
**RESEARCH STATUS AND EVOLUTIONARY TRENDS OF EDUCATIONAL
APPLICATION OF ARTIFICIAL INTELLIGENCE IN THE PAST FOUR YEARS-
ANALYSIS BASED ON CITE SPACE**

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Abstract

Artificial intelligence is one of the most demandable areas in the field of research. While discussing the educational scenario, the impact of Artificial Intelligence applications in education, how it can integrate AI into teaching, whether AI can make the academic – both administrative and teaching-learning – process easier, etc., are becoming the most discussed topics. Research in this field has been going on for years; mainly, the number has increased in the past two decades. The covid scenario has increased the demand for virtual/online learning. In this context, demand for AI applications increased. Here, the researcher tried to analyze prior research and collected details from databases such as Web of Science, Elsevier, Scopus, and Academia. Only the studies from 2019 to 2022 have been collected and analyzed. From the collected studies, only 30 were selected for the study. The analysis of past research shows that learners and students have a positive attitude toward AI integration. This paper consolidates the points highlighted in specific research reviews, surveys, and experimental studies. This paper also discusses some future challenges in AI in education.

Keywords: Artificial Intelligence, challenges, impact, implementation, machine learning. virtual learning

Introduction

The development of information and communication technology is happening at a high pace. The reflection of this can be seen in the education sector, like all other sectors of human life. Integration of technological advancement into the education sector is not a novel one. It has been happening throughout these years. Artificial Intelligence in Education is the latest application of technological advancement in the educational scenario. AI development has ushered in a new era of computer-supported learning. A computer system could act as an intelligent tutor, tool, or tutee and facilitate decision-making in educational contexts by combining human intelligence. A new window of opportunity to significantly raise the standard of instruction and learning will be created by merging AI and education. Intelligent technologies that support examinations, data collection, boosting learning progress, and creating new tactics might be helpful to teachers.



Asynchronous learning and knowledgeable tutors can help students achieve better learning outcomes [12]. Research is going on continuously in various disciplines on the application of Artificial Intelligence. The needs of the learners and the expectation of society are changing, and education intends to be more personalized. Artificial Intelligence has much to do with customizing the approach to learning. There is a need for changes in all aspects of teaching-learning. At the same time, implementing AI in education brings changes in the teaching-learning scenario. [20].

Concerning campus applications, numerous campus doors, classroom entrances, and dorm entrances are currently equipped with various face access control and attendance systems [19]. Multiple risks and issues that are undoubtedly brought about by quick technological advancements have so far surpassed regulatory structures and policy discussions. AI can potentially increase the pace towards attaining Sustainable Development Goal 4 – Quality education.

Research Questions

- What are the recent trends in research on the application of Artificial Intelligence in education?
- What are the challenges of applying AI in the educational field?

Methodology

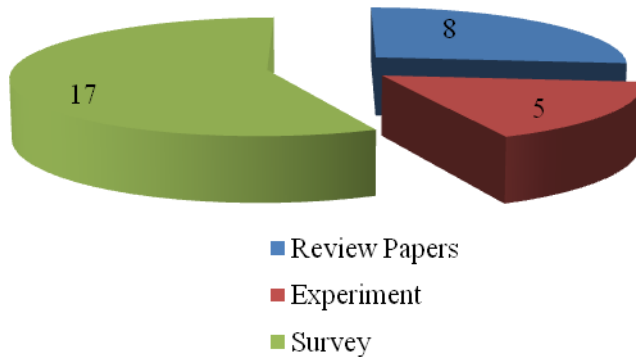
The researcher searched and reviewed the theoretical papers, articles, and research papers on the application of artificial intelligence in the educational sector published during 2019-2022. Artificial Intelligence, Intelligent Tutoring Systems, Education and AI, Application of AI for educational purposes, Teachers and AI, Virtual Learning, and Machine Learning were the keywords for searching the previous research and other sources on Artificial Intelligence in Education. The databases Scopus, Web of Science, Elsevier, and Academia served much in this research. The collected materials were thoroughly studied and analyzed. The researcher categorized the materials based on the paper's nature, subject, area of education discussed, findings, etc. The analysis was done based on the stipulated objectives.

Result and Discussion of the Study.

Studied 30 sources for this paper. Review papers, surveys, and experimental studies were included for review (Figure 1)

Figure 1

Categorization of the Sources Selected for this Study



The selected sources discuss the various applications of AI in education, how teachers and students conceive the concept of AI application in educational scenarios, and the challenges to be faced by the academic field in the future.

Review Papers

Many have reviewed past research on the application of AI and machine learning in the learning process. The reviewers found many studies discussing how AI's application in the educational field can make it more creative, accessible, innovative, personalized, etc. AI is used in intelligent tutoring systems, the prediction of dropout as well as performance, analyzing the learning styles and predicting the learning styles, etc. Automation also is made more accessible by the AI application. AI applications can assess the learner's performance, from the lower classes to the higher level of education. The potential AI can be used as an agent for individualized feedback and scaffolding [9]. Many researchers have been searching for AI-based assessments. Reviews of past research indicate a reduction in traditional tech-enabled instructional design research and a rise in learning analytics and student profiling models [8]. The systematic reviews highlight the following point.

