

The Role of Generative AI Tools in Modern Classrooms: Opportunities and Challenges

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Abstract

For many years, learning management systems like Google Classroom, Canvas, and Turnitin have been powered by AI in classrooms. However, generative AI tools like ChatGPT and large language models (LLMs), which generate natural language and other types of content to perform a wide range of tasks, have recently become more accessible, and academics are debating the potential opportunities and challenges of GenAI and AI in today's classrooms. The drive to commercialize comparable innovations across industries is presenting both educators and students with exciting possibilities and issues. Almost every aspect of our life is expected to be impacted by generative artificial intelligence (AI), and one of the first industries to deal with this rapidly developing technology is education. Hence, the present study focuses on how generative AI tools help the modern classroom, along with its opportunities and challenges.

Key Words: Generative, AI, Modern, Classrooms

Introduction

Artificial Intelligence (AI) is quickly changing education, especially in the areas of exams, assignments, feedback, creating questions and answers, curriculum design, and lesson planning, where teachers have historically spent a lot of time choosing content, matching objectives, and tailoring lessons for a variety of learners. Tools like ChatGPT, Grok, Gemini, Bard, Bing, Claude, EduPlanner, MagicSchool AI, TriQuest, Duolingo etc. can now support or automate content creation, create lesson plans, create assessments, and analyze student data to personalize learning thanks to recent developments in large language models (LLMs) and machine learning (Karpouzis et al., 2024; Wang et al., 2025). Global issues, including rising teacher workloads, greater classroom diversity, the need for individualized learning pathways, and the requirement to continuously update curricula for 21st-century skills, are what are driving this change (Ahad, 2024; Mustafa et al., 2024).

Generative AI (GenAI) has become one of the fastest-growing technologies in human history in recent years. GenAI tools, which are primarily powered by large language models (LLMs), have become the talk of every educational institution, teacher, and learning-related scientific venue, placing GenAI at the center of current practice, policy, and research. As technology develops, educators are looking for ways to support students' learning in novel ways and assessing the effects of GenAI technologies on life, education, and employment. Whether and how GenAI should be utilized to help contemporary schools is still up for debate (Giannakos, Azevedo, Brusilovsky, Cukurova, Dimitriadis, Hernandez-Leo,... Rienties, 2024).

ChatGPT, Gemini, and Copilot are examples of generative AI (GenAI) programs that have raised serious concerns in education and research on the future relevance of instructors in relation to ethical issues. According to some scholars, GenAI tools are revolutionary in the twenty-first century, emphasizing cognitive and evaluative skills. Similarly, GenAI tools have become a disruptive force in a number of fields, including education, where their incorporation has the potential to completely change conventional methods of instruction and learning. GenAI technologies have been more popular in contemporary classrooms in recent years, providing teachers and students with cutting-edge resources to improve language learning and proficiency (Ghimire, Neupane, & Dahal, 2024).

Because of AI's data-driven capabilities, learner analytics can be utilized to guide curriculum choices, allowing for early detection of vulnerable pupils and the improvement of flexible curricula (MDPI, 2025). Research has demonstrated that artificial intelligence-aided design can boost multidisciplinary curricular collaboration, increase efficiency, and improve personalization (Kanvaria & Ritika, 2024; TriQuest Study, 2025). But using AI also brings up issues with data privacy, algorithmic bias, content accuracy, and the possibility of reducing teacher agency (Yan et al., 2023; Powell & Courchesne, 2024). These issues underscore the need for teacher professional development that emphasizes critical assessment and regulation of AI-generated content in addition to tool utilization

Although the effectiveness of GenAI tools was encouraging, there were always a number of restrictions, flaws, and moral dilemmas. Therefore, more research is required to understand GenAI's opportunities and challenges as well as how it will affect current practices in terms of assessment, course creation, learning design, learning objectives, and so on, even though there is no doubt that it will have both positive and negative effects on education in the upcoming years (Giannakos, Azevedo, Brusilovsky, Cukurova, Dimitriadis, Hernandez-Leo,... Rienties, 2024).

Research on artificial intelligence-aided activities and tasks is expanding, but the results are still dispersed throughout educational levels and contexts. To fully comprehend the possibilities, difficulties, and ramifications of GenAI in educational design, a comprehensive analysis is required. Thus, the goal of this study is to investigate how GenAI tools help in voice assistants, personalization learning, feedback, exams, assignments, curriculum design, lesson planning etc. while also looking at their opportunities and challenges.

