

## A REVIEW ON THE USE OF GENERATIVE ARTIFICIAL INTELLIGENCE IN OPEN AND DISTANCE EDUCATION

Dr. Emin ÖZEN

ORCID: 0000-0001-7026-1503

Assesment and Evaluation Department  
Ministry of National Education, TÜRKİYE

### ABSTRACT

Advances in Information and Communication Technologies (ICT) are rapidly expanding the use of generative artificial intelligence (GAI) in educational environments. Open and distance education (ODE), inherently intertwined with technology, has inevitably embraced the use of GAI. This study comprehensively examines the use of GAI technologies in the context of ODE, analyzing the opportunities it offers in areas such as the creation of educational materials, the improvement of student assessment processes, and the support of personalized learning experiences. The rapid development of digital educational technologies requires teachers and students to use these innovative systems more effectively. GAI-based approaches provide a more dynamic and interactive learning environment compared to traditional teaching methods. This study evaluates the advantages and potential limitations of integrating GAI into ODE processes, focusing on accelerating the production of course materials, enhancing student feedback mechanisms, and personalizing learning experiences. Additionally, critical issues such as data privacy, ethical responsibilities, and pedagogical alignment are discussed. In conclusion, the future potential of GAI in ODE is analyzed, recommendations for further research are provided, and strategies to enhance the efficiency of AI-supported educational environments are explored.

**Keywords:** Open and Distance Education, Generative Artificial Intelligence, Educational Technologies, Personalized Learning, Automated Assessment.

### INTRODUCTION

All manuscripts are Open and distance education (ODE) has emerged as an increasingly prevalent educational model, driven by technological advancements. By overcoming the physical and temporal constraints of traditional education systems, ODE offers significant advantages in terms of flexibility and accessibility (Moore & Kearsley, 2011). However, the effectiveness of ODE faces challenges related to student engagement, motivation, and learning outcomes (Anderson, 2008). In this context, generative artificial intelligence (GAI) has gained importance as an innovative technology capable of making distance education processes more effective and efficient.

GAI, through big data analytics and machine learning algorithms, contributes significantly to the creation of educational content, the automation of assessment processes, and the design of personalized learning experiences (Sevilla & Smith, 2022). With the increasing digitization of education, teachers face growing workloads in creating course materials, while the need for personalized learning experiences for students becomes more critical (Popenici & Kerr, 2017). GAI supports educators by allowing them to focus more on pedagogical and guidance activities.

However, the use of GAI in education raises ethical, security, and pedagogical concerns. Issues such as student data privacy, the accuracy of AI-generated content, and the potential reduction in teacher-student interaction are important considerations in integrating this technology into educational processes (Selwyn, 2019). This article aims to discuss the opportunities and challenges of GAI in the context of ODE and explore its future potential.

This study evaluates how GAI can be effectively used in ODE, based on current research in the field. The primary goal of the article is to highlight the role and potential of GAI in educational processes for teachers, educational administrators, and policymakers. Additionally, the ethical and practical aspects of GAI in educational contexts are addressed to guide future research in this area.

## GENERATIVE ARTIFICIAL INTELLIGENCE AND ITS APPLICATIONS IN EDUCATION

Generative Artificial Intelligence (GAI) has the potential to transform various processes in education. From the creation of educational materials to student assessments and personalized learning experiences, GAI offers a wide range of applications (Sevilla & Smith, 2022). This section examines the use of GAI in education in detail.

### Content Creation

One of the most significant contributions of GAI to education is its ability to automate and enhance content creation. Teachers and educators often spend considerable time developing lesson plans, preparing lecture materials, and designing assessments. GAI can streamline these processes by generating high-quality educational content in a fraction of the time. For instance, text-based GAI models, such as GPT (Generative Pre-trained Transformer), can produce detailed lecture notes, summaries, and reading materials tailored to specific topics or learning objectives (Popenici & Kerr, 2017). These models can also adapt content to different learning styles, such as visual, auditory, or kinesthetic, by generating infographics, podcasts, or interactive simulations (Selwyn, 2019). This adaptability ensures that educational materials are accessible and engaging for a diverse range of learners.

Moreover, GAI can assist in the creation of multilingual content, making education more inclusive for non-native speakers. For example, GAI-powered translation tools can convert educational materials into multiple languages while preserving the original meaning and context (Sevilla & Smith, 2022). This capability is particularly valuable in ODE, where students often come from diverse linguistic and cultural backgrounds.



