Artificial Intelligence in Education

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ABSTRACT

The incorporation of Artificial Intelligence (AI) into the classroom has the possibilities to develop the way students learn and teachers teach. AI styles and methods can provide students with personalized feedback and recommendations, enabling for a more engaging and productive learning experience. Despite these potential benefits, there are also many challenges attached to incorporating AI into the classroom. This paper discusses the benefits of incorporating AI into the classroom, the challenges that teachers encounter when using AI, and best approaches for effectively integrating AI into the curriculum, content and teaching styles at various level of education.

Key words: Artificial Intelligence, education, benefits, challenges

INTRODUCTION

One of the key benefits of incorporating AI into the classroom is the ability to provide students with a more personalized learning experience. AI algorithms can analyze student data and adapt to their learning styles, providing feedback and recommendations that are tailored to their individual needs and abilities. This can help to keep students engaged and motivated and can lead to improved academic performance. Another benefit of incorporating AI into the classroom is the opportunity to deepen students' understanding of this rapidly-evolving technology. By incorporating AI into the curriculum, teachers can help students develop a critical perspective on this technology, and prepare them for the challenges and opportunities of the digital age. Finally, incorporating AI into the classroom can also help students develop important 21st-century skills, such as problem-solving, critical thinking, and collaboration. These skills are essential for success in the digital age, and they can be developed through hands-on experience with AI tools and applications (Melo, 2023).

STUDIES ADVOCATING USING AI IN THE CLASSROOMS

Research of Zhang (2023)

This study delves into the integration mechanisms and methodologies of AI-based wireless classrooms across diverse educational institutions. Building upon previous accomplishments, this work elucidates the fundamental aspects of AI, explicates the underpinnings of wireless classrooms, and analyzes pertinent components. Additionally, the study summarizes the elements of audience engagement in the context of wireless networks. The effectiveness of wireless classrooms is assessed through a questionnaire survey administered to students, exploring their perceptions and experiences in independent learning. Furthermore, by incorporating relevant classroom knowledge and employing a well-structured management mechanism, wireless classrooms exhibit distinct advantages over traditional classroom setups, fostering visual feedback, bolstering students' independent learning capabilities, and elevating the overall quality of modern teaching (Zhang, 2023).

Research of Fan and Li (2023)

To address the problem of the classroom practice teaching of art and design, this paper proposes an interactive learning method in universities, followed by the use of AI technology to evaluate the quality of art and design teaching. The study aims to achieve the following objectives: to introduce the current research status of art and design and interactive teaching methods used in other countries; to discuss the essential ideas and mechanics of Back Propagation Neural Networks and other standard teaching approaches based on interactive learning; and to input test data into the trained model and compare the obtained results with the evaluation results of experts. The findings of this study indicate that the model used to evaluate art and design instruction is accurate. The proposed interactive learning method is beneficial for art and design majors as it allows them to improve their practical skills and learn more engagingly and effectively. The use of AI technology for evaluation purposes can also improve the quality of art and design education in universities (Fan & Li, 2023).

Research of Trovati et al. (2023)

Automated decision-making techniques play a crucial role in data science, AI, and general machine learning. However, such techniques need to balance accuracy with computational complexity, as their solution requirements are likely to need exhaustive analysis of the potentially numerous events combinations, which constitute the corresponding scenarios. Intuition is an essential tool in the identification of solutions to problems. More specifically, it can be used to identify, combine and discover knowledge in a "parallel" manner, and therefore more efficiently. As a consequence, the embedding of artificial intuition within data science is likely to provide novel ways to identify and process information. There is extensive research on this topic mainly based on qualitative approaches. However, due to the complexity of this field, limited quantitative models and implementations are available. In this article, the authors have extended the evaluation to include a real-world, multi-disciplinary area in order to provide a more comprehensive assessment. The results demonstrate the value of artificial intuition, when embedded in decision-making and information extraction models and frameworks. In fact, the output produced by the approach discussed in their article was compared with a similar task carried out by a group of experts in the field. This demonstrates comparable results further showing the potential of this framework, as well as artificial intuition as a tool for decision-making and information extraction (Trovati et al., 2023).