Literature Review

Ukwandu, Omisade, Jones, Thorne, & Castle (2025) mentioned in their research paper entitled The future of teaching and learning in the context of emerging artificial intelligence technologies that in the current post-COVID-19 era, work from home, online learning, and conventional in-person educational environments have all been combined to create hybrid work patterns and integrated education. Another significant shift has been taking place since November 2022, driven by the introduction of GenAI technologies like OpenAI's ChatGPT. Without a doubt, this is quickly causing a structural shift that is unavoidable in all areas of human endeavor, including education.

Souza, & Weigang (2025) found in their research paper entitled Grok, Gemini, ChatGPT and DeepSeek: Comparison and Applications in Conversational Artificial Intelligence that four Conversational Artificial Intelligence models—Grok, Gemini, ChatGPT, and DeepSeek—were thoroughly compared in this study. It was feasible to emphasize the key features, advantages, and disadvantages of each model through a technical and application examination. While Gemini comes out for being an all-inclusive model that offers an adaptable framework to various sorts of data, Grok shines out for its interaction with the X platform (Twitter) and its emphasis on autonomy in expression. on contrast, DeepSeek emphasizes on data gathering and exploration, demonstrating exceptional accuracy in this field, while ChatGPT promotes itself as a widely utilized solution in numerous sectors, with an important position in client support and efficiency.

Souza, & Weigang (2025) found in their research paper entitled Grok, Gemini, ChatGPT and DeepSeek: Comparison and Applications in Conversational Artificial Intelligence that future developments in natural language processing were also discussed which highlighted the need for more effective, scalable, and adaptable methods. Additionally, problems like bias, hallucinations, and ethics continue to be significant obstacles to the development and secure use of these technologies. To guarantee the moral and secure application of these models in a variety of businesses, appropriate regulation and the creation of guidelines will be essential. Fütterer, Goldberg, Bühler, Sikimić, Trautwein, Gerjets, Stürmer, & Kasneci (2025) revealed that Artificial intelligence in classroom management: A systematic review on educational purposes, technical implementations, and ethical considerations that monitoring and improving student involvement is the main use of existing AI technologies for classroom management that have been observed to work efficiently. On the one hand, technological developments in AI, such the ability to recognize faces and emotions and interpret data from various sources, present intriguing ways to control the classroom environment and guarantee successful instruction.

Hussain (2025), in his research paper entitled Technology Integration in Modern Classrooms: An Analysis that the review's conclusions highlight the potential for change of technology integration in contemporary classrooms, but it necessitates a multi-layered, strategic approach. The review first and foremost demonstrates that, when used properly, digital tools improve student learning performance, increase involvement, and improve the quality of instruction. AI-driven platforms, game-based apps, and hybrid educational environments are examples of technologies that enable educators and students to overcome the constraints of conventional learning.

Hussain (2025), in his research paper entitled Technology Integration in Modern Classrooms: An Analysis that modern classrooms can benefit greatly from the use of modern technology, but its effectiveness requires a comprehensive and contextually appropriate approach. Everyone must work together to create settings where technology enhances instruction, fills in educational gaps, and gets students ready for a world that is becoming more digital and linked by the day.

Wardell & Courchesne (2024) in their research paper titled Opportunities and Risks Involved in Using ChatGPT to Create First Grade Science Lesson Plans identified that a basic science lecture on genes was created using ChatGPT in this qualitative case study. The resulting plan's alignment with a 5E instructional paradigm was assessed by the authors. They discovered that teachers could obtain a workable, curriculum-aligned lesson plan in around 30 minutes, but they also identified potential hazards (such as errors and oversimplification). Shrestha, Dahal, Hasan, Paudel, Kapar, (2025) in their research paper titled Generative AI on Professional Development: A Narrative Inquiry Using the TPACK Framework mentioned that This qualitative study uses the TPACK (Technological Pedagogical Content Knowledge) paradigm to examine how generative AI is impacting teacher professional development. It emphasizes how educators understand AI tools in connection to technology, pedagogy, and subject matter expertise.

Nyaaba (2025) in his research paper titled Glocalizing Generative AI in Education for the Global South: The Design Case of 21st Century Teacher Educator AI for Ghana identified that the presented use case presents a customized Generative AI system for teacher education in Ghana that uses Retrieval-Augmented Generation + prompt methods. While adhering to international educational and ethical norms, it incorporates regional curricular content, languages, and cultural contexts. The program generates assessments, lecture notes, and action-research recommendations.

