

Revolutionizing Education with Artificial Intelligence: Addressing Educational Challenges through Technological Innovation

Sobia Qadir¹, Seema Afzal², Simeran Jeet Kour³

^{1,2,3}Research Scholar, Education, University of Kashmir

Email : ¹sobia.scscholar@kashmiruniversity.net

²seema.scscholar@kashmiruniversity.net

³simeran.scscholar@kashmiruniversity.net

Abstract

The domain of Artificial Intelligence is currently experiencing a swift metamorphosis, exerting a profound influence on various sectors including education. The integration of Artificial Intelligence technologies like machine learning, natural language processing, data analytical has fundamentally revolutionized the process of developing, delivering and personalizing educational content for students. Artificial intelligence has also made a significant progress in the domain of personalized learning. AI-powered systems can analyze students learning habits, preferences and strengths to offer personalized learning experiences tailored to their individual needs. Artificial Intelligence can also offer interactive and flexible learning experiences that boosts student involvement and enhance the retention of information. The potential of Artificial Intelligence in education is vast. The advancement of Artificial Intelligence algorithms, coupled with growing availability of educational data, customized learning experience, data obsessed decision-making aids in improving educational field. This study offers a comprehensive outline of the role of artificial intelligence in education specifically highlighting its genesis and major challenges.

Keywords: Artificial intelligence, education, automation, personalized learning, machine learning.

1. Introduction

“I have exposure to the very cutting-edge Artificial Intelligence, and I think people should be really concerned about it. Artificial Intelligence is a rare case where we need to be hands-on about regulations instead of reactive. Because I think by the time we are reactive in Artificial Intelligence regulations, it’s too late.” _Elon Mask

Artificial Intelligence can be expressed as the adept replication of human behaviour or cognition via the usage of tools or programs (**Gocen and Aydemir, 2020**). Artificial Intelligence (AI) is increasingly used in education to improve student learning process. Artificial Intelligence not only improves student’s achievements but also contributes to the long-term development of society (**Wardat, et al., 2024**).

Artificial intelligence has brought tremendous fluctuations in the entire system of education especially teaching learning process and curriculum. In short, the entire education system from elementary to higher education, adult education is increasingly transforming with Artificial Intelligence technology (**Liu, et al., 2021**). Artificial Intelligence is the latest and most advanced trend in E-learning within the arena of education. Artificial Intelligence (AI) utilizes data analytics to offer personalized judgements, resulting in improving system of education through tailored instruction. Artificial Intelligence involves the emulation of human intelligence in a programmed machine, enabling it to think and solve a problem in a manner similar to a person. Artificial Intelligence focuses on creating a system capable of intelligent behaviour, processing the cognitive ability, capacity to approach and resolve intricate problems in a logical and sensible manner, similar to that of a human being. It is driven by advanced techniques such as machine learning, deep learning, heuristic searching, rule-based system, artificial neural networks, support vector machines and natural language processing and so on (**Desai V.P., 2021**). Artificial Intelligence is supposed to introduce innovative educational tools to enhance teaching and learning process. Schools should aim to develop novel teaching and learning approaches, foster innovation in teaching assessment and management system. Teachers should proactively modify their cognitive approach, investigate novel amalgamation of Artificial Intelligence and pedagogy, advocate for the profound fusion of technology and instruction and foster innovative advancements in education and teaching (**Liu, et al., 2021**). The incorporation of Artificial Intelligence in education will eliminate the limitation of time and space that exists in traditional teaching and learning. This will create a highly efficient system for the exchange of knowledge, enhance fairness in educational process and improve the overall quality of education. Students will be able to develop their potential where as teachers work load will be decreased by Artificial Intelligence systems, and the educational environment will become more intelligent and fruit fulling, and to prepare students and teachers (**Liu, et al., 2021**). According to World Bank Artificial Intelligence refers to software systems ability to perform tasks. Human intellect is typically required for vision, speaking, language, knowing and searching. Government see Artificial Intelligence as a vital resource for growing affordability and economic growth. According to 2018 research report by McKinsey and Company, Artificial Intelligence has the potential to generate \$13 trillion in global economic value by 2030.

