengal, India

Email – pks@rkmsm.org, Orcid id- 0000-0003-4400-1040

---

DOI : <https://doi.org/10.5281/zenodo.20687817>

---

### ARTICLE DETAILS

**Research Paper**

**Accepted:** 19-05-2026

**Published:** 10-06-2026

---

**Keywords:**

*Artificial Intelligence,  
Teacher Education, Self  
Learning.*

---

### ABSTRACT

A teacher guides mankind on the path of education. Since the contemporary education system is dependent on science and technology, the teacher must also be scientifically minded, full of technical knowledge and skilled. Artificial Intelligence (AI) is one of the most important discoveries in current technology, its ethical use can improve the education system. To implement it in the current education system, it is very important to provide teachers with knowledge and training in this regard. Therefore, this research work has been conducted to analyze the goals, areas of use, implications, ethical aspects and its critical analysis of the use of artificial intelligence in teacher education. This research work has followed a descriptive qualitative research approach and through discussion analysis, it has been found that the use of AI in various areas of teacher education such as self-learning, skill development, self-evaluation, lesson planning, adoption of new teaching methods, research work, etc. is of particular significance. NEP 2020 has also given special importance to artificial intelligence in teacher education.

**INTRODUCTION**

*“Predicting the future isn’t magic, it’s artificial intelligence.”*

*–Dave Waters*

The present era is the era of technology. The contribution of technology, as information and communication technology, in shaping the world into modernity is truly undeniable. The education sector is also not deprived of its impact. Teacher is one of the main components or pillars of education. Therefore, in keeping with the present era, the teacher must also be technologically knowledgeable. To make a teacher more knowledgeable and skilled, pre-service and in-service teacher training is necessary. Artificial intelligence (AI) is a special part of this modern technology, which has made our daily life, education, and workplace much easier. It is a branch of technology that works through computers, laptops, mobiles or any other device and it thinks like a human, analyzes information, makes decisions, and solves problems.

Nowadays, the role of a teacher is not only that of a knowledge provider, but the teacher is also a friend-philosopher-guide of the students. Therefore, along with the knowledge of the subject and psychology, technical knowledge and skills will enrich a teacher. With Artificial Intelligence, a teacher can easily acquire subject knowledge by sitting anywhere using a device and the internet, on the other hand, he/she can collect various information for research work, analyze information and solve problems. As a result, the interest and participation of teachers in research work will increase. Teacher training will also benefit to a large extent. Since India as a developing country, if the quality of education can be maintained, the development of the country and the nation will be possible. To maintain the quality of education, it is necessary to maintain the quality of teacher education because teachers are the backbone of education, the nation and the society. In order to firmly establish the National Education Policy (NEP)-2020 has laid special emphasis on technology-based education and AI in the field of teacher education, which has given a new path to the field of teacher education. AI has the potential to individualize teacher development Pathways, identify instructional gaps and support reflective teaching practices (Yang et al., 2021).

**OBJECTIVES OF THE STUDY :**

- I. To know the aims of using AI in Teacher Education.
- II. To know the uses of AI in the various fields of Teacher Education.



- III. To know about the uses of various AI tools in Teacher Education.
- IV. To understand the impact of AI in Teacher Education.
- V. To understand the significance of AI in Teacher Education.
- VI. To understand the ethics of using AI in Teacher Education.
- VII. To explore critical analysis of AI in Teacher Education.
- VIII. To detect the limitation of AI in Teacher Education.

### **METHODOLOGY OF THE STUDY:**

The study is purely based on descriptive analytic method. Several books, journals, articles, E-journals which were consulted during the study period. Only qualitative method is used to analyze the data. In this studies the significance of Artificial Intelligence have been analyzed to the perspective of Teacher Education.