Objectives:

1. To classify the role of generative AI Tools in modern classrooms
2. To identify the benefits and opportunities of generative AI Tools in modern classrooms
3. To detect the challenges and risks of generative AI Tools in modern classrooms

The Role of Generative AI Tools in Modern Classrooms:

1. A brief history of generative AI

In the 1960s, ELIZA, one of the first chatbots, was created as a natural language processing computer that relied on text substitution and pattern matching instead of actual generative powers. The formal algorithm for iteratively updating neural network parameters by propagating prediction mistakes backward—a technique still essential to contemporary AI—was first presented in the 1980s, coinciding with the emergence of the fundamental concepts behind backpropagation.

While generative AI gained momentum with the introduction of generative adversarial networks (GANs) in 2014, enabling models to learn data distributions and generate realistic synthetic content, including successful applications in atmospheric sciences like precipitation nowcasting, virtual assistants like Siri (2011) and Alexa (2014) popularized NLP applications in everyday devices. Generative AI became widely used thanks to innovations like Stable Diffusion in 2022 and OpenAI's ChatGPT (based on transformer topologies that leverage self-attention to overcome constraints of earlier sequence models). Transformers enable

interactive, context-aware discussions by being pretrained on massive datasets to predict the next token and then refined through reinforcement learning based on human feedback. These days, generative AI supports a variety of applications for teachers and students, including text, picture, and software-generation tools (Molina, M. J., McGovern, A., Carrasquilla, J. S. P., Li, X., & Tanamachi, R. L., 2025).

2. AI Tools in Modern Classrooms

Automatic Assessment:

AI is frequently utilized for question rectification and online autonomous assessment. Teachers and tutors can more easily and practically plan and administer examinations and quizzes when they employ features like these. It is no longer necessary for instructors and tutors to create and edit questions by hand. Teachers and tutors can more easily and practically plan and administer examinations and quizzes when they employ features like these. It is no longer necessary for instructors and tutors to create and edit questions by hand. The Kejarcita platform's (<https://kejarcita.id/>) quiz production and automatic correction tools are an illustration of the use of automatic assessment (Fitria, 2021).

Voice Assistant:

One of the most well-known and utilized AI technologies across a variety of industries, including education, is voice assistants. Some well-known voice assistants are Cortana (Microsoft), Siri (Apple), Google Assistant (Google), and others. By simply speaking or saying terms, students can use Voice Assistant to find resources, reference questions, articles, and books. Additionally, the VA will provide the results of your search based on the specified keywords. Like a personal assistant, Voice Assistant can speak and explain the information you require in addition to displaying it as text and visuals (Fitria, 2021).

Virtual Mentor:

AI serves as a virtual mentor and is currently widely used in a variety of educational technology platforms, particularly those that are online. A more experienced individual (the mentor) helps a less experienced individual (the mentee) accomplish a learning goal through the process of mentoring (Klamma et al., 2020). Like a teacher or tutor, AI can offer suggestions for content that needs to be reviewed after providing comments on students' learning activities and practice problems. Virtual Mentor (VM) is an e-learning environment that integrates multimedia and emphasizes intelligence, interaction, and personalization. For instance, Blackboard (<https://www.blackboard.com/teaching-learning/learning-management/mobile-learning-solutions>) is a popular program in American and European institutions. Professors and lecturers frequently utilize this AI technology to post notes, assignments, tests, and quizzes that let students ask questions and complete tasks for the evaluation process (Fitria, 2021).

Personalized Learning:

There are several similarities between Personalized Learning and other AI technologies. Essentially, this AI technology enables consumers or students to obtain personal assistant-like services. AI technology plays a major role in enhancing learning patterns and making them more useful and efficient. This has also been demonstrated by numerous studies and applications by different Edutech platforms, which can, in fact, significantly improve the quality and efficacy of learning after utilizing AI technology. Examples of the implementation of Personalized Learning include those carried out by Khan Academy (<https://www.khanacademy.org/>), Duolingo (<https://www.duolingo.com/>), Ruangguru (<https://www.ruangguru.com/>), and more (Fitria, 2021).

Educational Games:

Games that are intended to teach while still being entertaining are known as educational games. All types of games designed to give players an educational or learning experience are considered educational games. Khan Academy Kids and Duolingo are two instances of instructional games. Puzzle Kids and Quick Brain (Fitria, 2021).