Brief History of Artificial Intelligence in Education

The first “Artificial Intelligence period” began with the Dartmouth meeting in 1956, which gave Artificial Intelligence its name and aim. John McCarthy invented the term “Artificial Intelligence” which now refers to the scientific discipline (**Holmes, et al 2019**). The origins of Artificial Intelligence in education may be traced back to the work of famous psychologists like B. F. Skinner and Sidney Pressey. Skinner is also referred as father of Artificial Intelligence as he laid the ground work for its application in education. Gordon Pask, British polymath, is credited in developing the first genuinely adaptative teaching machine in the initial 1950. Pressey made various machines that are useful in arena of teaching and learning, one such sophisticated machines is based on mechanical type writer. Pressey was one of the pioneers who argued that a teaching machine could not only facilitate learning but also enhance a teacher’s life by alleviating them as one of their responsibilities. By allocating more time for teachers to interact with their pupil, they can prioritize the most engaging aspects of their job and delegate the less stimulating activities, such as marking tests. Pressey’s approach was later on elaborated by Skinner, who laid emphasis on

techniques that he developed for training rats and pigeons might be adopted for teaching pupil. Skinner also developed a teaching machine in 1958. Skinner's teaching device might be seen as a precursor to the division of automated instruction into distinct components, a concept later explored by AI researchers in the arena of teaching learning (Holmes, et al 2019).

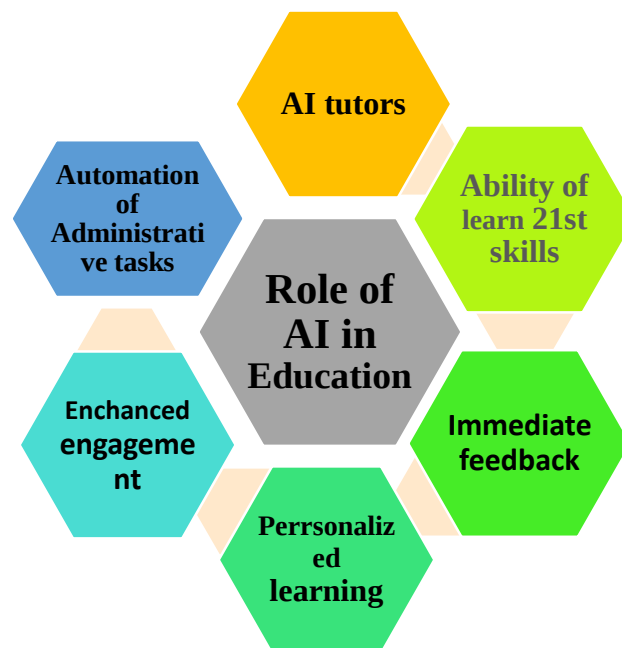


Table 1.1 Chronology of Artificial Intelligence in Education

Serial	Year	Description
1	1970	Researchers investigate the usability of Artificial Intelligence in the arena of natural language processing and machine learning, this research gives advancement to intelligent tutoring system that can help in understanding of natural languages and help students to adjust as per their level of expertise.
2	1980	Artificial intelligence is utilized in the field of teaching and learning to provide personalized knowledge and progress evaluation and assessment process. Researchers begin to utilize Artificial Intelligence in the arena of instructional design.
3	1990	Artificial intelligence is utilized to develop intelligent knowledge setting and adaptable educational system. Artificial Intelligence is further utilized for the determination of generating personalized learning experiences suitable to students' knowledge and learning styles.
4	2000	Development of educational data archaeology and learning analytics empowers educators to utilize data-driven decision making in their instructional practices. Artificial Intelligence is employed for the drive of generating or producing online tutors and virtual assistance.

5	2010	Massive Open Online Courses (MOOCs) and Learning Management Systems (LMS) can include Artificial Intelligence to provide tailored education. Artificial Intelligence integration has enhanced personalized learning experiences and automated grading.
6	2020	The COVID-19 pandemic is expedited the implementation of Artificial Intelligence in education particularly for remote learning and online platforms. Artificial Intelligence driven chatbots are utilized to offer assistance to students through virtual reality and augmented reality.

Artificial Intelligence and Education

In the past 25 years, there have been major breakthroughs in the field of Artificial Intelligence in Education. Artificial Intelligence in Education is the use of Artificial Intelligence technologies in education to improve decision making, teaching and learning. Artificial Intelligence could serve a variation of functions in educational environments. Emerging computer technologies including robot control, sensor devices, Quantum computing, variables and 5G wireless connection have opened up new prospects for Artificial Intelligence in learning and teaching design (**Nulbant, 2021**). Artificial Intelligence applications have become increasingly important in various areas, including the education. The incorporation of Artificial Intelligence and its application is considered a significant advancement in the field of education. The area of education is embracing Artificial Intelligence technologies and their use in the context of Education is growing steadily. According to Horizon report, a significant increase in Artificial Intelligence applications up to 43% has been seen from 2018 to 2022. The report further showed that a significant increase has occurred in Artificial Intelligence technologies in the area of teaching and learning (**Ahmad, et al, 2021**). The educational sector's identified strategies to meet stakeholders needs and improve education quality. The applicability of Artificial Intelligence is one of the important strategies for improving education. Artificial Intelligence has a bright future in education, as technology transforms our teaching and learning practices (**Rahiman & Kodikal, 2024**). The significance of Artificial Intelligence in the field of education is undeniable and its involvement in sector is closely connected to its future. Education has embarrassed the incorporation of Artificial Intelligence to various degrees, yet many teachers lack knowledge about its nature and capabilities. Artificial intelligence is inevitable in education and its purpose is to support educators in achieving their goals (**Ahmad, et al, 2021**).