### **DISCUSSION:**

#### **AIMS OF USING AI IN TEACHER EDUCATION**

*Swami Vivekananda stated* that suitable mentors are essential for the education of a youth community characterized by independent thinking, a scientific outlook, social awareness, and rationality. He realized that the role of a teacher extends beyond merely imparting facts and theories; rather, a teacher's true task is to guide a developing personality in accordance with its inherent nature, fostering the harmonious growth of the body, mind, and soul. He placed great emphasis on the process of a student's self-development and accorded significant importance to independent thinking.

The aims of utilizing Artificial Intelligence (AI) in teacher education is to enhance the overall quality of teacher training programs. With this overarching goal in view, the specific goals for incorporating AI into teacher education are as follows:

#### **• Enhancing a Teacher's Subject-Matter Knowledge:**

A teacher must be proficient in their own discipline and possess a thorough understanding of their subject matter. By utilizing AI—specifically an electronic device, an AI application, and an internet



connection—a teacher can retrieve any information regarding their subject from virtually anywhere, at any time. So, it can be said that, by AI, a Teacher will become expert on his / her subject matter.

- **Developing Advanced Lesson Plans :**

One of the primary aims of utilizing Artificial Intelligence in teacher education should be to assist teachers—both during their pre-service and in-service stages—in formulating diverse, creative, engaging, and classroom-appropriate lesson plans, as well as in continuously refining and revising those plans to suit the specific needs of their students.

- **Assisting Teachers in Self-Learning:**

Artificial Intelligence aids aspiring teachers in learning in accordance with their individual needs and interests. The primary prerequisite for becoming a teacher is self-learning—or independent study—and self-assessment. This self learning program can motivate teacher trainees to learn independently and enabled to evaluate their own progress.

- **Improving Teachers' Professional Capabilities :**

To continuously improving the education system, it is essential to continuously improving the professional capabilities of both pre-service and in-service teachers. Through this, teachers can equip themselves for the future, become more skilled, and continuously elevate their professional proficiency.

- **Producing Inclusive Education :**

One of the primary aims of utilizing artificial intelligence (AI) in teacher education is the implementation of inclusive education. By leveraging AI, teachers can foster an inclusive environment within the classroom, enabling them to educate students with diverse special needs—including those with visual, auditory, or linguistic impairments—alongside general students, all under one roof.

- **Motivating Teachers Towards Research Works:**

A teacher needs to possess knowledge of action research to identify and resolve problems that suddenly arise in the classroom. one of the primary objectives of integrating Artificial Intelligence into teacher education is to inspire teachers to undertake novel research initiatives, provide them with up-to-date research data, and ultimately increase their active participation in research endeavors.

- **Limiting Administrative Pressure of Teachers:**



Teachers are required to engage not only in classroom instruction but also in various administrative tasks outside the classroom. Notable examples of such duties include data maintenance, recording student attendance, evaluating answer scripts, and preparing result sheets. If teachers utilize artificial intelligence for these tasks, it can lead to significant savings in both time and effort.

## **USES OF AI IN VARIOUS FIELDS OF TEACHER EDUCATION**

Currently, Artificial Intelligence (AI) has influenced various domains within the field of teacher education. The particular areas of Teacher Education where AI can be used includes :

### **• In the Formulation of Lesson Plans:**

With the help of Artificial Intelligence, trainee teachers can craft engaging lesson plans. By utilizing AI, it is possible to create lesson plans that are specifically tailored to children of a particular age group—harmonizing with the psychological foundations and relevant content-based objectives appropriate for that age.

### **• Assistance with Research Activities :**

Artificial Intelligence will assist both future and practicing teachers in utilizing the action research process to address sudden classroom issues, guiding them on how to apply this methodology to effectively resolve such problems. With the support of AI, ambitious teacher can acquire uphold for their research work. Furthermore, through its application, aspiring teachers can encourage themselves to undertake and conduct new research projects.

### **• To Make a Virtual Classroom :**

Through virtual classrooms, simulation-based instruction, and—in the context of teacher training—the practice of micro-teaching, trainees can acquire realistic classroom experiences much earlier in the process; this, in turn, encourages trainees to engage in self-directed learning.

