International Journal of Engineering Applied Sciences and Technology, 2025
Vol. 9, Issue 11, ISSN No. 2455-2143, Pages 96-99
Published Online March 2025 in IJEAST (http://www.ijeast.com)

GENERATIVE AI IN EDUCATION: A REVIEW REPORT ON CURRENT AND FUTURE TRENDS

Adhyayan Gupta
MDS Public School,
Udaipur (Rajasthan), INDIA,

Navneet Agrawal
College of Technology and Engineering,
MPUAT, Udaipur (Rajasthan),INDIA

Himangi Agrawal
Institute of Technology, Nirma Uniniversity,
Ahmedabad (Gujarat), INDIA

Abstract - **Generative AI is a digital technology that can quickly create new and realistic visual, textual, and animated content. Generative Artificial Intelligence (AI) is no longer a futuristic concept; it has now become a transformative force reshaping various industries, including education. Integration of AI into educational systems promises to enhance learning experiences, upgrading the administrative processes, and personalize education for students worldwide. When employed effectively, this technology has the capacity to significantly diminish the time educators allocate to administrative duties. Consequently, educators can redirect their focus towards enhancing the learning experience for their students. However, if mishandled, there is a risk of fostering dependency on AI, leading to a decline in the proactive engagement of teachers and learners. This misuse could potentially undermine the very foundations of the education system. Educators know that AI is one of newest instruments that help the students in their classroom challenges; thus, we cannot prohibit them to use it but instead we have to accept the fact of AI's existence. In the current paper authors have covered all the aspects of use of Generative AI in the education system including the models adopted along with the challenges, current and the future trends.**

Keywords- **Artificial intelligence, Generative artificial intelligence, ChatGPT, Learning and teaching**

I. INTRODUCTION : GENERATIVE AI MODELS

Generative AI models function by scrutinizing patterns and information within extensive datasets, employing this understanding to create fresh content. This process encompasses various stages viz Data gathering, Pre-processing, Choosing the Right Model Architecture, Implementing the Training the Model, Evaluating and Optimizing and finally Fine-tuning and Iterations[11]. Here's a list of prominent generative AI models, categorized by their primary function:

- **Generative Adversarial Networks (GANs)**

A family of models, including GANs, DCGANs, and others, known for generating high-quality images.

- **Stable Diffusion**

A popular text-to-image model that uses a latent diffusion approach to generate images

- **DALL-E**

A model capable of generating images from text descriptions, known for its ability to combine concepts and styles.

- **Mid journey**

This is a popular text-to-image model, known for its artistic and photorealistic outputs.

- **Runway:**

A platform that offers various generative AI tools, including video generation and image editing.

- **Transformers**

A type of neural network architecture that is the foundation for many large language models.

- **Large Language Models (LLMs)**

Models like GPT-3, GPT-4, Llama 2, and ChatGPT, known for their ability to generate human-like text.

- **Gemini**

Google's family of generative AI models, designed for versatility and performance.

International Journal of Engineering Applied Sciences and Technology, 2025
Vol. 9, Issue 11, ISSN No. 2455-2143, Pages 96-99
Published Online March 2025 in IJEAST (http://www.ijeast.com)

➢ **Variational Autoencoders (VAEs):**
A type of generative model that can generate diverse and high-quality outputs.

➢ **Autoregressive models**
Models that predict the next part of a sequence based on previous inputs.

➢ **Flow models**
Models that learn the underlying structure of a dataset and can generate new samples from that distribution.

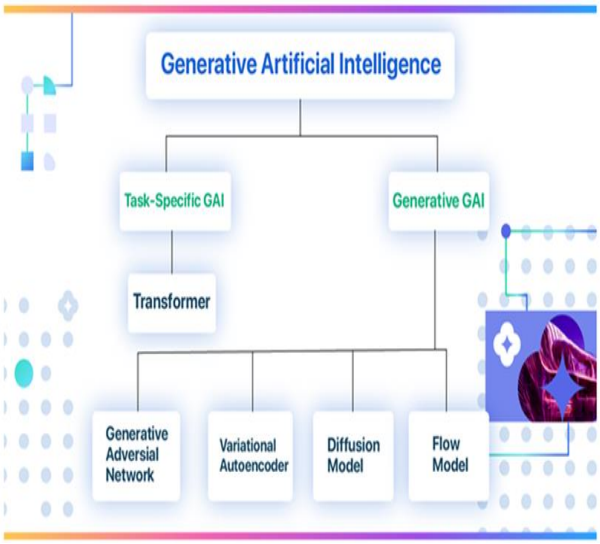

Fig 1: Models for Generative AI [11]

II. GENERATIVE AI IN EDUCATION

Generative AI can help bridge many gaps in a country like India that has vast cultural and social differences and barriers of inequality. It can be beneficial to various sets of stakeholders in the education system, be it students, teachers, or parents[11].
Recognizing the importance of developing AI skills for children, CBSE has introduced AI as a skill module in classes 6–8 and as a skill subject in classes 9–12. Additionally, there are several organizations that are creating virtual assistants for students, teachers, and parents to enable them to learn and teach better. Many such initiatives are now being seen across a diverse set of use cases.