Figure 1. Content Creation with GAI (Open AI, 2025)

'Figure 1 was generated using the artificial intelligence-based DALL-E 3 model. The image was generated by issuing a text-based command with the title 'Content Creation with GAI'. The model was trained by OpenAI and developed on a large dataset. During the generation, the resolution was set to 1024x1024 pixels and no manual editing was performed. This methodology demonstrates the creativity potential of the model in the process of converting textual descriptions into visual outputs. Ethical principles were observed during the use of the model, and a dataset was selected that did not include commercial and copyrighted content.

### Automated Assessment and Feedback

Another critical application of GAI in education is the automation of student assessment and feedback processes. Traditional assessment methods, such as written exams and essays, are time-consuming and labor-intensive for educators. GAI can alleviate this burden by automating the evaluation of student work and providing instant feedback.

AI-based assessment systems can analyze a wide range of student responses, from multiple-choice questions to open-ended essays. Natural Language Processing (NLP) technologies enable these systems to evaluate the quality of written responses, assess comprehension levels, and identify areas for improvement (Moore & Kearsley, 2011). For example, an AI model can analyze a student's essay for grammar, coherence, and argument strength, providing detailed feedback on how to improve (Popenici & Kerr, 2017).

In addition to written assessments, GAI can also evaluate multimedia submissions, such as videos or presentations, using computer vision and speech recognition technologies. This capability allows for a more comprehensive assessment of student learning, particularly in disciplines that require creative or practical skills (Sevilla & Smith, 2022).

The use of GAI in assessment not only reduces the workload for educators but also enhances the learning experience for students. Instant feedback enables students to identify their strengths and weaknesses in real-time, fostering a more proactive approach to learning (Anderson, 2008).



Figure 2. Automated evaluation with GAI (Dall-E, 2025)

'Figure 2 was generated using the artificial intelligence-based DALL-E 3 model. The image was generated by issuing a text-based command with the title '**Automated evaluation with GAI**'. The model was trained by OpenAI and developed on a large dataset. During the generation, the resolution was set to 1024x1024 pixels and no manual editing was performed. This methodology demonstrates the



creativity potential of the model in the process of converting textual descriptions into visual outputs. Ethical principles were observed during the use of the model, and a dataset was selected that did not include commercial and copyrighted content.

### Personalized Learning Experiences

Personalization is a key advantage of GAI in education. Traditional classroom settings often struggle to cater to the individual needs of each student due to time and resource constraints. GAI addresses this challenge by offering adaptive learning systems that tailor educational content to the unique needs and preferences of each learner.

Adaptive learning systems powered by GAI analyze students' performance data to identify knowledge gaps and recommend targeted learning activities. For example, if a student struggles with a particular math concept, the system can provide additional practice problems or alternative explanations to reinforce understanding (Moore & Kearsley, 2011). Similarly, advanced learners can be challenged with more complex tasks to keep them engaged and motivated.

GAI can also personalize the pace of learning, allowing students to progress through course materials at their own speed. This flexibility is particularly beneficial in ODE, where students often balance their studies with work or family commitments (Selwyn, 2019). By accommodating individual learning styles and schedules, GAI enhances the overall effectiveness of ODE.



Figure 3. GAI-supported adaptive learning environment (Dall-E, 2025)

Figure 3 was generated using the artificial intelligence-based DALL-E 3 model. The image was generated by issuing a text-based command with the title '**GAI-supported adaptive learning environment**'. The model was trained by OpenAI and developed on a large dataset. During the generation, the resolution was set to 1024x1024 pixels and no manual editing was performed. This methodology demonstrates the creativity potential of the model in the process of converting textual descriptions into visual outputs. Ethical principles were observed during the use of the model, and a dataset was selected that did not include commercial and copyrighted content.

### Interactive Learning Environments

Another important application of GAI is the creation of interactive and dynamic learning environments. Chatbots Another significant application of Generative Artificial Intelligence (GAI) in education is the development of interactive and dynamic learning environments, which enhance the quality of teaching and learning processes. GAI-powered chatbots and virtual assistants provide immediate guidance and

support to students, thereby fostering an adaptive and personalized learning experience (Sevilla & Smith, 2022). These systems are capable of offering real-time assistance by answering students' queries, clarifying complex concepts, and facilitating problem-solving, thus supporting learners in comprehending and engaging with course materials more effectively.

