



IMPACT OF AI TOOLS ON THE LEARNING PROCESS AND COGNITIVE ABILITIES OF UG AND PG STUDENTS

Ms. Anasuya

Assistant Professor

SDM College of Business Management

Mangalore

ABSTRACT

The integration of Artificial Intelligence (AI) tools into the education sector is reshaping traditional learning methodologies and redefining the student learning process. By incorporating AI tools in education, students can enhance their ability to analyze data, automate processes, and innovate all essential skills for remaining competitive in a technology-driven economy. AI systems can analyze user data, taking into account students' strengths, weaknesses, and learning preferences to provide customized educational content. These tools help students stay on track with their studies and offer additional support in areas where they struggle. However, this shift also raises important concerns, including data privacy, over-dependence on technology, and the potential reduction of human interaction in the learning process. The purpose of this research is to explore both the positive and negative impacts of AI tools on student learning and cognitive abilities, as well as to propose strategies for students to balance AI usage while actively developing their cognitive skills.

Keywords : Skill, Learning process, Cognitive abilities, Artificial intelligence.

INTRODUCTION

The integration of artificial intelligence (AI) tools in education is reshaping the learning landscape for undergraduate (UG) and postgraduate (PG) students. This transformation has a multifaceted impact, enhancing both the learning process and students' cognitive abilities. AI's ability to personalize educational experiences enables tailored content that meets individual learning needs, improving both comprehension and engagement. For instance, AI algorithms analyze student performance data to adjust instructional materials in real-time, allowing each learner to progress at their own pace.

Moreover, AI-powered virtual tutors provide immediate assistance, supporting independent learning while fostering critical thinking skills. These intelligent systems serve as supplementary resources, guiding students through complex concepts and offering feedback that enhances their academic performance. Additionally, the automation of administrative tasks such as grading

and scheduling further streamlines educational workflows, allowing educators to focus more on interactive teaching methods. However, the adoption of AI tools in education also raises important discussions about potential risks and ethical considerations. Data privacy concerns are paramount, as these systems often handle sensitive student information. Additionally, there is a risk of overreliance on technology, which could undermine essential human interactions crucial for social and emotional development. Equity issues may arise if access to AI resources varies among institutions, potentially widening the educational gap. Furthermore, ethical dilemmas related to algorithmic biases in assessments require careful scrutiny to ensure fair treatment of all students.

While AI tools offer significant opportunities to enhance the educational journey of UG and PG students through personalized learning and immediate support, it is crucial to address the associated risks and ethical challenges to ensure their benefits are maximized responsibly.



I. OBJECTIVES OF THE STUDY

- To examine the impact of AI on students' learning processes.
- To analyze the effects of AI-based learning on students' cognitive abilities.
- To provide suggestions for maintaining a balance between AI usage and traditional learning methods.

II. RESEARCH METHODOLOGY

The present study is a descriptive cum exploratory in nature and is based on primary data and secondary data. The data has been collected through distributing questionnaires and with the help of a well-structured questionnaire. The area of study has been Mangaluru on a random sampling basis and 121 respondents were selected for the survey. Data was fed into Microsoft Excel and was analysed with the help of statistical tools.

III. LITERATURE REVIEW

This literature review aims to explore existing studies on the impact of AI tools on the learning process and cognitive abilities of UG and PG students.

Adewale, Azeta, Abayomi-Alli, and Sambo-Magaj conducted a systematic literature review titled "Impact of Artificial Intelligence Adoption on Students' Academic Performance in Open and Distance Learning." Their study highlights the transformative potential of AI in education while acknowledging potential risks. It emphasizes the need for a predictive framework to assess AI's impact on student outcomes, particularly in open and distance learning (ODL) environments. Machine learning techniques, such as support vector machines (SVM), show promise in forecasting academic performance. Additionally, the study underscores the relevance of theoretical models, including the Technology Acceptance Model (TAM), the DeLone and McLean Information Systems Success Model (D&M), and the Unified Theory of Acceptance and Use of Technology (UTAUT). When combined with ODL-specific factors, these frameworks can inform the development of a comprehensive model for AI

integration in distance learning, ensuring effective implementation while addressing potential challenges.

Janaki and Mariyappan (2024) conducted a study titled "Exploring the Influence of AI-Powered Learning Tools on Student Understanding and Academic Performance." Their research found that AI-powered learning tools enhance personalized instruction by adapting to individual student needs, tracking progress, and providing targeted feedback. This individualized approach increases student engagement and motivation, ultimately leading to improved information retention and overall academic performance. Additionally, key features such as real-time feedback, adaptive assessments, and gamification contribute to a more engaging and effective learning experience, highlighting the potential of AI-driven tools to transform traditional educational methodologies.