Fig.2: A virtual assistant built on generative AI can assist a teacher in planning unique and engaging classroom activities. Picture courtesy: Frederick FN Noronha / CC BY [3]

III. CURRENT TRENDS IN EDUCATION SECTOR

There are number of ways within the education, where AI and generative AI are being used for up skilling the students. Some of the most notable trends in this sector are as follow:

➢ **Personalized Learning**
AI can help learners choose the most suitable courses, materials, and methods for their goals, preferences, and abilities. AI can also help learners access tutoring, mentoring, and coaching services, using platforms such as intelligent tutoring systems, conversational agents, and recommender systems. Furthermore, AI can help learners develop critical skills, such as problem-solving, creativity, and communication, through interactive and immersive experiences.

➢ **Intelligent Tutoring System**
AI can assist tutors in various ways, such as automating administrative tasks, providing feedback, enhancing content delivery, and facilitating collaboration. Teachers have always been superheroes for their students, guiding them like shining candles on their future path. But AI is like the wind that helps spread the flame further, making knowledge accessible in new and exciting ways[9].

➢ **Automatic Assessment and Grading**
AI can help teacher's grade assignments, monitor student progress, customize curriculum, and identify learning gaps. AI can also help teachers create more engaging and interactive lessons, using tools such as chatbots, simulations, and gamification. Moreover, AI can enable teachers to collaborate with peers and experts across the world, sharing best practices and resources. With growing class sizes, the automation would also allow teachers more

time for one-on-one instruction with students who are struggling [1].

- **Data Analytics and Natural Language Processing**

Data analytics is very useful tool in prediction and future planning of any service or operation. With the help of this, the policy makers can foresee or predict the future growth and performance. In the field of education AI can help policymakers analyze the impact and effectiveness of educational policies, programs, and interventions, using tools such as data mining, machine learning, and natural language processing. AI can also help policymakers forecast the future trends and needs of education, using tools such as scenario planning, simulation modelling, and sentiment analysis. Additionally, AI can help policymakers design and implement more equitable and inclusive policies, by identifying and addressing the gaps and biases in education.

IV. CHALLENGES AND OPPORTUNITIES

AI in education is not without challenges and opportunities. Some of the challenges include ethical, social, and technical issues, such as privacy, security, accountability, transparency, quality, reliability, and accessibility. Some of the opportunities include innovation, collaboration, and transformation, such as new pedagogies, models, platforms, and ecosystems[15]. Therefore, it is important to adopt a holistic and multidisciplinary approach to AI in education, involving various stakeholders, such as educators, learners, policymakers, researchers, developers, and civil society.

V. FUTURE TRENDS

In 2025, the Generative AI market is projected to reach $66.89 billion, with the United States leading in market size, and AI agents are expected to see increased enterprise adoption. The market size is expected to show an annual growth rate (CAGR 2025-2031) of 36.99%, resulting in a market volume of US$442.07bn by 2031. In global comparison, the largest market size will be United States (US$21.65bn in 2025).With a continuous evolvement of AI, its implications for the future of education are profound. Here are some potential future developments:

- **Lifelong Learning and Continuous Education:**

AI will facilitate lifelong learning by providing personalized, on-demand educational resources. Individuals will be able to upskill and reskill throughout their careers, adapting to the changing job market.

- **Global Education Equity:**

AI has the potential to bridge educational gaps by providing quality education to underserved and remote areas. AI-driven platforms can offer scalable and affordable learning solutions to students worldwide[17].

- **Ethical and Privacy Considerations:**

As AI becomes more integrated into education, addressing ethical concerns and ensuring data privacy will be paramount. Developing robust policies and practices to protect student information and promote ethical AI use is essential.

- **Evolving Roles of Educators:**

The role of educators will shift as AI takes on more administrative and instructional tasks. Educators will become facilitators of learning, focusing on mentorship, critical thinking, and social-emotional development.

- **Interdisciplinary Learning:**

AI will promote interdisciplinary learning by integrating knowledge from various fields. Students will engage in project-based learning that combines science, technology, engineering, arts, and mathematics (STEAM), fostering creativity and innovation.

VI. CONCLUSION

In order to make the most of AI in education, it is important to adhere to specific best practices and recommendations. This includes aligning AI with educational goals, values, and standards, as well as making sure it is ethical, transparent, accountable, and trustworthy. Furthermore, AI should be accessible and affordable to all users, while also being user-friendly, adaptable, and interoperable. Additionally, AI should be evidence-based and quality-assured through rigorous methods and standards [22]. Finally, it should be collaborative, participatory, and empowering in order to foster a culture of learning and innovation. Finally we conclude that 1. AI can revolutionize education, but ethical considerations are paramount. 2.AI tools should seamlessly integrate with curriculum & target specific objectives. 3. Students & educators need to understand how AI works & trust its results. 4. AI shouldn't widen educational gaps. All students deserve high-quality tools, regardless of background. Collaboration is key.