### **• Application of Adaptive Learning Systems:**

Adaptive teaching methods provide trainees—future teachers—with significant assistance in identifying and understanding the various weaknesses of students within the classroom. By utilizing this approach, prospective teachers gain insight into how to apply innovative strategies to address the diverse range of problems faced by individual students.

**• Application in Self-Learning and Self-Assessment:**

By utilizing AI—and with the aid of a device and an internet connection—a teacher trainee can engage in self-learning from any location, gather diverse information, and enhance their subject-matter expertise; in much the same way, they are also enabled to conduct self-assessments in various forms. They can find and understand their own mistakes, and then proceed once again with self learning.

**• Application for Refining Language and Communication Proficiency :**

Teacher trainees can utilize various artificial intelligence-based tools to identify their linguistic errors and enhance their language proficiency. Through the use of these tools, they become capable of employing effective instructional discourse methods in the classroom. They can correct their pronunciation and refine the grammatical aspects of their language.

**• Application in Generating Inclusive Classrooms:**

Artificial Intelligence can be utilized to educate students with special needs—such as those with visual, auditory, or linguistic impairments—alongside their general student peers. By leveraging this technology, an educator can create a diverse range of appropriate and engaging instructional materials—such as various charts and models—thereby fostering a classroom environment that is both conducive to learning and truly inclusive.

**• Improving the Professional Capabilities of Teacher Trainers:**

Only if a trainer consistently improves their professional skills—by utilizing various artificial intelligence tools—and actively engages themselves in research-oriented, technology-driven, and scientifically grounded endeavors, will they be capable of molding an ideal future teacher.

**THE USES OF VARIOUS AI TOOLS IN TEACHER EDUCATION**

Various Artificial Intelligence (AI) tools that can be utilized in the field of teacher education include: ChatGPT, Google Gemini, Deepseek, Google Bard, QuillBot, Canva, Beautiful.ai, Google Forms, Kahoot!, Quizizz, Grammarly, Google Translate, Google Classroom, Microsoft Teams, Synthesia, Otter.ai, Khan Academy, Duolingo, Turnitin, and Grammarly, among others.

To acquire knowledge, gather information, develop various projects, and obtain assistance with research tasks, a teacher can utilize various AI tools such as ChatGPT, Google Bard, QuillBot, Gemini, and Deepseek.



To create engaging PowerPoint presentations, a teacher can employ tools such as Canva and Beautiful.ai.

To resolve various linguistic, grammatical, and translation-related issues, a teacher can utilize tools like Grammarly and Google Translate. For assessment purposes, a teacher can use tools such as Google Forms, Kahoot!, and Quizizz. These tools are particularly helpful for both aspiring and practicing teachers in creating online questionnaires and assessments.

To establish a virtual learning environment accessible anytime and anywhere, a teacher can utilize tools such as Google Classroom and Microsoft Teams. This facilitates the success of distance education initiatives. Tools such as Synthesia and Otter.ai can be used to create various types of educational videos. Teachers can utilize tools like Khan Academy and Duolingo for self-directed learning.

To prevent academic dishonesty—specifically to check for plagiarism—a teacher can employ tools such as Turnitin and Grammarly. If these aforementioned tools are utilized by both aspiring and practicing teachers in an ethical and responsible manner to enhance their professional competencies, the overall improvement of teacher education programs will be achievable.

## **THE IMPACT OF ARTIFICIAL INTELLIGENCE IN TEACHER EDUCATION**

One of the most significant discoveries of modern technology is Artificial Intelligence. Just as Artificial Intelligence has exerted a significant influence on education, teacher education, too, has not remained untouched by its impact. However, if a teacher utilizes artificial intelligence while upholding ethical standards—directing its use toward enhancing their professional expertise, acquiring knowledge, improving communication skills, preparing various teaching aids (such as PowerPoint presentations), and facilitating both online learning and instruction—then AI will exert a positive, rather than negative, influence on educators.

