

Impact Of Generative AI On Education

Sakhi Anand¹, Pavani Gupta², Akash Tiwari³, Sweety Agarwal⁴
^{1,2,3,4}*Department of Computer Applications, Invertis University, Bareilly*
doi.org/10.64643/IJIRTV12I11-207241-459

Abstract—Generative Artificial Intelligence (GAI) is rapidly transforming multiple sectors, including education, by enabling the automatic creation of content such as text, images, videos, music, and computer code. Powered by advanced machine learning algorithms trained on large datasets, generative AI supports various educational activities, including content development, assessment design, and personalized learning experiences. As this technology advances, its role in higher education has attracted growing attention from educators and researchers. This study examines the impact of generative AI on students' learning experiences and teaching practices in higher education. It focuses on how students and educators utilize AI tools, the benefits they perceive, and the challenges associated with their adoption. Key areas explored include the frequency and context of AI usage, its effects on learning efficiency, creativity, and independent thinking, as well as concerns related to accuracy, reliability, and ethical use of AI-generated content. The findings suggest that generative AI enhances learning efficiency, promotes student engagement, and supports creative thinking. Many students report improved understanding of complex topics and greater ease in generating study materials and practice assessments. However, despite increased efficiency, some students believe their overall academic performance remains largely unchanged. Educators express mixed views, citing concerns about academic integrity, reliability of AI-generated information, and insufficient institutional support. Overall, the study highlights both opportunities and challenges in integrating generative AI into higher education and emphasizes the importance of responsible use, clear guidelines, and ongoing research to ensure effective and ethical implementation.

Index Terms—AI Adoption, Educational Technology, Ethical Issues in AI, Generative Artificial Intelligence (GAI), Higher Education, Learning Efficiency, Personalized Learning

I. INTRODUCTION

In recent years, generative AI has grown rapidly, and a large number of students have started using

generative AI tools in their studies. These tools have changed the learning process by creating both opportunities and challenges in education. They can generate human-like content such as text, images, and code based on user input, making them valuable for various academic purposes.

Artificial Intelligence (AI) has become an important part of modern society and is widely used in various fields, including education [1]. In recent years, the growth of Generative Artificial Intelligence (GenAI) has greatly impacted the way students learn and teachers teach. These tools can generate human-like content such as text, images, videos, and code, making them valuable for a wide range of academic activities. In the field of education, students are increasingly using AI tools to understand complex topics, complete assignments, improve productivity, and save time. Similarly, teachers use these technologies to create learning materials and enhance their teaching methods, allowing them to save time and devote more attention to teaching and student interaction.

However, despite these advantages, the growing use of generative AI also raises several concerns. Issues such as over-dependence on AI tools, reduced critical thinking, and the risk of academic misuse have become significant challenges [2].

Therefore, this study aims to analyze the impact of generative AI on education by examining students' usage patterns, perceived benefits, and the challenges associated with its adoption.

II. LITERATURE REVIEW

A number of studies have examined the role of generative AI tools, such as ChatGPT, in education. Recent research highlights their contribution to education by supporting active learning, critical thinking, and creativity. However, many educators are still unaware of how to effectively use AI as a teaching tool or remain hesitant to implement it in classrooms [3].

Several studies have explored the role of artificial intelligence in education and its impact on teaching and learning processes. Holmes et al. [1] reported that AI technologies have the potential to improve personalized learning by adapting educational content to individual student needs. Similarly, recent research suggests that generative AI tools help students understand complex topics, improve productivity, and assist with various academic tasks.

However, despite these benefits, researchers have also identified several challenges associated with the use of generative AI. Studies indicate that excessive reliance on AI tools may lead to academic misuse, reduced critical thinking, and over-dependence on technology. In addition, concerns regarding data privacy, security, and the reliability of AI-generated content have been widely discussed.

Despite the growing body of research in this area, limited studies have focused on students' actual usage patterns and perceptions of generative AI tools in real academic environments. Therefore, this study aims to examine how students use generative AI tools and evaluate their impact on the overall learning experience.

III. GENERATIVE AI OVERVIEW

Generative AI is a branch of artificial intelligence that can generate human-like content such as text, images, videos, and computer code. It uses advanced machine learning algorithms and Large Language Models (LLMs) to analyze data and generate new content based on user input. Popular generative AI tools include ChatGPT, Perplexity, Google Gemini, and Claude.

In recent years, generative AI has advanced rapidly due to improvements in Large Language Models (LLMs) and deep learning techniques. These tools are now easily accessible to both students and teachers. They can assist in answering questions, generating notes, writing code, and explaining complex concepts in a simple and understandable manner.