Research of Chiu (2023)

Generative artificial intelligence (GenAI) tools have become increasingly accessible and have impacted school education in numerous ways. However, most of the discussions occur in higher education. In schools, teachers' perspectives are crucial for making sense of innovative technologies. Accordingly, this qualitative study aims to investigate how GenAI changes our school education from the perspectives of teachers and leaders. It used four domains – learning, teaching, assessment, and administration – as the initial framework suggested in a systematic literature review study on AI in education. The participants were 88 school teachers and leaders of different backgrounds. They completed a survey and joined a focus group to share how ChatGPT and Midjounery had a GenAI effect on school education. Thematic analysis identified four main themes and 12 subthemes. The findings provide three suggestions for practices: know-it-all attitude, new prerequisite knowledge, interdisciplinary teaching, and three implications for policy: new assessment, AI education, and professional standards. They also further suggest six future research directions for GenAI in education (Chiu, 2023).

Research of Nikolic et al. (2023)

ChatGPT, a sophisticated online chatbot, sent shockwaves through many sectors once reports filtered through that it could pass exams. In higher education, it has raised many questions about the authenticity of assessment and challenges in detecting plagiarism. Amongst the resulting frenetic hubbub, hints of potential opportunities in how ChatGPT could support learning and the development of critical thinking have also emerged. In this research, they examined how ChatGPT may affect assessment in engineering education by exploring ChatGPT responses to existing assessment prompts from ten subjects across seven Australian universities. They explored the strengths and weaknesses of current assessment practice and discussed opportunities on how ChatGPT can be used to facilitate learning. As artificial intelligence is rapidly improving, this analysis sets a benchmark for ChatGPT's performance as of early 2023 in responding to engineering education assessment prompts. ChatGPT did pass some subjects and excelled with some assessment types. Findings suggested that changes in current practice are needed, as typically with little modification to the input prompts, ChatGPT could generate passable responses to many of the assessments, and it is only going to get better as future versions are trained on larger data sets (Nikolic et al., 2023).

Research of Strzelecki (2023)

ChatGPT is an AI tool that assisted in writing, learning, solving assessments and could do so in a conversational way. The purpose of the study was to develop a model that examined the predictors of adoption and use of ChatGPT among higher education students. The proposed model was based on a previous theory of technology adoption. Seven predictors were selected to build a model that predicted the behavioral intention and use behavior of ChatGPT. The partial-least squares method of structural equation modeling was used for data analysis. The model was found to be reliable and valid, and the results were based on a self-reported data of 534 students from a Polish state university. Nine out of ten proposed hypotheses were confirmed by the results. Habit was found to be the best predictor of behavioral intention, followed by performance expectancy and hedonic motivation. The dominant determinant of use behavior was behavioral intention, followed by personal innovativeness. The research highlighted the need for further examination of how AI tools could be adopted in learning and teaching (Strzelecki, 2023).

Research of Farazouli et al. (2023)

AI chatbots have recently fuelled debate regarding education practices in higher education institutions worldwide. Focusing on Generative AI and ChatGPT in particular, the study examines how AI chatbots impact university teachers' assessment practices, exploring teachers' perceptions about how ChatGPT performs in response to home examination prompts in undergraduate contexts. University teachers ($n = 24$) from four different departments in humanities and social sciences participated in Turing Test-inspired experiments, where they blindly assessed student and ChatGPT-written responses to home examination questions. Additionally, they conducted semi-structured interviews in focus groups with the same teachers examining their reflections about the quality of the texts they assessed. Regarding chatbot-generated texts, they found a passing rate range across the cohort, $37.5 - 85.7\%$, and a chatbot-written suspicion range 14–23%. Regarding the student-written texts, they identified patterns of downgrading, suggesting that teachers were more critical when grading student-written texts. Drawing on post-phenomenology and mediation theory, they discuss AI chatbots as a potentially disruptive technology in higher education practices (Farasouli et al., 2023).