Regarding the impact of AI on teacher education, it must be noted that AI provides teachers with a constant stream of new information, enabling them to acquire knowledge from the comfort of their own homes. In the context of teacher education programs, prospective teachers are often required to undertake numerous practical assignments. They can execute these practical tasks with great ease from home by leveraging AI tools. Furthermore, they are frequently tasked with creating various innovative teaching aids—such as charts, models, and maps. AI assists future teachers by generating fresh concepts; beyond merely offering ideas, it also provides guidance on the specific materials and methodologies required to construct these educational aids effectively. Various AI applications prove particularly beneficial to



teachers when it comes to preparing PowerPoint presentations. Moreover, AI introduces teachers to novel pedagogical approaches—for instance, demonstrating how to utilize the "project method" within the classroom to motivate students and foster their engagement in learning.

Additionally, AI assists teachers in cultivating inclusive classroom environments and facilitates the acquisition of various languages. Based on this discussion, it can be concluded that—by simply utilizing a device and an internet connection—a teacher can continuously update and upgrade their skills through the application of AI tools. They can participate in research endeavors and stay abreast of the latest research methodologies. Artificial intelligence has undoubtedly rendered teachers more adept and sophisticated. When human intelligence converges with artificial intelligence, it inevitably sparks a revolution within the realm of education. Consequently, in contemporary times—spanning everything from lesson planning to the selection of teaching methodologies and instructional materials—AI charts a new course for both aspiring and practicing teachers, thereby empowering them to become more modern and scientifically oriented educators. However, it is absolutely essential for an educator to understand the extent to which—and the specific ethical principles by which—the positive impact of AI can be harnessed to benefit both society at large and the student community. Therefore, to sustain this positive influence within the realm of teacher education, an educator must be well-versed in the ethical guidelines governing the use of artificial intelligence; only then can teacher education programs be truly enriched by the positive impact of AI.

## **SIGNIFICANCE OF AI IN TEACHER EDUCATION**

Artificial Intelligence has become a breakthrough technology in the modern education system. The use of AI in Teacher Education has made the training process more attractive, engaging and efficient. AI offers promising tools and frameworks that can significantly enhance pedagogical effectiveness from intelligent tutoring systems and virtual teaching assistants to adaptive learning analytics and real-time performance feedback, AI has the potential to individualize teacher development Pathways, identify instructional gaps and support reflective teaching practices (Kumari et al., 2025). The significance of AI has prepared future teachers. These are -

- **Motivation for self-learning:**

With the help of artificial intelligence, both a future teacher and a working teacher are motivated for self-learning. To use it, a device and the internet are required. They can retrieve the necessary information anytime, anywhere, without the help of a trainer, as a result of which their knowledge



increases, as well as their ability to use technology increases. Artificial intelligence makes teacher-trainees and working teachers interested in self-learning.

- **Development of professional skills:**

Artificial intelligence helps future and working teachers to prepare lesson plans, apply modern teaching techniques in the classroom such as reflection methods, etc. and use various subject-specific attention-grabbing teaching aids such as various charts, models and also provides ideas on how to prepare them. Also, future teachers get a basic idea about role-playing teaching and tutoring with the help of artificial intelligence. Apart from these, using AI, they can know the syllabus of various education boards in advance such as CBSC syllabus in the case of central schools, also ICSE syllabus, West Bengal Board syllabus, etc. and can prepare lesson plans accordingly. As a result, their professional skills can be improved.

- **Adopting a personalized learning approach:**

AI can help future and current teachers identify their students' learning differences, interests, and abilities in the classroom, and teachers can use this information to prepare lesson plans tailored to each student's individual needs. Artificial intelligence can also help teachers continuously monitor students' progress and implement teaching strategies for them accordingly.

- **Modernization of teaching methods:**

AI motivates future teachers and working teachers to introduce digital and interactive teaching methods. As a result, it is possible to teach students through PowerPoint in smart classrooms, showing various pictures and diagrams and using audio-visual aids. Teachers are also motivated to use virtual learning methods.