Artificial intelligence and students

Students are future of a nation. In the age of Artificial Intelligence, students have two roles: users and developers. Artificial Intelligence technology is being integrated into education and can be applicable for many aspects of learning (**Nalbant, 2021**). Artificial Intelligence-powered learning evaluates student's performances, identifies strengths and weakness, and customizes learning experiences to meet their unique needs. This approach offers students a tool kit model for effective information acquisition and productive outcomes. Artificial Intelligence -based technology such as virtual assistance tools, chatbots and adaptive learning system offer immersive and engaging learning experience that help students to discover complicated theories and answer in a more dynamic and meaningful manner (**Rahiman & Kodikal, 2024**). AI can provide modified explanations tailored to each student's needs, their proficiency level and preferred method of learning. Artificial intelligence applications will primarily be integrated into existing

teaching techniques. Artificial Intelligence technology is also well-suited for acquiring and evaluating factual knowledge. The requirement for students to be physically present in a classroom will no more necessary, therefore Artificial Intelligence is facilitating their ability to attend international classes as well (vorst & Jelcic, 2019).

Artificial Intelligence and Teachers

Teachers play a central role in the structure of education. The teacher has the autonomy to regulate the organization of the lesson. The design of an Artificial Intelligence can facilitate the design thinking perspective. The teacher's needs play a major role in development of a technology in the context of design thinking, proper integration of Artificial Intelligence in education system can help teacher to achieve this goal (vorst & Jelcic, 2019). Artificial intelligence takes over certain work responsibilities such as analyzing and responding to student's inquiries, it is probable that teachers should shift their focus towards addressing difficult problems and engaging with students on a deeper level (Jain & Jain, 2019). Artificial Intelligence also identifies areas for teachers' improvement and offer individualized professional development opportunities. For instance, Artificial Intelligence powered coaching tools give teachers with feedback on their teaching performance and identify areas for their growth (Rahiman & Kodikal, 2024). Artificial Intelligence has the capacity to automate certain instructional jobs. Additionally, existing tasks will gain greater significance and various new task can be developed through the application of Artificial Intelligence. Artificial Intelligence can also help teachers in the selection of course materials and assessment/grading (vorst & Jelcic, 2019).

Challenges of Artificial Intelligence in Education

There are numerous contributions of Artificial Intelligence in the field of education, but there are also various challenges that hinder the incorporation of Artificial Intelligence in the field of education. Authorization and fiscal support should consistently limit the enhanced academic performance and instructional assistance provided by Artificial Intelligence. Privacy regulations also provide certain significant limitations, as it is necessary to regularly update them in order to address the capability of Artificial Intelligence frameworks to collect and utilize information for analytical purposes (Jain & Jain, 2019). Students rely on social media platforms to engage with one another. Students who spend 90% of their leisure time virtual environments and games may struggle to prioritize their study. Artificial Intelligence has led to more individualization in work. The capacity to access information with a few keys has led to isolation and an asocial personality. Furthermore, the radiation emitted by technological items can pose health risks. Individuals who spend a significant amount of time using technology may experience health issues such as eye disorders, nerve compression, neck, waist, and wrist pain. When it comes to educational unemployment, robotic teachers have the potential to replace regular teacher. Artificial Intelligence development is tough due to the high complexity of computers. Repairs and maintenance for these equipment's can be fairly expensive (Nalbant, 2021).

Recommendation

1. The utilization of Artificial Intelligence in the field of education may effectively enhance the teaching learning process, foster the wellbeing of students, staff, administrative operations etc.
2. Artificial Intelligence should assist every student in attaining their educational objectives, while also taking into account the principles of fairness, inclusiveness and reduction of disparities in assistive digital resources.
3. Artificial Intelligence technologies must be in accordance with the collective educational vision, catering to diverse learning needs and background.
4. It is important to exercise caution and take the appropriate steps to ensure that robots and Artificial Intelligence never dominate situation without human over sight, particularly in the arena education.
5. Integration of Artificial Intelligence in education necessitates adherence to crucial aspects of technology policy, such as privacy, data security, student safety, and data ownership.
6. Provide teachers training on Artificial Intelligence structures and tenders to improve their skills and knowledge of Artificial Intelligence approaches in the classroom.
7. Use of Artificial Intelligence in the arena of education should be done keeping in view the ethical considerations, especially with regard to safeguarding student privacy and data security.
8. Additional research is needed to evaluate the effect of Artificial Intelligence on student and instructor performance in various countries and samples (**World economic forum**).