Sasikala and Ravichandran (2024) conducted a study titled "Study on the Impact of Artificial Intelligence on Student Learning Outcomes." Their research highlights AI's potential to personalize learning, enhance student engagement, and improve academic performance through technologies such as adaptive learning platforms. While AI-driven education offers significant benefits, the study also identifies key challenges, including data privacy concerns, algorithmic bias, and disparities in access to AI resources. The authors emphasize the need for future research to address these challenges, ensure the ethical use of AI in education, and explore its long-term impact across diverse educational contexts.

Eltahir and Babiker conducted a study titled "The Influence of Artificial Intelligence Tools on Student Performance in e-Learning Environments: A Case Study." Their research found that integrating AI tools in education enhances learning, improves critical thinking, and increases student motivation. The study highlights AI's ability to provide innovative and personalized learning experiences, offering benefits to students regardless of gender. These findings underscore the potential of AI-driven education to create more effective and inclusive learning environments.



Basha (2024) conducted a study titled “The Negative Impacts of AI Tools on Students in Academic and Real-Life Performance.” This research explores the effects of AI tools on students’ academic and real-life performance, highlighting both their advantages and drawbacks. While AI can enhance personalized learning, improve teaching efficiency, and increase resource accessibility, it may also lead to overreliance, hinder critical thinking, and raise concerns about privacy and inequality. The study emphasizes the need for educators, parents, and policymakers to address these challenges by establishing guidelines that promote the responsible integration of AI without compromising traditional education methods.

Ward, Deepshikha, BhatiFnu, NehaAngela, and Guercio conducted a study titled “Analyzing the Impact of AI Tools on Student Study Habits and Academic Performance.” Their research found that AI-powered educational tools, incorporating adaptive learning, personalized difficulty levels, and real-time analysis, significantly improved student performance while reducing study time. Students expressed strong support for these features but also highlighted the importance of flexibility and transparency in AI-driven learning systems. The study suggests that future advancements should address concerns such as over-reliance on AI, data privacy, and seamless curriculum integration to ensure AI effectively supports student learning without diminishing essential academic skills.

IV. POSITIVE IMPACT OF AI TOOLS ON STUDENTS

Artificial intelligence (AI) is revolutionizing the educational landscape, offering unprecedented opportunities to personalize learning, enhance critical thinking, improve accessibility, and increase efficiency.

One of the most significant contributions of AI lies in personalized learning. By analyzing student data, AI systems can tailor educational content to individual needs, recognizing that each learner has unique strengths, weaknesses, and learning styles.

This personalized approach allows students to learn at their own pace, receive targeted support

in areas where they struggle, and quickly advance in areas where they excel. Adaptive learning tools, powered by AI, dynamically adjust content based on student performance, ensuring that learners receive the appropriate level of challenge and support. Furthermore, AI-powered virtual mentoring systems provide real-time feedback and guidance, helping students overcome challenges and develop independent problem-solving skills.

Virtual tutoring further enhances the personalized learning experience by simulating one-on-one instruction. AI-powered tutors can answer student questions, explain complex concepts clearly and concisely, and provide personalized guidance and support. This is particularly beneficial for students who may not have access to human tutors or who require additional support outside the classroom.

AI also plays a vital role in creating engaging and interactive learning experiences. By incorporating AI-powered simulations, games, and virtual labs, educators can transform passive learning into an active and immersive process. These interactive experiences not only enhance student engagement but also improve understanding and retention.

Content curation is another significant benefit of AI in education. AI algorithms can efficiently sift through vast amounts of information from various sources, including textbooks, articles, and online resources, to curate relevant and high-quality learning materials for each student. This saves students valuable time and effort while ensuring that they have access to a comprehensive set of resources.

AI also plays a crucial role in improving accessibility in education. Tools such as speech recognition and text-to-speech technology make educational content more inclusive, allowing students with disabilities to access information and participate fully in the learning process. Additionally, AI can bridge geographical barriers, enabling students in remote areas to access high-quality educational resources that were previously unavailable to them.



Finally, the use of AI in education significantly enhances efficiency for both educators and students. By automating routine tasks such as grading and scheduling, AI frees up educators' time, allowing them to focus on personalized instruction and meaningful student interactions. This increased efficiency not only saves time but also improves the overall quality of education by enabling educators to address individual learning needs more effectively.

V. NEGATIVE IMPACT OF AI TOOLS ON STUDENTS

The integration of artificial intelligence (AI) in student learning presents both exciting opportunities and significant challenges. While AI-powered tools can personalize learning, automate administrative tasks, and offer valuable insights, their widespread adoption necessitates careful consideration of several critical concerns.

One of the most pressing issues is overreliance on technology. As students increasingly depend on AI tools for assistance, there is a risk of hindering the development of crucial skills such as critical thinking, problem-solving, and independent learning. Students may become accustomed to relying on AI for quick answers, potentially stifling their intellectual curiosity and creativity.