- **Enhancing Adaptive Learning :**

Adaptive Learning is a method that uses AI algorithms to identify students' learning dynamics, strengths, and weaknesses and helps teachers use different teaching strategies accordingly. This allows teachers to solve students' problems, help students gain deeper knowledge of the subject matter, and improve their results.

- **Continuous professional development of teachers:**



The National Education Policy 2020 has emphasized the continuous professional development of teachers. By using AI tools, a future teacher and a working teacher can continuously improve their professional skills, strengthen themselves with new technological knowledge, engage in research work, and develop themselves as an ideal teacher.

- **Creating interest in research work:**

Artificial intelligence makes a future teacher and a working teacher interested and motivated in research work. Action research has to be applied to solve various problems that arise in the classroom, in this regard, artificial intelligence helps the teacher. Artificial intelligence also helps the teacher by providing various information and materials to conduct new research work. For example, using artificial intelligence, a teacher can easily review literature and learn and gain ideas from previous research. AI plays a significant role in this regard.

- **Providing training in inclusive classroom management:**

Artificial intelligence provides training to a future teacher and a working teacher to build and manage inclusive classrooms. Since in an inclusive classroom, there are students with special needs along with general students such as those with visual impairments, auditory impairments, linguistic impairments, etc. The teacher must have special skills to teach all of them under the same roof. With the help of AI, a teacher can teach them using teaching techniques and materials suitable for inclusive classrooms, such as various audio-visual aids, charts, models, etc. Also, using AI, a teacher can get a basic understanding of the Braille system. Artificial intelligence plays a significant role in helping teachers to develop various linguistic skills and communication skills.

## **THE ETHICS OF USING AI IN TEACHER EDUCATION**

Ethics or morals refer to the principles of determining the difference between right and wrong. Ethics in teacher education develops teachers in such a way that they can behave responsibly, dutifully, justly, with values and humanity. This ethical perspective becomes even more important in the use of artificial intelligence.

- **The main ethical aspects of the use of artificial intelligence are -**

*First*, data privacy is an important ethical issue in the use of artificial intelligence. Artificial intelligence-based systems help to collect and analyze personal information of students and trainees.



Ensuring the security of this information is very important. Because information leakage or its misuse can have a negative impact on the personal lives of students and trainees.

**Second,** the algorithmic bias of artificial intelligence is seen as a major ethical issue. Because artificial intelligence systems usually work based on previous data. And if that data is biased, then the decisions of artificial intelligence can be biased. This can lead to discrimination in the assessment and teaching methods of students. Because teachers have the responsibility to maintain justice and equality.

**Third,** there is a possibility of degradation of human values due to the excessive use of artificial intelligence in teacher education. Because education is a human process, where empathy, value sensitivity, compassion, tolerance and interdependence play a very important role. But artificial intelligence cannot completely replace these human qualities.

**Fourth,** currently we see that with the help of artificial intelligence we can easily prepare any project or any research work which in many cases increases the risk of copying or plagiarism, in this case the aspect of academic integrity is disrupted. Therefore, it is very important to develop honesty, ethics, and originality among future teachers in the field of teacher education.

**Fifth,** the use of artificial intelligence creates technological inequality. For example, students living in remote areas, future teachers or working teachers do not get the same opportunities to use artificial intelligence or they do not get the necessary equipment or training to use it properly.

**Sixth,** teacher autonomy is a very important ethical aspect of the use of artificial intelligence. Because if artificial intelligence exerts excessive influence on the selection of teaching methods, evaluation and decision-making in teacher education, then the teacher's independence may decrease. Because a teacher makes decisions according to his knowledge, experience, judgment and classroom context, which artificial intelligence cannot fully imitate.

**Seventh,** another aspect is also revealed in this case, as theoretically speaking, humanistic education theory provides a very important perspective in the use of artificial intelligence. According to this theory, education is a humane and proactive process in which the personal relationship and values of teachers with students are very important. But artificial intelligence is not able to fully capture this aspect. Maintaining human values is an essential element in the use of artificial intelligence in teacher education.



