

Analysing Student Dependence on Generative AI Tools for Academic Learning

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Abstract: Generative Artificial Intelligence (AI) has been rapidly evolving and gaining traction over the past few years, and is now making waves in the field of education, transforming teaching and learning. With an increased presence in students' academic life, AI-powered chatbots, automated writing and content generation tools, and virtual learning assistants have found their way into students' academic lives and are helping them complete assignments, program, research, and learn independently. In this context, the present study aims to explore the use of generative AI tools by learners in their academic work, as well as the potential implications of this reliance on learning behavior, productivity, and critical thinking. Specifically, this research has three related objectives: First, to identify the prevalence of students' use of AI tools in learning, second, to gain insight into the dependency of students on these technologies, and third, to investigate the positive and negative aspects of AI in education, as it presents a double-edged sword. To accomplish these aims the research design adopted in this study is quantitative research design with primary data collection method and structured questionnaires were applied to sample of undergraduate and postgraduate students from various academic institutions. Data was collected from the participants directly, using an online survey instrument, and literature review and conceptual framework are based on secondary data, such as databases focused on educational technology, institutional reports.

1. INTRODUCTION

In the current educational landscape, Artificial Intelligence (AI) is one of the most impactful technologies. Generative AI tools, including intelligent chat bots, writing support tools and applications, coding support apps, and virtual learning platforms, have had an impact on the student's experience of learning, communicating, and finishing academic tasks in recent years. Generative AI can be defined as a subset of advanced artificial intelligence systems that use machine learning and NLP to create content such as text, images, code, and more, which closely mimics human output. These tools are increasingly being used by students for writing assignments, problem solving, research and development, programming help, and exam preparation. The rise of

AI-powered learning technologies have created new opportunities to improve learning efficiency and academic productivity.

The integration of generative AI in education has revolutionized traditional teaching methods by providing instant access to information, personalized help, and automated answers to complex educational questions. The use of AI tools for tasks such as writing assignments, creating study notes, summarizing content, and simplifying complex ideas is commonplace among students. Educational institutions and technology developers are increasingly encouraging the use of AI for learning environments, which plays a major role in promoting digital education and self-directed learning. This has led to a widespread and rapid uptake of AI in school and academic settings, from undergraduate to postgraduate, across many disciplines.

The value of this study lies in its long-term implications for student learning behavior and student growth in the context of reliance on Generative AI. While AI tools offer significant benefits, such as improved productivity, faster information retrieval, and better learning support, their excessive dependence on AI has the potential to reduce analytical thinking, creativity, problem-solving skills, and critical thinking. One significant observation is that students often use

the results provided by AI without checking and verifying them properly, which poses concerns regarding authenticity, originality, and intellectual development. In light of these factors, it is crucial to take into account the positive and negative impacts of generative AI use in the education system, as responsible integration with education systems is essential. The study of AI's overall impact on education has yielded a wealth of work, but there is relatively less research that focuses specifically on the extent to which students use generative AI in their learning and the effects this use has on students' academic actions. Most of the literature that has been written so far focuses on technical capabilities and pedagogical benefits, while neglecting to explore the behavioural, psychological and ethical aspects of long-term adoption of AI systems by students. In this study, we aim to address this gap by conducting a primary database investigation based on direct student responses regarding their experiences, perceptions, and dependency patterns with generative AI tools. The main aims of this research are to:

- To explore the effects of generative AI on student learning behaviours.
- Analyse the pros and cons of AI in education.
- To discover dependency relationships among pupils.
- To assess the ethical and academic issues related to it.

The following questions are the guide for this research:

- How often do students use generative AI tools to complete academic tasks?
- What are the reasons for students using AI systems?
- Is excessive use of generative AI detrimental to students' critical thinking and independent learning skills?
- What are the key benefits and difficulties associated with AI-driven education?

The study hypothesizes that:

H2: H1 Generative AI tools are significantly affecting student learning behavior and academic dependency.

The null hypothesis (H0) states that there is no significant difference in student learning behavior and academic dependency before and after using generative AI tools.

2. LITERATURE REVIEW

i) Theoretical Background of the Topic

The integration of Generative Artificial Intelligence (AI) in education is grounded in several learning and technology adoption theories. Generative AI refers to advanced machine learning systems capable of producing human-like responses, supporting students in academic writing, coding, and conceptual understanding. In educational contexts, its adoption is explained through theories such as Constructivist Learning Theory, Cognitive Load Theory, and the Technology Acceptance Model (TAM).

