

The Role of Large Language Models (LLMs) in Transforming Teaching and Learning: A Comparative Analysis

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Abstract

By strengthening motivation, engagement, and personalization, large language models (LLMs) like Perplexity, ChatGPT, and Claude are transforming contemporary education. The ability of LLMs to represent information and comprehend language has been shown in earlier research, which has a direct positive impact on educational applications. This study examines the function of LLMs in education using a mixed-methods approach that blends student survey responses with a comparison of well-known LLMs. Although worries about privacy and diminished critical thinking still exist, survey findings show that students find AI technologies helpful for comprehending difficult topics, increasing motivation, and developing confidence in their studies. The comparison study draws attention to the distinct advantages and disadvantages of models such as ChatGPT, Claude, and Perplexity in learning environments. The results indicate that LLMs can support teachers when properly implemented. This research paper suggest the importance of integrating responsibly, LLMs can be complement to educators, adaptive learning, and lead the way for student-centered digital education.

Keywords— Large Language Models, ChatGPT, Claude, Perplexity, AI in Education, Personalized Learning, Student Engagement, Motivation.

I. INTRODUCTION

Since it contributes to teaching and learning more flexible, interactive, and scalable, artificial intelligence (AI) has transformed the educational landscape. Large Language Models (LLMs) are among the AI technologies that have shown exceptional potential in producing responses that resemble those of a human, offering automated tutoring, and facilitating individualized learning. These models were developed through research on the Transformer design, and current evaluations highlight their expanding function in improving accessibility and engagement. AI-powered technologies like ChatGPT, Claude, and Perplexity are becoming more and more popular, which demonstrates their impact on education. For adoption to be sustainable, issues with over-reliance, privacy, and ethical use must be resolved. By integrating a comparative analysis of top LLMs with student perception surveys, this

paper explores the significance of LLMs in education.

II. RELATED WORK

The growing use of AI in educational settings has been noted in earlier research. GPT models' short-range capabilities have been utilized to facilitate interactive learning. BERT is useful for assessment automation since it enhanced text comprehension and question-answering duties. In the same manner, the majority of LLMs nowadays are built on the Transformer architecture.

Based upon reviews, AI-powered platforms increase student involvement.

and determination, demonstrating their capacity to enhance results. The significance of AI-based adaptive systems in real-time personalization has

been explored more lately, although other studies have focused on the necessity for a balance between integrating AI and human-centered pedagogy. This article supports the study's conclusions while highlighting the difficulties with biases, ethical issues, and safe use in

III. METHODOLOGY

A hybrid method design of research was used in this study:

1. Survey Method: Students from several disciplines were given a structured questionnaire that focused on their motivation, engagement, confidence, and concerns about AI learning tools.
2. Comparative Analysis: The accuracy, response time, language support, cost, and ethical considerations of the main LLMs (ChatGPT, Claude, Perplexity, GPT-3, GPT-4, BERT, and T5) were evaluated.
3. To support survey findings, case studies of AI use in education and existing literature were examined.

- Most of the students uses AI tools weekly or daily basis.
- Over and above 80% agreed that AI enabled tools make learning engaging and help them understand the complex concepts.
- Dynamic feedback and gamified enabled features increased motivation and confidence.
- Main concerns is included in privacy risks, reduction in critical thinking, and occasional misinformation.

Teachers' Perspective:

- LLMs mainly lessen the administrative workloads, including content creation, grading, and assignment preparation.
- Encourage individualized learning and assist in energizing inactive learners.
- Concerns include the possibility of plagiarism, discrimination in AI responses, the decline of instructor authority, and the deterioration of critical thinking abilities.

IV. RESULTS AND DISCUSSION

Survey Insights according to Students' Perspective:

Table 1. Comparison of Students' and Teachers' Perspectives

Dimension	Students' Perspective	Teachers' Perspective
Ease of Use	Easy to integrate into study.	Helps in the content preparation but needs careful supervision.
Engagement	Makes the learning more interactive and interesting.	Helps in capture attention of distracted learners by visualization.

Personalization	Learners who are weak in studies benefit from AI adapting to pace of study.	encourages the use of customized resources and personalized instruction.
Motivation & Confidence	Increases study motivation and confidence.	Improves in participation and assignment completion.
Concerns	Misinformation, Privacy, reduced critical thinking.	Plagiarism, bias in AI content.

Table 2. Comparative LLM Analysis

Model	Accuracy	Language Support	Strengths	Limitations
ChatGPT	Very High	Multilingual	Support which is conversational, flexible, and instructional	ChatGPT can produce factually incorrect or misleading information.
Perplexity	High	English-centric	Good for fact and search checking	Limited multilingual capability
Claude	High	Multilingual	Safe responses, Ethical alignment	Difficulty with Nuanced Language
GPT-3/4	High-Very High	Multilingual	Rich databases and complex reasoning	High computational cost
BERT	High	Multilingual	Q&A tasks, Classification,	Not generative
T5	High	Multilingual	text-to-text	Computationally

			tasks, Summarization,	expensive
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V. CONCLUSION AND FUTURE SCOPE

According to the study's findings, LLMs are effective instruments that help improve instruction by creating individualized, interesting, and inspiring experiences. Although privacy, bias, and critical thinking issues need to be properly handled, students have a positive perception of them.

Future Scope: Create LLMs for education that are in line with ethics. Incorporate multilingualism to promote inclusive international education. Examine hybrid models that combine AI direction with human instruction. Provide guidelines for responsible AI use and data privacy.

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AUTHOR PROFILE

Dr. Anu Thomas is currently serving as Vice Principal at **SIES (Nerul) College of Arts, Science, and Commerce..** She has more than **23 years of experience** in teaching and research. Dr. Anu Thomas has published **over 20 research papers** in reputed journals and conferences and has authored/co-authored multiple books in the field of Computer Science and Information Technology. She is also an active **Board of Studies member at the University of Mumbai**, contributing to curriculum development and academic reforms. Her areas of interest include **Artificial Intelligence, Data Analytics, Machine Learning, Educational Technology, and Innovation in Higher Education.**