However, if artificial intelligence can be applied appropriately while maintaining human values, it will not only improve teacher training activities, but it will also make the classroom environment more engaging, scientific, and effective, paving the way for overall improvement in the education system.

### **CRITICAL ANALYSIS OF AI IN TEACHER EDUCATION**

AI has brought a significant change in the objectives, methods, and types of teacher training. However, this change is not entirely positive; rather, while it has a lot of potential for development, it also has some special problems and challenges.

One of the main contributions of AI in teacher education is to make the teacher-training process more innovative. AI can analyze the learning interests, speed, and weaknesses of trainees and create suitable teaching plans for them. As a result, future teachers can learn how to change the teaching methods according to the different needs of different students in the classroom. In addition, AI encourages the use of new technologies and innovative methods in teacher training, which especially helps in increasing the professional skills of teachers.

However, in addition to these positive aspects, what is particularly noteworthy is whether AI is harmful to the human aspect of education. Education is not just a process of knowledge exchange but it is a human, social, moral and value-based process where strong emotions, empathy and mutual understanding work between the teacher and the student. Artificial intelligence cannot play this role, that is, artificial intelligence cannot properly replace this understanding, emotions, mutual exchange of ideas, mutual exchange of values, etc. As a result, future teachers may ignore the aspect of human relations. It can also be said that the use of artificial intelligence makes future teachers overly dependent on technology, which may hinder their own creative thinking. However, despite all these negative aspects, if a future teacher can properly understand how much artificial intelligence should and should not be used and use it while maintaining moral standards, then teacher education and the entire education system will not be deprived of the positive impact of modern technology and artificial intelligence, but will become richer.

### **LIMITATION OF AI IN TEACHER EDUCATION**

- **Deficiency in Human Qualities:**



Artificial Intelligence is unable to comprehend human emotions, empathy, values, and ethics; consequently, it fails to grasp the nuances of the teacher-student relationship. As a result, the human qualities inherent in the bond between teachers and students become attenuated.

- **Limitations on Teacher Autonomy:**

Teaching methodologies that rely excessively on artificial intelligence confine teachers within a rigid framework. Consequently, teachers experience a decline in their independent thinking, creativity, and inherent personal qualities.

- **Excessive Dependence on Technology:**

As a result of utilizing artificial intelligence, teacher-trainees become overly dependent on it. In such instances, should technical glitches or errors arise, their learning process fails to be effective; instead, it becomes disrupted.

- **Accuracy of Data and Bias:**

Artificial intelligence does not consistently provide accurate information in all instances.

- **Limitations of the Evaluation Process:**

Artificial intelligence is incapable of adequately evaluating tasks involving subjective or creative thinking. It fails to take into account students' emotions, feelings, effort, and resilience.

- **Digital Divide:**

Not all teachers, educators, or trainees have equal access to the use of artificial intelligence. This is because, in contrast to the infrastructural resources and facilities typically available in urban areas, rural education systems face a severe shortage of such resources. Furthermore, a widening disparity is also evident on economic grounds.

- **Lack of Training:**

We often observe that, across various disciplines, there is a shortage of properly trained teachers. In particular, a lack of proficiency—especially regarding technology-dependent tools or the application of artificial intelligence—is evident among many educators.

- **Expensive Infrastructure:**



Utilizing Artificial Intelligence technology requires advanced devices, software, and internet connectivity—resources that are not feasible for all organizations. Here, financial constraints emerge as a major obstacle.

• **Ethical and Privacy Issues:**

In many instances, students' personal information is collected by artificial intelligence. Consequently, there is a risk of data misuse, making it extremely difficult to ensure privacy in this context.

• **Limitations regarding Creativity and Critical Thinking:**

Through its programming, artificial intelligence provides students with ready-made answers; consequently, a decline is observed in students' creativity, as well as in their capacity for deep reflection and critical thinking on a given subject.