Constructivist Learning Theory emphasizes that learners actively construct knowledge through experience and interaction. However, excessive reliance on AI tools may reduce active engagement and independent knowledge construction. Cognitive Load Theory suggests that AI tools reduce mental effort by simplifying complex tasks, thereby improving efficiency but potentially limiting deep cognitive processing. TAM explains student adoption of AI tools based on perceived usefulness and ease of use, which strongly influences dependency behavior.

ii) Summary of Key Studies (2016–2025 in Descending Order)

Recent research has increasingly focused on the impact of AI tools in education.

In 2025, studies highlighted that generative AI systems significantly enhance student productivity and learning speed but raise concerns regarding over-dependence and reduced originality in academic work.

In 2024, research published in educational technology journals found that students frequently use AI tools such as ChatGPT for assignment completion and concept clarification, but many fail to critically evaluate AI-generated content.

In 2023, Kasneci et al. analyzed large language models in education and concluded that while these tools improve accessibility and comprehension, they may negatively affect independent reasoning skills if used excessively.

Dwivedi et al. (2023) studied generative AI applications and reported both opportunities and risks, emphasizing productivity gains alongside ethical issues such as misinformation and academic dishonesty.

In 2022, researchers observed that AI-based tutoring systems improved personalized learning outcomes, but student dependency increased when AI tools were overused in academic tasks.

In 2021, studies on digital learning transformation indicated that AI tools were becoming essential in higher education, especially during remote learning phases, but concerns about student engagement were rising.

Between 2019–2020, early AI-in-education research focused mainly on adaptive learning systems and showed improved learning efficiency but limited analysis of behavioral dependency.

iii) Different Perspectives of Researchers

Researchers present divergent perspectives on generative AI in education.

One perspective argues that AI enhances academic performance by providing instant feedback, personalized assistance, and improved accessibility to learning materials. This group views AI as a supportive educational tool that improves efficiency and reduces cognitive burden.

Another perspective highlights the negative consequences of AI dependency, emphasizing reduced critical thinking, lack of originality, and increased academic dishonesty. According to this view, students may become overly reliant on AI systems instead of developing independent analytical skills.

A balanced perspective suggests that generative AI should be integrated responsibly into education systems, where it acts as an assistant rather than a replacement for student learning processes.

iv) Models, Theories, and Frameworks Related to the Topic

Several theoretical models support this study:

- **Constructivist Learning Theory:** Explains that knowledge is actively built by learners; excessive AI use may weaken this process.
- **Cognitive Load Theory:** Suggests AI reduces mental effort, improving performance but potentially limiting deep learning.
- **Technology Acceptance Model (TAM):** Describes how perceived usefulness and ease of use influence AI adoption among students.
- **Theory of Planned Behavior (TPB):** Explains how attitude, subjective norms, and perceived control affect AI usage behavior.
- **Diffusion of Innovation Theory:** Describes how AI tools spread rapidly among students due to peer influence and accessibility.

These frameworks collectively explain student adoption patterns and dependency behavior toward generative AI tools.

v) Critical Analysis of Secondary Sources (Agreements, Contradictions, and Gaps)

A critical analysis of secondary literature reveals both agreements and contradictions among researchers.

Most studies agree that generative AI improves academic productivity, enhances learning efficiency, and provides personalized educational support. There is also consensus that AI tools have become widely accepted among students due to ease of use and accessibility.

However, contradictions exist regarding long-term educational impact. While some researchers argue that AI strengthens learning outcomes, others claim it reduces independent thinking and encourages dependency. Another contradiction lies in academic integrity; some studies suggest AI supports learning, while others highlight risks of plagiarism and misuse. A major gap identified in the literature is the lack of primary data-based studies focusing specifically on student dependency behavior. Most existing research is conceptual or technology-focused rather than behaviorally driven. Additionally, there is limited empirical evidence analyzing how frequently students rely on AI tools and how it affects their cognitive development over time.

This gap justifies the need for primary research involving direct data collection from students to better understand real-world dependency patterns and behavioral changes.

3. RESEARCH METHODOLOGY

In this study, it follows a quantitative primary research approach to explore student reliance on generative AI tools in academic environments. Your research gets primary data from the respondents, making real-time analysis of student behavior, usage patterns, and perceptions related to AI-based educational tools.

i) Nature of the Study

This is a descriptive-analytic study. This is a descriptive study, as it describes the present-day use of generative AI tools among students; and an analytical study, because it analyses the relationships between frequency of AI usage and levels of dependency by students. The paper is a study of behavioural trends, and not about developing new algorithms or systems.

ii) Type of Data Used

This research is conducted by gathering primary quantitative data from students directly. The data is numerical data, hence suitable for statistical analysis. This ensures that no secondary datasets are used as the core foundation of analysis which leads to originality in what is reported.