Furthermore, the potential for algorithmic bias is a significant concern. If the data used to train AI algorithms reflects existing societal biases, the AI systems themselves may perpetuate these biases, leading to unfair and discriminatory outcomes for certain student groups. For instance, biased algorithms could disadvantage students from underrepresented backgrounds in admissions processes, scholarship applications, or academic evaluations.

Another critical concern is data privacy. AI systems often require extensive data collection on students, including personal information, academic records, and even communication patterns. This raises serious concerns about the potential for unauthorized access, data breaches, and the misuse of sensitive student information.

The impact on social and emotional development is another important consideration.

Increased reliance on AI-powered tools and virtual learning environments can limit opportunities for face-to-face interaction, potentially hindering the development of essential social and emotional skills. Human interaction plays a vital role in fostering emotional intelligence, building strong relationships, and cultivating empathy.

Finally, the issue of equity must be carefully addressed. Unequal access to technology and the internet exacerbates existing disparities in education. Students from disadvantaged backgrounds may lack the resources to fully benefit from AI-enhanced learning environments, further widening the achievement gap.

VI. DATA ANALYSIS

This section presents the Data of the statistical analysis of the questionnaire data.

Table 1: Socio- demographic Factors: An Analysis

Demographic Profile	Respondents	Percentage
Age		
19	13	10.7
20	23	19.0
21	22	18.2
22	24	19.8
23	21	17.4
24	15	12.4
28	3	2.5
Gender		
Male	73	60.3
Female	48	39.7
Course		
BBA	28	23.1
BCA	23	19.0
BA(HRD)	21	17.4
BCOM	27	22.3
MCOM	12	9.9
MBA	10	8.3

Source : Primary Data

The above summarizes the socio-demographic characteristics of the sample population, focusing



on age, gender, and course of study. The age distribution of respondents shows a relatively even spread across different age groups, with the majority falling between 19 and 24 years old. The highest representation comes from the age group of 22 years (19.8%), followed closely by 20 years (19.0%) and 21 years (18.2%). The least represented age is 28 years (2.5%).

Similarly, the gender distribution reveals that males (60.3%) outnumber females (39.7%), indicating a gender disparity in the sample and suggesting that males are more represented in the surveyed group.

The respondents are enrolled in a variety of academic programs, with BBA (23.1%) and B.COM (22.3%) having the highest representation. The BCA (19.0%) and BA (HRD) (17.4%) programs also have a substantial share, followed by M.COM (9.9%) and MBA (8.3%). This distribution suggests a mix of undergraduate and postgraduate students, with a stronger presence from undergraduate business and commerce-related disciplines.

Table 2 : Student Learning Process Factors: An Analysis

Student Learning Process	Respondents	Percentage
Use of AI tool for learning		
Daily	13	10.7
Weekly	45	37.2
Monthly	52	43.0
Rarely	11	9.1
Using AI tools for		
Completing assignments	34	28.1
Preparing for Exams	22	18.2
Exploring new Concepts	12	9.9
Papering Research Paper	18	14.9
Paper Presentation	33	27.3
Other	2	1.7

AI tools helped in learning process		
Very helpful	61	50.4
Somewhat helpful	45	37.2
Not very helpful	15	12.4
Not at all helpful	0	0.0
AI tools helped to develop new skills or interest		
Yes	49	40.5
No	72	59.5
AI tool personalize in learning experience		
Not at all,	19	15.7
Slightly,	37	30.6
Moderately	50	41.3
Extremely	15	12.4
Immediate feedback from AI tools boost to motivation continue learning		
Yes	64	52.9
No	57	47.1
Experienced frustration due to inaccurate or misleading information provided by AI tool		
Yes	37	30.6
No	84	69.4

Source : Primary Data

The data presented in Table 2 provides insights into how students utilize AI tools in their learning processes. This analysis focuses on the frequency of AI tool usage, their perceived effectiveness, and their overall impact on students' learning experiences. The majority of students (80.2%) use AI tools at least monthly, with a significant portion (37.2%) using them weekly. This suggests that AI tools are becoming an integral part of the learning process for many students, though only a small percentage engage with these tools daily.



Students reported various reasons for utilizing AI tools, with the highest usage for completing assignments (28.1%) and paper presentations (27.3%). This indicates that students primarily view AI tools as aids for practical tasks rather than as resources for deeper conceptual understanding or exploration. The lower percentages for exploring new concepts suggest that while AI tools assist with task completion, they may not be fully utilized for fostering creativity or critical thinking.