Conclusion

The incorporation of Artificial Intelligence into the education system has significant potential to completely transform teaching and learning process. Artificial Intelligence -powered tools and systems enable teacher to customize student learning experience, pinpoint student's strengths, shortcomings and deliver focused interventions. In addition, Artificial Intelligence has the capacity to automate administrative work, so allowing teachers to allocate more time towards student engagement and the implementation of innovate teaching methods. In order to ensure fair and responsible use of Artificial Intelligence in education, it is important to address difficulties such as data privacy concerns, ethical considerations, and the digital divide. It enhances effective collaborations among teachers, policy makers and stakeholders. Thus, Artificial Intelligence can be a powerful instrument to bring revolutionary changes in the field of education.

Reference:

1. Adair, A. (2023). Teaching and Learning with AI: How Artificial Intelligence is Transforming the Future of Education. XRDS: Crossroads, The ACM Magazine for
2. Ahmad, S. F., Rahmat, M. K., Mubarik, M. S., Alam, M. M., & Hyder, S. I. (2021). Artificial intelligence and its role in education. Sustainability, 13(22), 12902.
3. Cardona, M. A., Rodríguez, R. J., & Ishmael, K. (2023). Artificial intelligence and the future of teaching and learning: Insights and recommendations. <https://tech.ed.gov>.
4. Crompton, H., & Burke, D. (2023). Artificial intelligence in higher education: the state of the field. International Journal of Educational Technology in Higher Education, (20), 8.

5. Desai V. P. (2021). Development of Artificial Intelligence based E-learning system. Retrieved from <http://hdl.handle.net/10603/355638>
6. Gocen, A., & Aydemir, F. (2020). Artificial intelligence in education and schools. *Research on Education and Media*, 12(1), 13-21.
7. Holmes, W., Bialik, M., & Fadel, C. (2023). *Artificial intelligence in education*. Globe ethics Publications.
8. Ilkka, T. (2018). The impact of artificial intelligence on learning, teaching, and education. European Union. Doi:10.2760/12297.
9. Jain, S., & Jain, R. (2019). Role of artificial intelligence in higher education—An empirical investigation. *IJRAR-International Journal of Research and Analytical Reviews*, 6(2), 144-150.
10. Liua, Y., Salehb, S., & Huang, J. (2021). Artificial intelligence in promoting teaching and learning transformation in schools. *Artificial Intelligence*, 15(3).891-902.
11. Nalbant, K. G. (2021). The importance of artificial intelligence in education: a short review. *Journal of Review in science and engineering*, 2021, 1-15. *Students*, 29(3), 7-9.
12. Rahiman, H. U., & Kodikal, R. (2024). Revolutionizing education: Artificial intelligence empowered learning in higher education. *Cogent Education*, 11(1), 2293431.
13. Roll, I., & Wylie, R. (2016). Evolution and revolution in artificial intelligence in education. *International Journal of Artificial Intelligence in Education*, 26, 582-599.
14. Sabzalieva, E., & Valentini, A. (2023). ChatGPT and artificial intelligence in higher education: quick start guide.
15. Sheng, X. (2023). The Role of Artificial Intelligence in History Education of Chinese High Schools. *Journal of Education, Humanities and Social Sciences*, 8, 238-243.
16. Tao, B., Díaz, V., & Guerra, Y. (2019). Artificial intelligence and education, challenges and disadvantages for the teacher. *Arctic Journal*, 72(12), 30-50.
17. Vorst, J., & Jelcic, N. (2019). Artificial Intelligence in Education Can AI bring the full potential of personalized learning to educationss. In 30th European Conference of the International Telecommunications Society (ITS).
18. Wardat, Y., Tashtoush, M., AlAli, R., & Saleh, S. (2024). Artificial Intelligence in Education: Mathematics Teachers' Perspectives, Practices and Challenges. *Iraqi Journal for Computer Science and Mathematics*, 5(1), 60-77.
www.worldbank.org/govtech
19. Zawacki-Richter, O., Marín, V. I., Bond, M., & Gouverneur, F. (2019). Systematic review of research on artificial intelligence applications in higher education—where are the educators? *International Journal of Educational Technology in Higher Education*, 16(1),