Generative AI is widely used as a supportive learning tool in the field of education. Students use it to understand complex topics, complete assignments, conduct research, perform data analysis, and improve their productivity. Similarly, teachers use generative AI to create study materials, design assessments, and provide personalized guidance to students. However,

the increasing use of generative AI also raises concerns about over-dependence, academic integrity, and the need for proper guidelines and policies to ensure its responsible and effective use in education.

IV. APPLICATIONS OF GENERATIVE AI IN EDUCATION

A. Personalized Learning

AI technologies such as generative AI, chatbots, and learning analytics enhance the learning experience by providing personalized content and explanations tailored to individual students' needs, allowing them to learn at their own pace.

B. Automation of Academic Tasks

Generative AI tools can automate repetitive tasks such as attendance tracking, grading, and other administrative activities. This enables teachers to save time and devote more attention to teaching and meaningful student interaction.

C. Content Creation

Generative AI tools help teachers create educational resources such as lecture notes, quizzes, presentations, and study materials. This enables teachers to save time while improving the availability and quality of learning resources.

D. Intelligent Tutoring System

If The Generative AI tools help students by acting as a virtual tutor by answering questions, explaining concepts, and guiding students step by step. Tools like ChatGPT and google Gemini are commonly used.

E. Assessment and Feedback

The AI tools can evaluate student performance, provide instant feedback, and help in identifying, weakness and strengths, this can improve the overall learning process.

V. RESEARCH METHODOLOGY

This study adopts a quantitative research approach to analyse the Impact of Generative AI on Education. The data for this research was collected through an online survey conducted among students. The primary objective of the survey was to understand students' awareness, usage patterns, and perceptions regarding

generative AI tools in their academic activities. The survey-based quantitative approach is widely used in educational research to collect and analyze data effectively. [4]

The survey was conducted among undergraduate and postgraduate students, with a total of 80 responses collected. The participants belonged to diverse academic backgrounds, including Computer Science, Engineering, and other fields, ensuring a broader perspective on the use of generative AI in education. A structured questionnaire consisting of 10 questions was designed to gather relevant information. The questions included multiple-choice and opinion-based formats, focusing on areas such as awareness of generative AI, frequency of usage, purpose of using AI tools, and students' opinions regarding the benefits and challenges of AI in education.

The survey was created and distributed using Google Forms, and responses were collected through online student groups and communication channels. The collected data was automatically organized and represented using visual tools such as pie charts and bar graphs.

The responses were analyzed to identify trends and patterns in students' interaction with generative AI tools such as ChatGPT and Google Gemini. The analysis helps in understanding the overall impact of generative AI on students' learning experiences and academic performance.

VI. HELPFUL HINTS

The collected survey data was analyzed to understand students' awareness, usage, and perception of generative AI in education. The results are presented using graphical representations such as pie charts and bar graphs, followed by their interpretation.

The survey results indicate that 91.3% of respondents are undergraduate students, while 6.3% are postgraduate students and 2.5% belong to other educational levels. This indicates that the study primarily reflects the perspectives of undergraduate students regarding the use of generative AI in education.

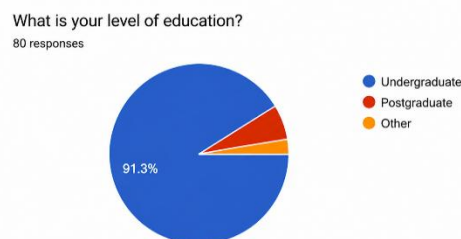


Fig. 1: Education Level of Respondents

The results indicate that 83.8% of the respondents belong to the Computer Science/IT field, while 15% are from Engineering. The remaining 1.2% represent participants from Commerce, Arts, and other fields. These findings show that the majority of respondents have a technical background, which may contribute to a higher level of familiarity and engagement with generative AI technologies.

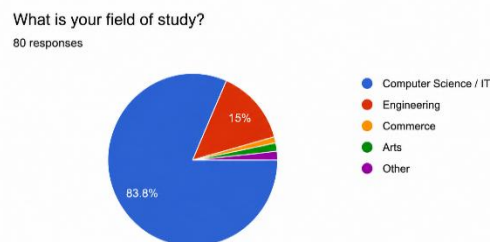


Fig. 2: Field of Study

The survey results indicate that 88.8% of respondents are familiar with generative AI technologies, while 2.5% are not aware and 8.8% are uncertain. This reflects a high level of awareness among students regarding AI-based technologies.