## CONCLUSION

The application of artificial intelligence is significant for the improvement of teacher education and the improvement of the professional skills of teachers, as its use enables working teachers or teacher trainees to collect the necessary information, as well as saves both their time and labor. They become interested in participating in various innovative activities, research work. They learn to prepare new educational materials and feel motivated to use modern psychological teaching methods in the classroom.

However, some ethical and technical issues need to be carefully considered in the use of AI. Such as data privacy, algorithmic

bias, etc. It is essential to create a comprehensive infrastructure to ensure the proper use of AI in teacher education. In teacher education, the appropriate and ethical use of AI can bring about revolutionary changes in the training system and improve the quality of the overall education process. AI provides personalized and adaptive learning experiences according to the individual needs and interests of teacher trainees. As in other areas of education, the correct, appropriate, planned, value-based, and ethical use of artificial intelligence in teacher education will be able to elevate this teacher training program to the pinnacle of improvement in the future.

**REFERENCES**

- Barik, R. H., & Datta, B. (2025). Artificial intelligence and the future of education. *Anwesa: A Journal of Education*, 17, 0973–5895.
- Chandra, A. (2025). Artificial intelligence in teacher education: Unlocking potential, navigating challenges and shaping the future. *The Academic: International Journal of Multidisciplinary Research*, 3(4), 450-462. <https://doi.org/10.5281/zenodo.15390385>
- Fitria, T. N. (2021, December 20). Artificial intelligence (AI) in education: Using AI tools for teaching and learning process. In *Proceeding Seminar Nasional & Call for Papers* (pp. 134–147).
- Hilner, E. (2024, October 18). Artificial intelligence and the future of teaching and learning. *Engageli*. <https://www.engageli.com/blog/artificial-intelligence-and-the-future-of-teaching-and-learning-engageli.com>
- Heine, S., & König, J. (2025). Applying artificial intelligence in teacher education: Preservice teachers' attitudes and reflections in using ChatGPT for teaching and learning. *European Journal of Teacher Education*, 48(5), 934–963. <https://doi.org/10.1080/02619768.2025.2540791>
- Jana, R. K., Mandal, S. C., & Si, A. (2025). *Artificial intelligence: Theory and applications*. Techno World.
- Jamal, A. (2023). The role of artificial intelligence (AI) in teacher education: Opportunities & challenges. *International Journal of Research and Analytical Reviews (IJRAR)*, 10(1). 139-146 <https://www.ijrar.org/>
- Kumari, A., Begum, S., Paunikar, S., Kaur, A., & Verma, S. (2025). The role of artificial intelligence in teacher training: Enhancing pedagogical effectiveness. *Journal of Marketing & Social Research*, 2(5), 116–122.
- Ng, D. T. K., Leung, J. K. L., Su, J., Ng, R. C. W., & Chu, S. K. W. (2023). Teachers' AI digital competencies and twenty-first century skills in the post-pandemic world. *Educational Technology Research and Development*, 71, 137–161. <https://doi.org/10.1007/s11423-023-10203-6>
- Office of Educational Technology. (2023, May). Artificial intelligence and the future of teaching and learning. *U.S. Department of Education*.
- Russell, S. & Norvig, P. (2022). *Artificial Intelligence: A modern approach. (4th ed)*. Pearson. Roll, Ido, & Wylie, Ruth. (2016). *Evolution and revolution in artificial intelligence in education*. *International Journal of Artificial Intelligence in Education*, 26(2), 582–599. <https://doi.org/10.1007/s40593-016-0110-3>
- Seshadri, S., & Iyer, S. (2023). *AI for everyone*. Embassy Books.



- Tahir, M., Hassan, F. D., & Shagoo, M. R. (2024). Role of artificial intelligence in education: A conceptual review. *World Journal of Advanced Research and Reviews*, 22(1), 1469–1475. <https://doi.org/10.30574/wjarr.2024.22.1.1217>
- Wu, W., Burdina, G., & Gura, A. (Year). Use of artificial intelligence in teacher training. *International Journal of Web-Based Learning and Teaching Technologies*, 18(1), 1–15. <https://doi.org/10.4018/IJWLTT.331692>