1) Duolingo: In addition to teaching English, this educational game software allows kids to learn thirty additional foreign languages, such as Mandarin, French, Italian, Spanish, Korean, Japanese, and more (Fitria, 2021).

2) Khan Academy Kids: Khan Academy Kids is the next educational game for kids. For toddlers, preschoolers, and kindergarteners, Khan Academy Kids offers thousands of interactive activities. Children can study reading, language, writing, math, social-emotional development, problem-solving techniques, and motor development in this one-stop educational game (Fitria, 2021).

3) Quick Brain: Quick Brain is the next instructional game for kids. This newest kid's game improves the brain's ability to process calculations quickly, as the name implies (Fitria, 2021).

4) Puzzle Kids (Animals Shapes and Jigsaw Puzzles): There are four types of short games: jigsaw puzzles, matching shapes, item arrangement, and picture guessing. In a vibrant, user-friendly display ideal for small hands, each mini-game tests your child's ability to locate and manipulate objects, solve jigsaw puzzles, and understand how pieces fit into the larger picture. Moms, this educational game for kids is more than simply a picture-matching game; it has numerous tactics that improve kids' memory. Memory, focus, accuracy, attention, quick thinking, and reasoning abilities can all be improved with this game (Fitria, 2021).

Lesson Planning

There are numerous ways that educators can employ generative AI. Lesson planning can be expedited using generative AI techniques, especially for junior teachers or teachers

developing a new course. Giving the generative AI enough background data for lesson planning can assist direct its output to fit the requirements of the course and boost its effectiveness. These specifics may include the students' educational background (e.g., undergraduate or graduate), the learning objectives of the course, the size and length of the class, and the instructional or learning environments (e.g., laboratory sessions, field experiments, or online courses). Refinement of created content is made possible by the interactivity of certain generative AI models. Let's say, for instance, that the AI recommends an active learning exercise that necessitates excessive movement around classroom furniture. To better fit the classroom layout and guarantee student safety, a teacher can then instruct the AI to perform a less movement-intensive task (Molina, M. J., McGovern, A., Carrasquilla, J. S. P., Li, X., & Tanamachi, R. L., 2025).

Giving Feedback:

Artificial intelligence transforms the delivery and reception of feedback, making it quicker, more thorough, and more helpful for both teachers and students. AI-powered evaluation systems go beyond just marking responses as correct or incorrect, spotting trends and emphasizing areas where students are doing well or require more help. For students, this entails receiving constructive criticism rather than merely a grade on a page. It gives teachers useful information on how their class is doing, enabling them to modify classes or offer focused assistance (EselfAI, 2025).

Curriculum Design:

Curriculum design is experiencing a surge of innovation thanks to artificial intelligence, creating new opportunities for engagement and customisation. You must have a defined direction in order to include AI into curriculum design. What issues are you resolving? What results are you hoping to attain? Establishing your objectives in advance guarantees that AI is utilized purposefully, whether it is for automating monotonous work or developing more individualized learning experiences. This clarity enables institutions and educators to concentrate on what really matters: enhancing students' educational experiences. AI is simplifying the complexities of curriculum design and taking care of the laborious administrative duties that frequently cause educators to get overwhelmed. AI tools are freeing up teachers to concentrate more on face-to-face interaction with students by automating tasks like enrollment, grading, and class scheduling. Predictive analytics is another area of automation that helps organizations manage their resources and make more intelligent, data-driven decisions that improve student services and campus operations. The success of integrating AI into curriculum design depends on how it is applied, but it can open up amazing prospects (EselfAI, 2025).

Course Assignments:

Considering the real-world ramifications of generative AI and how it affects students' employment, integrating generative AI tools into course assignments is in line with course objectives and student preparation. In today's workforce, the ability to evaluate generative

AI-generated content critically and to understand its advantages and disadvantages are becoming more and more crucial. One way to utilize generative AI in assignments is for students to use it to create visuals for a class presentation or to use it to write an essay and then mark it up. Incorporating generative AI into assignments may be a worthwhile investment for educators because students will unavoidably use AI tools in their education and careers (Molina, M. J., McGovern, A., Carrasquilla, J. S. P., Li, X., & Tanamachi, R. L., 2025). This is assuming that students engage critically and maintain academic integrity when using generative AI.