The above research showed the usefulness of artificial intelligence in education, however Live Tiles (2021) put some pros and cons about the use of artificial intelligence in education. Quoted from Live Tiles they thought that AI:

- Personalized Learning: Much attention is usually given to what students learn, with a historical tendency to focus on curriculum. However, how a student learns is just as important. Advances in AI are giving teachers a better understanding of how their students learn and allowing them to customize the curriculum accordingly.

- ITS (Intelligent Tutoring Systems): ITS aren't some far-off vision of the future—they already exist in a practical capacity. While far from the norm, they are capable of functioning without a teacher having to be present and can effectively challenge and support the learner using different algorithms.

- Adaptive Group Formation: By analyzing learner information, AI can generate groups particularly suited to a certain task, or groups that balance one learner's weaknesses with another learner's strengths.

- Facilitation by Example: Models of effective collaboration can be used to support learners and help them identify effective problem solving strategies

- Intelligent Moderation: Intelligent Moderation allows human tutors, moderators and teachers to analyze the data produced by large groups with the assistance of AI techniques like machine learning. In turn, educators can be more efficient in the classroom.

- Virtual Reality Learning: Taking a page from aviation education, VR-assisted learning allows for educational support in authentic environments and extends the boundaries of the classroom[1]. Realistic immersion in virtual environments can provide learners with a richer understanding of the material. This will also act as a stepping stone to real-world experiences, with fully integrated AIs, humans will employ machines for space and ocean exploration, fraud detection, knowledge management, job training and precision surgeries.

- Essay Grading Software: Software that can instantly grade student essays is a significant benefit. Every graded essay adds to a central database to which future essays are compared.

- Real-time Problem Solving Assessment: This reduces the load on teachers by providing simultaneous instruction in a classroom setting.

Improving Course Quality: AI can analyze patterns in which a large number of students submit wrong answers to the same questions. By alerting the educator to these patterns, AI can help make teachers more effective.

- Dynamic Scheduling and Predictive Analysis By using predictive computing, AI can learn students' habits and propose the most efficient study schedule for them. This is a benefit for the customer service agent, medical intern, or anyone who does a repetitive or laborious tasks; a machine won't get bored, tired or need a break and should the machine encounter a problem or question out of its programming a human will be contacted to step in.

- Custom Textbooks: Educators will be able to import a syllabus and AI will generate a textbook filled with the core content (CTI). This makes for an incredible amount of customization, not only from class to class or grade to grade, but within the school year itself.

- Virtual Humans: While seemingly something out of science fiction, virtual humans are already a reality. Intelligent interfaces like the twins[2] at the Boston Museum of Science, for example, provide a much-needed social dynamic to artificial intelligence. Virtual humans like avatars, digital assistants or Chatbots are cost efficient and can work 24 hours, seven days a week in those repetitive and time-consuming tasks no human enjoys doing.

- Intelligent Game Based Learning Environments: Using gamification[3] to motivate learners can help improve retention while making the learning experience fun.

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[1] https://lectrum.com.au/
[2] https://ict.usc.edu/prototypes/museum-guides/
[3] https://livetilesglobal.com/3-benefits-of-gamification

- Machine Translation: While today's translation apps are not as accurate as human translation, machine translation can be faster and more efficient. Machine translation has the potential to bridge the language gap for many second language students (Live Tiles, 2016).

- Empowering the Disabled (Differently-Abled): AI programs that augment the educational experience for the disabled are already in development by companies like Facebook. These advancements can grant learners with special needs a greater sense of autonomy (Live Tiles, 2021).

And then Live Tiles put six reasons to be skeptical about artificial intelligence:

- Cost: When combining the cost of installation, maintenance and repair, it's clear that AI is expensive. Only the most well-funded schools will find themselves in a position to benefit from AI.

- Addiction: As we rely on machines to make everyday tasks more efficient, we risk technology addiction.

- Lack of Personal Connections: While smart machines improve the education experience, they should not be considered a substitute for personal interaction. Relying too much on these machines to grade or tutor may lead to educational oversights that hurt learners more than help.

- Unemployment: Making teaching more efficient could create less of a demand for educators. With the advent of MOOCs[4], class size is no longer as much of a determining factor in quality education, and even at the K-12 level, the implementation of AI may mean a decrease in teaching aids and assistants.