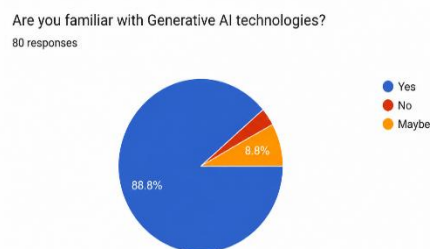


Fig. 3: Awareness of Generative AI

The survey reveals that 88.8% of students use AI tools for studying or academic work, while 10% use them occasionally and only 1.2% do not use them. This demonstrates that AI tools have become an integral part of students' academic activities.

Do you use AI tools for studying or academic work?
80 responses

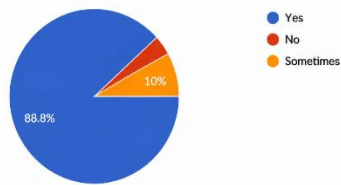


Fig. 4: Use of AI Tools for Academic Work

The results show that 77.5% of students use ChatGPT, while 18.8% use Google Gemini and 3.7% use other AI tools. This indicates that conversational AI platforms are the most preferred tools among students for academic support.

Which AI tools do you use most frequently?
80 responses

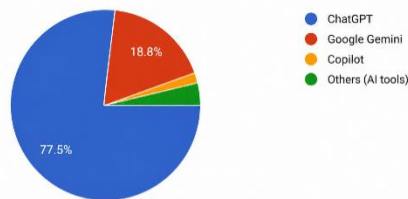


Fig. 5: Most Frequently Used AI Tools

The survey results indicate that 85% of respondents use AI tools daily, while 13.8% use them weekly and 1.3% use them occasionally. This highlights the frequent use of generative AI in students' daily learning processes.

How often do you use AI tools for learning?
80 responses

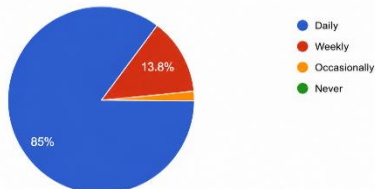


Fig. 6: Frequency of AI Usage

The results reveal that 67.5% of students use AI tools for understanding concepts, 16.2% for coding assistance, 8.8% for completing assignments, and 7.5% for research purposes. This suggests that AI tools are primarily used to enhance learning and problem-solving.

For what purpose do you mainly use AI tools?
80 responses

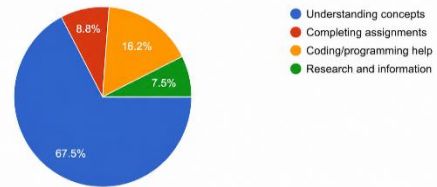


Fig. 7: Purpose of Using AI Tools

The survey indicates that 61.3% of respondents strongly agree and 32.5% agree that AI tools help in understanding difficult topics, while 6.3% remain neutral. This demonstrates a positive perception of AI tools in improving learning outcomes.

Do AI tools help you understand difficult topics more easily?
80 responses

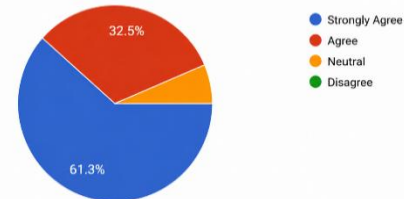


Fig. 8: Effectiveness of AI in Learning

The results show that 72.5% of respondents believe that AI tools can be misused for academic cheating, while 11.3% disagree and 16.2% are uncertain. This highlights concerns related to academic integrity.

Do you think students may misuse AI tools for academic cheating?
80 responses

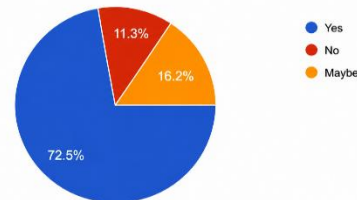


Fig. 9: Misuse of AI Tools

The survey results indicate that 55% of students support the integration of generative AI in education, while 45% believe it should be allowed only with proper guidelines. This reflects a positive yet cautious attitude toward AI adoption in education.

The Overall, the survey findings indicate that generative AI technologies are widely adopted among students for academic purposes. While the majority of students recognize the benefits of AI in improving

learning efficiency, concerns regarding misuse and dependency remain significant. These findings highlight the need for responsible and guided integration of AI in educational systems.

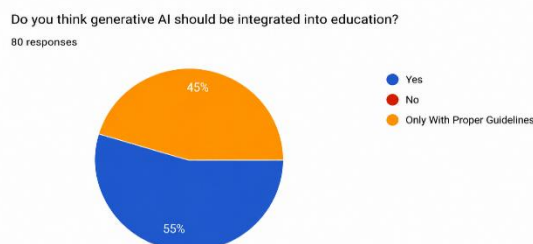


Fig. 10: Integration of AI in Education

VII. ADVANTAGES OF GENERATIVE AI

Generative AI offers various advantages in the field of education and is widely used by students for academic purposes. One of the major benefits is time efficiency, as AI tools provide quick answers and reduce the time required for searching information.