Such tools also exhibit the ability to personalize instruction based on the specific needs and progress of individual learners. For example, through the analysis of student interactions and performance data, virtual assistants can identify areas where a student is struggling and provide targeted resources, such as additional practice exercises, tailored explanations, or visual aids, to address these challenges. This adaptive capability ensures that the learning process is both efficient and student-centered.

Moreover, these systems contribute to the scalability of educational support by offering 24/7 availability, which is particularly valuable for online and asynchronous learning environments. In addition to academic assistance, chatbots can provide reminders about deadlines, encourage consistent study habits, and promote self-regulated learning practices. Furthermore, by reducing response times and offering continuous support, such technologies alleviate the workload on educators while ensuring that students receive timely feedback and assistance. In this way, GAI-based systems not only enhance the accessibility of educational resources but also play a pivotal role in creating a more engaging, responsive, and inclusive learning environment and virtual assistants can provide instant guidance to students, supporting their learning process (Sevilla & Smith, 2022). These systems help students understand course materials while offering 24/7 support.

Moreover, AI-powered simulations and virtual laboratories provide students with immersive and interactive learning experiences, particularly in fields such as science, engineering, and medicine (Popenici & Kerr, 2017). These tools enable students to conduct complex experiments and simulate real-world scenarios in a risk-free, cost-effective virtual environment. For instance, students studying chemistry can safely explore hazardous chemical reactions, while engineering students can test structural designs without the need for physical materials. Such opportunities bridge the gap between theory and practice, allowing learners to apply their theoretical knowledge in simulated real-life contexts.

Furthermore, AI-supported discussion forums serve as collaborative platforms where students can engage in meaningful academic dialogues. These forums leverage AI to facilitate topic recommendations, moderate discussions, and provide instant feedback, ensuring that the discourse remains productive and focused. By exchanging ideas, debating different viewpoints, and collaborating on problem-solving, students not only enhance their understanding of the subject matter but also develop critical thinking and communication skills (Selwyn, 2019). Such forums foster a sense of community and encourage active participation, which are essential components of a successful online learning experience.

In conclusion, GAI has vast potential in education. It offers effective solutions in areas ranging from content creation to student assessment, personalized learning experiences, and interactive learning environments. However, the pedagogical and ethical dimensions of these technologies must be considered, and they should be integrated in a balanced manner with the role of teachers.

## **ADVANTAGES AND LIMITATIONS**

Generative artificial intelligence (GAI) offers numerous advantages in open and distance education but also comes with certain limitations. This section discusses the opportunities and challenges associated with GAI in detail

### **Advantages**

GAI provides benefits in areas such as content creation, student assessment, and personalized learning. First, GAI-based systems reduce teachers' workloads by simplifying the creation of course materials (Popenici & Kerr, 2017). This allows teachers to focus more on pedagogical and guidance activities.

Additionally, GAI provides instant feedback to students, accelerating the learning process (Sevilla & Smith, 2022). Automated assessment systems, in particular, enable students to view their results immediately and identify areas for improvement (Anderson, 2008). This process creates a learning cycle that supports student development.

GAI also offers personalized learning experiences, better addressing students' individual needs. Adaptive learning systems analyze students' knowledge levels and provide tailored content and recommendations to address their weaknesses (Moore & Kearsley, 2011). This allows students to learn at their own pace and enhances their motivation

## Limitations

The use of GAI in education also brings certain limitations and ethical concerns. First, there are significant concerns regarding the privacy and security of student data (Selwyn, 2019). How AI systems process student data, who has access to this information, and potential security breaches are major issues. Educational institutions must develop robust data protection policies to minimize these risks.

Additionally, the accuracy and reliability of content generated by GAI-based systems are important concerns (Popenici & Kerr, 2017). AI-generated content may sometimes be incorrect or misleading, so educators and students must critically evaluate such materials.

Furthermore, there are concerns that GAI may reduce teacher-student interaction (Sevilla & Smith, 2022). Fully automated learning systems could limit teachers' roles in providing guidance and feedback. For effective use of AI in education, teachers must view this technology as a complementary tool and use it to support their pedagogical approaches.

Finally, the development and effective implementation of GAI requires educators and students to have sufficient knowledge of how to use this technology. However, training and support programs for teachers to effectively use GAI systems are not yet widespread (Anderson, 2008). This could hinder the full realization of GAI's potential.