- Efficient Decision Making: Computers are getting smarter everyday. They are demonstrating not only an ability to learn, but to teach other computers (Knight, 2015). However, it is debatable whether they can implement intuition-based decision making in new situations, which often arises in the classroom.

- Loss of information: When the inevitable occurs and an AI needs repairs, how much information will be lost?

When it comes to the pros and cons of artificial intelligence, there are clearly more benefits. However, in order to fully gain from AI, a balance must be struck between the machines that optimize tasks and the people that use the machines. The aim of artificial intelligence in the classroom shouldn't be to replace educators. It should make their jobs easier.

By integrating your digital classroom within a school intranet[5], you widen the options for students to learn in a hybrid environment. There are options to automate replies, content and lessons, based on your students' needs and create a social platform where students can interact with each other, teachers and parents (Live Tiles, 2021).

BENEFITS OF ARTIFICIAL INTELLIGENCE IN EDUCATION

Moreover Mathew Lynch discussed the benefits of using artificial intelligence in education at various levels. He wrote slowly but surely, artificial intelligence (AI) has infiltrated every area of our lives, from clothes shopping to TV viewing to dating. But what is its impact on education? Will it help teachers, or make them obsolete?

In fact, AI does not detract from classroom instruction but enhances it in many ways. Here are some of the benefits of AI in our educational systems.

Personalization: It can be overwhelmingly difficult for one teacher to figure out how to meet the needs of every student in his/her classroom: remedial students, advanced students, ESL students and the disabled all need to have the same access to learning. AI systems easily adapt to each student's individual learning needs and can target instruction based on their

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[4] https://www.insidehighered.com/blogs/higher-ed-beta/impacts-moocs-higher-education
[5] https://livetilesglobal.com/intranet-enterprise/

strengths and weaknesses, meaningless work for teachers and a more meaningful learning experience for students.

Tutoring: Yes, it's already happening: thanks to AI, machines are taking on the role of humans in many capacities, including tutors. As with human tutors, "Intelligent Tutoring Systems" can gauge a student's learning style and pre-existing knowledge to deliver customized support and instruction.

Grading: This is arguably one of the most tedious teaching tasks and takes time away from more meaningful and purposeful pursuits, like lesson planning and professional development. Machines are now so far advanced that they can do much more than simply grade an exam with an answer key; they can compile data about how students performed and even grade more abstract assessments such as essays.

Feedback on course quality: AI can identify instruction gaps in the course content based on student performance on assessments. For example, if a significant percentage of students answer a question incorrectly, AI can zero in on the specific information or concepts that students are missing, so that educators can deliver targeted improvements in materials and methods.

Meaningful and immediate feedback to students: In an age when most communication occurs online or via text message, students are increasingly hesitant about taking risks in front of teachers and peers. They shrink from receiving critical feedback in such a public forum. With AI, students can feel comfortable to make the mistakes necessary for learning and receive the feedback they need for improvement.

As educators, we all have fears about instituting large systemic changes, and sometimes those fears are well grounded. However, we cannot afford to ignore the possibilities that AI offers us for dramatically improving the student learning experience (Lynch, 2017).

University of San Diego reported that Bernard Marr explains that AI tools can enhance inclusion and universal access to education in a number of ways, including:

- Helping to make global classrooms available to all, including those who speak different languages or who might have visual or hearing impairments;
- Creating access for students who might not be able to attend school due to illness;
- Better serving students who require learning at a different level or on a particular subject that isn't available in their own school.

Overall, it is hoped that AI will ultimately help educators make continued progress in addressing the broad range of physical, cognitive, academic, social and emotional factors that can affect student learning and ensure that all students have equal opportunity in education, regardless of their social class, race, gender, sexuality, ethnic background or physical and mental disabilities (University of San Diego online, 2024).