One of the other important advantages is improved understanding, as AI tools explain complex topics in a simple way. According to the survey, 67.5% of students use AI tools for understanding concepts, which highlights their usefulness in learning.

Generative AI also increases productivity by helping student's complete tasks faster and supports self-learning by allowing students to explore topics independently. In addition, AI tools assist in assignments and coding, making them especially useful for technical students. Overall, generative AI improves the learning experience and enhances academic efficiency.

VIII. CHALLENGES

A. Over-dependence on AI

One major challenge of generative AI is Over-dependence of Students on Generative AI Tools. Many of the students fully depend on Generative AI tools for their academic work like completing assignment, understanding concepts, which can reduce their ability of learning independently. According to the survey, around 85% of students use AI tools daily, which shows a high level of dependence on these tools. This concern has been discussed in recent studies on AI in education [6].

B. Incorrect / Misleading Information

One of challenge is that Generative AI tools do not always give correct answers. In some cases, the information generated may be incomplete, inaccurate or misleading, which can negatively impact students' learning. As a result, students should not depend entirely on AI and should cross-check the information. Hence, critical evaluation of AI-generated information is necessary.

C. Reduced Critical Thinking

The increasing use of Generative AI tools can impact student's critical thinking skills. When students use these tools to get quick answers without thinking about the problem, it reduces their ability to analyze and understand concepts independently.

D. Data Privacy and Security

Data Privacy and Security is an important concern when using generative AI tools. To receive accurate and relevant answers, students may need to share personal or academic information while interacting with these tools. This data may also be used to improve responses and train the models. However, this can create risks related to data misuse or unauthorized access. Therefore, it is important for students to be careful while sharing sensitive or personal information.

E. Academic Misuse

Academic misuse is another significant concern. Students may use AI tools to complete assignments without proper understanding, which can affect academic integrity. The survey results show that 72.5% of students believe AI can be misused, highlighting the seriousness of this issue. Some other research studies have also raised similar concerns about the misuse of AI in education.

IX. CONCLUSION AND FUTURE SCOPE

This study examined the impact of generative AI on education and its adoption among students for academic purposes. The findings indicate that a large proportion of students actively use generative AI tools to understand concepts, complete assignments, and improve learning efficiency, productivity, and time management.

Despite these benefits, the study also identifies several challenges, including over-dependence on AI, reduced critical thinking, academic misuse, and concerns related to academic integrity. These findings are consistent with recent studies, emphasizing that while generative AI offers significant educational benefits, its responsible use remains essential.

Looking ahead, generative AI is expected to play an increasingly important role in education. Future developments should focus on improving the accuracy, reliability, and transparency of AI systems while establishing clear institutional policies and ethical guidelines for their responsible use. Further research should investigate the long-term effects of generative AI on students' learning outcomes, critical thinking, creativity, and academic performance, as well as its integration with adaptive and personalized learning systems.

In conclusion, generative AI has the potential to transform education by enhancing teaching and learning experiences. However, its successful adoption will depend on a balanced approach that combines technological innovation with ethical practices, institutional support, and the preservation of academic integrity.

REFERENCES

- [1] W. Holmes, M. Bialik, and C. Fadel, *Artificial Intelligence in Education: Promises and Implications for Teaching and Learning*. Boston, MA, USA: Center for Curriculum Redesign, 2019.
- [2] Y. K. Dwivedi et al., "So what if ChatGPT wrote it? Multidisciplinary perspectives on opportunities, challenges and implications of generative conversational AI for research, practice and policy," *International Journal of Information Management*, vol. 71, Art. no. 102642, Aug. 2023.
- [3] T. K. F. Chiu and C. S. Chai, "Digital competence and artificial intelligence in education," *Interactive Learning Environments*, vol. 28, no. 5, pp. 1–14, 2020.
- [4] C. R. Kothari, *Research Methodology: Methods and Techniques*, 2nd ed. New Delhi, India: New Age International Publishers, 2004.
- [5] W. M. Lim and A. Gunasekara, "The adoption of ChatGPT and generative artificial intelligence in education: A systematic review and future research agenda," *International Journal of*

Management Education, vol. 21, no. 3, Art. no. 100790, 2023. doi: 10.1016/j.ijme.2023.100790.

- [6] E. Kasneci et al., "ChatGPT for good? On opportunities and challenges of large language models for education," *Learning and Individual Differences*, vol. 103, Art. no. 102274, 2023.