By prioritizing these best practices, we can create a future where AI empowers all learners, educators, and psychometricians to build a more effective & inclusive educational experience.

VII. REFERENCE

[1]. Bethencourt-Aguilar, A ;Castellanos-Nieves, D.; Sosa-Alonso, J.J.; Area-Moreira, M.(2022).Implicacionestécnicas y prácticas de lasRedesAdversariasGenerativas a la CienciaAbierta en Educación. Rev. Interuniv. Investig. Tecnol. Educ. 2022, (pp138–156).

[2]. Bozkurt A (2023), Generative artificial intelligence (ai) powered conversational educational agents:

The inevitable paradigm shift. Asian J DistEduc(pp18-23).

[3]. Cao Y, Li S, Liu Y, Yan Z, Dai Y, Yu PS, Sun L (2023) A comprehensive survey of ai-generated content (AIGC): A history of generative ai from gan to ChatGPT (pp 89-98)

[4]. Clark K, Luong M-T, Manning CD, Le QV (2018) Semi-supervised sequence modeling with cross-view training (pp1809-1822).

[5]. Cooper, G.(2023); Examining science education in ChatGPT: An exploratory study of generative artificial intelligence. J. Sci. Educ. Technol. 2023,(pp 444–452).

[6]. Extracts from Center for Innovation in Teaching & Learning, University of Illinois Urbana Champaign, 249 Armory Building , 505 East Armory Avenue ,Champaign, IL 61820

[7]. Generative AI Models Types, Training and Evaluation Strategy , Dr. JagreetKaur Gill | 11 February 2025 , https://www.xenonstack.com/blog/generative-ai-models , (accessed on 29 March 2025)

[8]. Gupta Gaurav(2023),"Can generative AI help the education sector in India"?, IDR , (accessed on 31 March 2025)

[9]. Holmes, W.; Bialik, M.; Fadel, C. Artificial intelligence in education. 2023. Available online: http://hdl.handle.net/20.500.12424/4273108 (accessed on 29 March 2025).

[10]. İpek, Z.H.; Gözüm, A.İ.C.; Papadakis, S.; Kallogiannakis, M. Educational Applications of the ChatGPT AI System: A Systematic Review Research. Int. J. 2023, 12, 26–55. [Google Scholar] [CrossRef]

[11]. Leonardo.ai. Create Stunning Visual Assets with AI. 2023. Available online: https://leonardo.ai/ (accessed on 28 March 2025).

[12]. Neimark D, Bar O, Zohar M, Asselmann D (2021) Video transformer network

[13]. Odena A, Olah C, Shlens J (2017) Conditional image synthesis with auxiliary classifier GANS

[14]. OpenAI (2023) Gpt-4 technical report

[15]. OpenAI. ChatGPTV4. 2023. Available online: https://chat.openai.com/ (accessed on 26 March 2025).

[16]. Rani R, Lobiyal D (2021) An extractive text summarization approach using tagged-lda based topic modeling. Multimed Tools Appl 80 (pp3275–3305).

[17]. Reddy MDM, Basha MSM, Hari MMC, Penchalaiah MN (2021) Dall-e: Creating images from text. UGC Care Group I Journal vol .8(14) (pp71–75).

[18]. Ruiz-Rojas, L.I.(2020) How to Be a Virtual Author and Tutor Applying Educational Methodologies and Teaching Strategies Supported by Digital Tools and Resources? Educ. Knowl. Soc. 2020, 21, 15.

[19]. Sengar, S.S., Hasan, A.B., Kumar, S. (2024) Generative artificial intelligence: a systematic review and applications. Multimed Tools Appl (2024). https://doi.org/10.1007/s11042-024-20016-1

[20]. Torres-Cruz, F.; Yucra-Mamani, Y.J.(2022) Artificial Intelligence Techniques in Assessment of Virtual Education by University Students. Hum. Rev. Int. Humanit. Rev. 2022, vol.11, pg.3853.

[21]. Yang, W.(2022) Artificial Intelligence education for young children: Why, what, and how in curriculum design and implementation. Comput. Educ. Artif. Intell. 2022, 3, 100061.

[22]. Walczak and Cellary, , K. Walczak, W. Cellary(2023) , Challenges for higher education in the era of widespread access to Generative AI , Economic and Business Review, 9 (2) (2023), (pp. 71-100) .

[23]. Zhai , X. Zhai, X. Chu, C.S. Chai, M.S.Y. Jong, A. Istenic, M. Spector,(2021);A review of artificial intelligence (AI) in education from 2010 to 2020 Complexity,Article 8812542,DOI 10.1155/2021/8812542