Studies concentrate on and put forward the idea of AI applications in

- Academic support services
- Institutional services
- Administration
- Profiling
- Assessment and evaluation



- Personalization of education [4] [5]
- Intelligent tutoring systems [4] [7] [21]
- Prediction [23]
- The smart school (Face/speech recognition, virtual labs, sensing technologies) [3]
- Mobile remote education
- Real-time analysis
- Professional development of teachers and academicians [3] [4] [5]

Reviews of past studies also highlight many drawbacks:

- Lacks critical reflection on the challenges and risks of the application of AI in education
- Lack of a strong connection between the theoretical and pedagogical perspectives
- Most studies don't put forward a need for exploring educational approaches in AI applications.
- Ethics of AI application in the educational setting remain unexplored [23]
- Need for studies on teacher bots.
- Need for further investigation on the delayed effects on AI applications during experimental studies [4] [5] [6]

Reviews suggest semi-experimental studies on the effectiveness of AI applications in the professional development of teachers and academicians. Studies point out the need for more training in technological integration. Some studies show that the automatic feedback in the online environment makes positivity in the learners perform more accurately [4]

Survey

The application of AI in education goes effectively and continuously only if the teachers are aware of it and know about the 'how' of AI in education (Table 1). A survey conducted to know teachers' perspectives on AI by taking computer teachers as a sample shows that teachers, as well as students, have a positive attitude towards using artificial intelligence in learning language [2] [7] [18]. On the contrary, a study also reported pre-service teachers' negative emotions toward integrating AI into education [10]. A study reported that teachers' experience with AI-enhanced scaffolding systems for helping learners with scientific writing for STEM education is positive. At the same time, the research also raises the issues that may occur due to the role change of educators in the classroom and the transparency in the decision-making. [15].



Table 1

Focused Area in the Survey Studies

Area focused	Reference
Teachers' perspective	[18]
Students Attitude	[2]
Teachers' Attitude	[2]
Impact of AI on the interaction between learner and instructor	[24]
Future educational scenario with the arrival of AI in education	[7]
View of Pre-service teachers on AI.	[10]
Perception of University students about AI application	[14]
Teacher perception of using AI-based educational tools for scientific writing	[15]

Teachers and learners are interested in the AI application in their learning process, as learners always have an interest in learning with innovative, novel methods [24]. At the same time, there is a fear in the learner whether the AI-based individualized learning process may lead to the learner-teacher interaction being wrong, against everyday social norms. AI applications will provide novel opportunities for students and teachers along with a different engaging teaching-learning scenario [7]. Studies suggest the need for audit mechanisms, considering human psychology development of supportive and preventive software, and should be careful that the integration of AI doesn't affect social relations negatively [7] [24]. There is a need to give more lectures to university students on the current application and future use of [14]

Experimental Studies

One of the concerns of applying AI, as well as other technology in the educational field, is about managing learners' emotions (Table 2). According to recent studies, when AI-supported systems took into account their affective status and cognitive factors, students' task engagement and



performance increased [13]. The study shows how AI may be used to meet learners' affective or emotional requirements, which may enhance learning. Additionally, it implies that AIED technology designs should be more inclusive to accommodate students' diverse requirements and preferences.

Table 2

Summary of the Selected Experimental Study

Strategy/AI. Used	Application	Focused Skill/Ability	Beneficiaries	Reference
Google Assistant		English Speaking Skill	Primary Students	[1]
AI Chatbot		English Grammar Skills	University students	[16]
Google Home Mini & Alexa		Listening skill English speaking skill Listening comprehension and vocabulary skills	Undergraduate Students	Obari and Lambacher (2019)
AI-based simulation on Flipped classroom mode		Listening Speaking for English	English Majors	[26]
AI-based technology (RightToRead Intervention)	multi-sensory platform	Reading and Comprehension in English	School students Teachers	[25]

AI-integrated teaching helps enhance the learners' English language performance level [1]. The flipped classrooms show an improvement in their ability to self-managing their learning ability [26]. Many researchers studied the impact of AI-based learning on the English language skills of



learners of different levels (from the lower to the higher classes). They found it to be having a positive impact. This denotes the importance of AI integration in the curricula.

Challenges of Applying AI in Education

The application of AI is a challenging task. As it is an advanced technology, many steps must be taken for a fruitful outcome. Many studies have reported the future challenges that have to be faced while integrating AI into education. It can be summarized as follows:

- Reducing the disparities among the developed, developing, and underdeveloped countries in terms of technological advancement in the educational scenario.[11]
- Lack of adequate teaching-learning materials
- Lack of best-practice examples and tools
- AI remains secluded from the primary curricula
- Costs and Scalability
- Lack of computer, software, and wireless communication infrastructure.
- Rehabilitating teacher educators and honing their traditional abilities to fit modern learning methods and computer use
- Lack of infrastructure
- Give experts in these tactics an immense advantage over other students.
- More incredible isolation results from more indirect communication; unlike traditional education, only some are forced to be in one spot.
- Social culture has to be changed to welcome the new application and remove the misconceptions about the technological application in the educational field.
- Continuous training is needed for both teachers and students.
- Adopting tactics for removing the misconceptions and fear of students and teachers whether the pupil-instructor interaction may cross the social boundary and norms [24]
- Fear of teacher replacement is prevalent.
- Learners fear being mechanical in terms of information processing with the pervasive use of AI [7]
- Preparing the training teachers for increased use of computers and AI.
- We need to raise awareness of the misuse or faulty use of technology and the impact caused by it. [22]
- Re-conceptualizing the role of the educators [27]
- Ethical and safety issues regarding the data [11]



Conclusion

This paper analyzed nearly 30 research papers published in very recent years. The analysis shows that integrating AI technology will promote equity in education. It enhances the quality of the teaching-learning environment and experience, reduces the teachers' stress and burden, and can help them to have more time to approach the learners in a more humanistic way. It helps in the automation of educational administration too. The analysis shows that studies on AI-integrated education conducted in India are very meager. Most of the studies are done in developed countries. This itself points out the disparities that may occur in the future in terms of technology-integrated education. The analysis also highlights the need for more research on AI applications in the educational scenario.

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Author Contributions

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Declaration of Interest

The author declares that the author does not have any competing interest

Data Availability

The data can be made available on request

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