Creating Exams:

Questions can be created more quickly by generative AI. The instructor should give the AI enough instructions, such as information on the format of the questions (such as multiple choice or single choice) and the accompanying answer key. Given that a thorough comprehension of the subject matter is essential for effectively responding to student inquiries, generative AI also performs very well as a tutor, which can assist educators in preparing to respond to inquiries from students with a wide range of learning modalities and backgrounds. Additionally, teachers can "flip the script" and interact with the generative AI tool as if it were a virtual student (Molina, M. J., McGovern, A., Carrasquilla, J. S. P., Li, X., & Tanamachi, R. L., 2025).

Opportunities and Challenges:

Opportunities:

Teachers' Efficiency

Teachers can concentrate on methodology and student involvement because AI drastically cuts down on the amount of time they spend on planning (Kanvaria & Ritika, 2024). Content creation is automated by generative AI (e.g., through GAIDE or mega-prompting), which facilitates the rapid creation of drafts, activities, and assessments (Dickey & Bejarano, 2024).

Customization and Flexibility

By applying machine learning to identify at-risk kids, predictive analytics and adaptive learning pathways can customize curriculum to meet the needs of students (Thai Son Chu, & Ashraf, 2025). AI-driven content can be tailored to various learner profiles (learning style, age, and ability).

Multidisciplinary and Creativity

Curriculum design becomes more creative and comprehensive with the aid of tools like TriQuest, which facilitate the integration of knowledge from several disciplines (Dickey & Bejarano, 2024).

Continuous Improvement Driven by Data

In order to iteratively enhance curriculum design, AI can gather and evaluate input (sentiment analysis, performance measures) (Thai Son Chu, & Ashraf, 2025).

Adaptability

AI frameworks have the ability to democratize high-quality curriculum design once they are implemented and spread across courses, institutions, and situations.

Challenges:

Concerns associated with GenAIs:

Although GenAI tools are still in their infancy, there are a number of concerns that should be carefully considered. For example, they may encourage independent learning without improving student academic achievement (Ukwandu, Omisade, Jones, Thorne, & Castle, 2025).

Hallucinations:

These are situations in which the output substantially differs from the intended cue, leading to erroneous responses or logic. For instance, studies on ChatGPT's limits for code creation showed that the model occasionally gave inaccurate responses, especially in situations involving ambiguity. Other GenAIs may still display hallucinations, particularly in tasks involving logic and arithmetic, even though later updates may enhance model performance (Ukwandu, Omisade, Jones, Thorne, & Castle, 2025).

Magical Thinking in AI:

When it comes to GenAIs for teaching, magical thinking present serious hazards. Students may mistakenly believe that AI systems possess unjustified qualities like wisdom or infallibility, which results in a lack of validation and verification (Ukwandu, Omisade, Jones, Thorne, & Castle (2025).

AI Replication

By turning abstract AI systems into indisputable truths independent of their actual performance, reification in AI exacerbates these problems even more. These tendencies raise the possibility of relying on erroneous results by contributing to exaggerated expectations and perceptions of AI capabilities. Teaching students to think critically while using GenAIs and giving them tools like triangulation to confirm and validate the results of GenAIs are two ways to lessen the effects of these issues (Ukwandu, Omisade, Jones, Thorne, & Castle (2025).

Accuracy and Quality

Teacher supervision is crucial because AI-generated lesson plans may contain factual errors or pedagogically flawed recommendations (Kussin, Khalid, Chaniago, Moneyam, & Hassim, 2024). Teachers' design skills may deteriorate if they rely too much on AI.

Limitations on Resources

Not every educational institution has the infrastructure (computer power, internet bandwidth) necessary to successfully implement AI tools.

Need for AI Knowledge and Skills:

GenAIs are here to stay and have revolutionary consequences on education that cannot be overstated. Teachers and students now need to acquire the requisite knowledge and upskill in this area (Ukwandu, Omisade, Jones, Thorne, & Castle, 2025).

Data Security and Privacy:

Data security and privacy are important considerations when using conversational AIs. Models that process user data and preserve interactions for ongoing improvement include ChatGPT, Gemini, Grok, and DeepSeek. However, this method poses issues with privacy laws, information leak hazards, and sensitive data protection (Souza, & Weigang 2025).

Conclusion

After studying the numerous research papers and articles, it can be concluded that AI and generative AI tools have been harnessed in the modern classroom. Generative AI tools hold immense promise and give opportunities for giving exams, creating questions and answers, creating course assignments, virtual mentoring, voice assistants, personalizing learning, providing feedback, lesson planning, and designing curriculum. However, there are limitations and challenges of generative AI tools.

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