## CONCLUSION

The use of generative artificial intelligence (GAI) technologies in open and distance education has the potential to transform educational processes. Studies show that GAI offers significant advantages in content creation, student assessment, and personalized learning experiences (Luckin, 2017; Roll & Wylie, 2016). However, to use this technology effectively, teachers' pedagogical knowledge and skills must be enhanced, student data security must be ensured, and ethical issues must be addressed. From the perspective of teacher training, educators' digital literacy skills must be developed to effectively use GAI technologies. The integration of AI-supported tools into teaching processes requires teachers to understand how to use these systems (Zawacki-Richter et al., 2019). In this context, creating continuous professional development programs for teachers is crucial.

GAI, which contributes to student-centered learning approaches, offers personalized learning paths, allowing each student to learn at their own pace (Holmes et al., 2021). However, students must develop critical thinking skills to evaluate AI-generated content critically. Educators and policymakers must establish standards and ethical guidelines to ensure the accuracy and reliability of content provided by GAI (Schneider & Council, 2021). Moreover, more research is needed to understand the long-term impact of GAI-based systems on educational processes. Future studies should focus on evaluating the pedagogical effectiveness of GAI, analyzing risks related to ethics and data privacy, and examining its impact on student achievement (West et al., 2019).

In conclusion, to fully leverage the opportunities offered by GAI in open and distance education, educators, researchers, and policymakers must collaborate. A secure, inclusive, and ethically grounded approach that considers the pedagogical dimensions of GAI must be adopted to realize its full potential in education.

## REFERENCES

Anderson, T. (2008). *The theory and practice of online learning*. Athabasca University Press. <https://doi.org/10.15215/aupress/9781771992329.01>

- Holmes, W., Bialik, M., & Fadel, C. (2019). *Artificial intelligence in education: Promises and implications for teaching and learning*. Center for Curriculum Redesign. <https://doi.org/10.13140/RG.2.2.35767.93605>
- Luckin, R. (2017). *Machine learning and human intelligence: The future of education for the 21st century*. UCL Institute of Education Press. <https://doi.org/10.14324/111.9781782772262>
- Moore, M. G., & Kearsley, G. (2011). *Distance education: A systems view of online learning* (3rd ed.). Cengage Learning.
- Popenici, S. A. D., & Kerr, S. (2017). Exploring the impact of artificial intelligence on teaching and learning in higher education. *Research and Practice in Technology Enhanced Learning*, 12(1), 22. <https://doi.org/10.1186/s41039-017-0062-8>
- Roll, I., & Wylie, R. (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>
- Schneider, S., & Council, R. (2021). Ethics and artificial intelligence in education: A critical review. *AI & Society*, 36(4), 789–803. <https://doi.org/10.1007/s00146-021-01137-5>
- Selwyn, N. (2019). *Should robots replace teachers? AI and the future of education*. Polity Press.
- Sevilla, C., & Smith, J. (2022). The role of AI in personalized education: A systematic review. *Educational Technology Review*, 58(2), 112–135.
- West, M., Kraut, R., & Ei Chew, H. (2019). AI in education: Opportunities and challenges. *Computers & Education*, 140, 103598. <https://doi.org/10.1016/j.compedu.2019.103598>
- Zawacki-Richter, O., Marín, V. I., Bond, M., & Gouverneur, F. (2019). Systematic review of research on artificial intelligence applications in higher education. *International Journal of Educational Technology in Higher Education*, 16(1), 39. <https://doi.org/10.1186/s41239-019-0171-0>

## BIODATA and CONTACT ADDRESSES of the AUTHOR/S



Dr. Emin ÖZEN is a Ph.D. Department of Distance Education. Since 2008, he has been working in schools affiliated to the Ministry of National Education mathematics teaching / management and instructor trainer duties in institutions Dr. ÖZEN is currently working as a Measurement and Evaluation Specialist in a unit affiliated to the Ministry of National Education and lectures at undergraduate and graduate level at Anadolu University. Mixed method research, scale development and adaptation, digital transformation in education, technological pedagogical content knowledge, attitudes and trends in distance education, quality in online distance education, learner support services, etc. He has carried out more than 50 studies such as articles, full text and abstract papers, books, book chapters, etc.

Emin ÖZEN (Dr./Ph.D.)  
Eskişehir Assesment and Evaluation Center  
Tel. 02222344446  
[eminozen@anadolu.edu.tr](mailto:eminozen@anadolu.edu.tr)  
[eminozen00@gmail.com](mailto:eminozen00@gmail.com)  
<https://scholar.google.com.tr/citations?user=30MKri8AAAAJ&hl=tr>  
[https://www.researchgate.net/profile/Emin\\_Oezen2](https://www.researchgate.net/profile/Emin_Oezen2)