A significant majority (87.6%) of students find AI tools helpful in their learning process, with half rating them as “very helpful.” This positive perception highlights the potential of AI tools to enhance student learning experiences, suggesting that they effectively provide support and resources. However, despite the overall positive feedback, a large portion of students (59.5%) indicated that these tools have not helped them develop new skills or interests. This discrepancy suggests that while AI tools are useful for immediate academic tasks, they may not significantly contribute to broader skill development or personal growth.

The data also indicates a moderate level of personalization in the learning experience through AI tools, with only a small percentage (12.4%) feeling that their experience is highly personalized. This suggests room for improvement in how AI tools can cater to individual learning styles and needs. Additionally, just over half of the respondents (52.9%) feel that immediate feedback from AI tools boosts their motivation to continue learning, indicating that timely responses can enhance engagement and persistence in academic tasks.

However, a notable portion of students (30.6%) have experienced frustration due to inaccurate or misleading information provided by AI tools. This could undermine their trust in these resources and potentially impact their learning outcomes.

Table 3: Cognitive Ability factors: An Analysis

Cognitive Ability	Respondents	Percentage
Felt that AI tools affected their critical thinking skills		
Yes	72	59.5
No	49	40.5
Feeling confident about ability to think critically		
Very confident	45	37.2
Somewhat Confident	36	29.8
Somewhat UnConfident	25	20.7
UnConfident	15	12.4
Believing that using AI tools can lead to a decreased sense of accomplishment when completing tasks		
Yes	56	46.3
No	65	53.7

Source : Primary Data

Table 3 : provides insights into students’ perceptions of the impact of AI tools on their cognitive abilities, particularly in relation to critical thinking skills, confidence in critical thinking, and feelings of accomplishment when using these tools. Understanding these factors is essential for evaluating the broader implications of AI in educational settings.

A majority of students (59.5%) believe that AI tools have influenced their critical thinking skills. This suggests that while many students recognize a potential impact—whether positive or negative on their ability to think critically, experiences vary among individuals. Some may feel that reliance on AI tools diminishes their ability to analyze and evaluate information independently, while others might view these tools as enhancing their cognitive processes.

Confidence levels regarding critical thinking abilities present a mixed picture. A combined total



of 67% of students express some level of confidence (either “very confident” or “somewhat confident”) in their critical thinking skills, whereas 33% report feeling somewhat unconfident or unconfident.

Nearly half of the respondents (46.3%) believe that using AI tools leads to a decreased sense of accomplishment when completing tasks. This aligns with concerns that over-reliance on technology may undermine intrinsic motivation and reduce the satisfaction derived from personal effort and achievement. However, more than half of the students (53.7%) do not feel that AI tools diminish their sense of accomplishment, suggesting that, for many, these tools serve as valuable aids rather than replacements for personal effort.

VII. OBSERVATIONS

In today’s technologically advanced world, the way people live, work, and learn has undergone significant transformation. The emergence of AI technology has revolutionized education, making academic activities more efficient and accessible. AI tools are widely used to simplify learning processes, enhance engagement, and provide personalized, adaptive learning experiences. They also offer immediate feedback and ensure easy access to information, thereby improving students’ overall academic journey.

However, relying exclusively on AI tools may hinder students’ critical thinking, limit their independent reasoning, and weaken their decision-making and problem-solving abilities skills essential for both academic success and real-life challenges. Encouraging students to engage with traditional learning methods while integrating AI tools allows them to develop their own ideas, explore different perspectives, and actively participate in the learning process.

Furthermore, combining AI with traditional approaches enhances the overall learning experience, making it not only more effective and efficient but also more productive and insightful. A balanced approach ensures that students benefit from technological advancements while

maintaining the essential cognitive and analytical skills necessary for lifelong learning.

VIII. RECOMMENDATIONS

1. Encourage Traditional Learning Methods – Students should read textbooks, research papers, and physical books to complement AI-generated content and develop a deeper understanding of subjects.
2. Promote Critical Thinking – Instead of accepting AI-generated answers as final, students should analyze multiple perspectives on a topic to enhance their reasoning and analytical skills.
3. Foster Independent Creativity – Engaging in personal projects without AI assistance can help students develop original ideas and problem-solving skills.
4. Integrate AI with Traditional Learning – A balanced approach that combines AI tools with conventional learning methods can equip students with the necessary skills to thrive in academic and real-life situations.
5. Ensure Ethical AI Use – Implementing robust data governance policies is essential to protect student privacy and ensure the responsible handling of their data.

IX. CONCLUSION

In conclusion, integrating AI tools with traditional learning methods can significantly enhance the learning process, making it more effective and efficient for students. While AI offers remarkable advantages in education, a balanced approach is essential to ensure the development of critical skills such as critical thinking, problem-solving, decision-making, social interaction, emotional intelligence, and strong moral values. By adopting this approach, potential drawbacks can be mitigated while fostering students’ holistic growth and overall well-being, ultimately preparing them for both academic success and real-life challenges.



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