Lynch (2017) came up with twenty six ways that artificial intelligence is transforming education for the better they are as follows:

1. Classroom/Behavior Management: AI is currently being used to help teachers manage student behavior and the entire classroom.
2. Assistive Technology: AI is currently being used to help special needs students access a more equitable education. For instance, AI that performs routine tasks such as reading passages to a visually impaired student.
3. Coding: AI is currently being used to teach students to code
4. Gamification. AI is currently being used to facilitate and manage educational games.
5. Early Childhood Education: AI is currently being used to power interactive games that teach children basic academic skills and more.
6. Adaptive Learning: AI is currently being used to teach students basic and advanced skills by merely assessing their present skill level and creating a guided instructional experience that helps them become proficient.

7. Lesson Planning: AI is currently being used to develop lesson plans. All teachers need to do is set a few parameters, and AI does the rest.
8. Classroom Audio-Visual: AI is currently being used to manage classroom audio-visual devices. Just tell AI what you need for it to do.
9. Parent-Teacher Communication: AI is currently being used to facilitate parent-teacher communication, and the process, helping to increase parental involvement.
10. Language Learning: AI is currently being used to help students learn another language. As a matter of fact, there are hundreds of language learning apps that are powered by AI.
11. Writing: AI is currently being used to help students improve their writing skills. I am currently using a grammar and usage app to help me write this article.
12. Test Prep: AI is currently being used to help student's study for exams. It utilizes the same adaptive learning process that we discussed earlier.
13. Scheduling: AI is currently being used to help education administrators schedule high school and college courses or individuals to manage their daily, weekly, monthly or yearly schedules.
14. Assessment: AI is currently being used to grade assessments for teachers. AI can even grade essays.
15. Diagnosis: AI is currently being used to diagnose reading and academic difficulties. AI can even screen students for learning disabilities.
16. Data and Learning Analytics: AI is currently being used by teachers and education administrators to analyze and interpret data.
17. Learning Management Systems: AI is currently being used by online instructors to manage online learning and flipped or blended learning.
18. Staff Scheduling and Substitute Management: AI is currently being used by education administrators to handle staff scheduling. For instance, if a teacher informs you that they will be sick the next day, AI can contact a viable substitute and confirm their availability. Afterward, it will update the system, so you know that substitute has been secured.
19. Professional Development: AI is currently being used to provide professional development to educators, allowing them to learn at their own pace.
20. Transportation: AI is currently being to manage school transportation systems.
21. Maintenance: AI is currently being used to manage and monitor maintenance workflow for school district's; dispatching staff members to schools that need assistance.
22. Facilities Management: AI is currently being used to manage the facilities of an entire school district's, monitoring the status of power, Wi-Fi, and water services; alerting the facilities management workers when problems arise.
23. Finance: AI is currently being used by education administrators to manage their schools' budget, make purchases, etc.
24. Cybersecurity: AI is currently being used by school IT professionals to keep their school network and its users safe from cybercriminals.
25. Safety and Security: AI is currently being used to prevent school shootings by monitoring the school environment; identifying any potential threats.
26. School Management: AI is currently being used to manage entire schools, powering student records systems, transportation, IT, maintenance, scheduling, budgeting, etc. (Lynch, 2019).

Butulis added pros that include saving time, enhancing readability, expanding vocabulary and grammar skills, improving linear communication skills, enhancing creative thinking, and uncovering perspectives from which to research or critically appraise topics further (Butulis, 2023).

CONCLUSION

The integration of AI into educational practice almost always involves the introduction of commercial tools into classrooms. AI-enabled tools are constantly being marketed to schools, promising personalized learning and enhanced efficiency. However this misunderstands the real objectives of education and potentially undermines democratic control, critical for ensuring equal access and for serving societal interests. Furthermore, the commercialization of education through AI has other potential negative consequences. The emphasis on standardized testing, which might be easier to market, could in fact neglect individual student needs and stifle intellectual curiosity and creativity, providing a narrow education that may not properly prepare students for their futures. In addition, the integration of commercial AI-enabled technologies in classrooms raises issues of privacy, surveillance, and potential exploitation of vulnerable groups. Moreover, there is a risk of mishandling student and teacher data, potentially violating privacy rights and eroding trust in the educational system through constant monitoring and evaluation (Mentz et al., 2023).

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