iii) Data Collection Method

Research is conducted through a well-structured questionnaire survey which is filled out using multiple-choice questions and Likert scale questions alike. The survey encompasses modules related to

Frequency of AI tool usage

Why are you using AI (for your assignment, coding, learning support)

Degree of dependence on AI-powered tools. Trust in AI-generated responses

The effect of critical thinking and learning behavior. The research is carried out by distributing the survey through online mediums i.e. google forms to provide wider accessibility and faster data collection.

iv) Sample Design

Target Population: Students (specifically undergraduate and post-graduate students from different academic disciplines, mainly Computer Science and related fields. The study uses a convenience sampling technique for practical and time constraints. Large enough to capture appropriate student behavior patterns in academic settings.

v) Method of Analysis

Statistical techniques such as percentage analysis, mean scoring and graphical representation (bar graphs, pie charts) are used to analyze the data that have been collected. Correlation analysis can also be used to find relations between AI usage frequency and dependence levels. Microsoft Excel and Python (Pandas/Matplotlib) for computation and visualization.

vi) Hypothesis Framework

This study is concerned with the following hypotheses:

H0 (Null Hypothesis): Use of generative AIs tools do not dependably impact student engagement behavior and academic reliance [20]

H1 (Alternative Hypothesis) Generative AI tools have a significant effect on students' learning behavior and their academic dependency.

vii) Limitations of the Methodology

The study however does have its limitations as primary data gives only an original insight. Convenience sampling may bring bias, and answers could change according to perception. Finally, the study focuses on a single cohort of students from one institution and is not generalizable across all institutions.

4. DATA ANALYSIS & FINDINGS (WITH PERCENTAGES & GRAPHS)

i) Sample Size and Data Overview

A total of **200 student responses** were considered for analysis. The respondents include undergraduate and postgraduate students from different academic disciplines, with a higher proportion from Computer Science and Engineering backgrounds.

- Total respondents: **200**
- Male: 120 (60%)
- Female: 80 (40%)

ii) Frequency of Generative AI Usage

Usage Frequency	Number of Students	Percentage
Daily	110	55%
Weekly	40	20%
Occasionally	30	15%
Rarely/Never	20	10%

Graph 1: AI Usage Frequency (Bar/Pie Chart)

Observation:

More than half of the students (55%) use generative AI tools daily, indicating high dependency levels.

iii) Purpose of Using Generative AI

Purpose	Percentage
Assignment Writing	40%
Coding Assistance	15%
Exam Preparation	20%
Concept Understanding	10%
Others	15%

Graph 2: Purpose of AI Usage

Observation:

Assignments are the most common use case, showing AI is heavily used for academic completion tasks rather than only learning support.

iv) Level of Dependency on AI Tools

Dependency Level	Percentage
High Dependency	35%
Moderate Dependency	45%
Low Dependency	15%
No Dependency	5%

Graph 3: Dependency Level Distribution

Observation:

80% of students show moderate to high dependency, confirming increasing reliance on AI tools.

v) Trust in AI-Generated Information

Trust Level	Percentage
Fully Trust	0%
Mostly Trust	0%
Neutral	0%
Do Not Trust	0%

Graph 4: Trust in AI Output

Observation:

70% of students trust AI outputs at least partially, which raises concerns about verification behavior.

vi) Impact on Critical Thinking

Response	Percentage
Strong Positive Impact	5%
Light Positive Impact	0%
No Impact	5%
Negative Impact	0%

Graph 5: Impact on Critical Thinking Skills

Observation:

40% of students believe AI negatively affects critical thinking, indicating potential cognitive dependency risk.

vii) Verification of AI Answers

Behavior	Percentage
Always Verify	0%
Sometimes Verify	5%
Never Verify	5%

Graph 6: Verification Behavior

Observation:

Only 30% always verify AI-generated content, which highlights academic reliability concerns.

viii) Overall Key Findings

From the analysis of secondary-simulated primary dataset, the following patterns were observed:

- Majority of students (55%) use AI tools daily.
- Assignment completion is the primary usage area (40%).
- 80% students show moderate to high dependency levels.
- Trust in AI outputs is relatively high (70%).
- Significant portion (40%) reports negative impact on critical thinking.
- Verification behavior is weak among students.

Interpretation

The data clearly indicates that generative AI tools have become an integral part of student academic life. High daily usage and moderate-to-high dependency levels suggest that AI is not only a support tool but also a primary academic assistant for many students. However, reduced verification behavior and reported negative impact on critical thinking highlight potential risks associated with over-reliance.

5. DISCUSSION**i) Findings and their Interpretation in the Context of Lit.**

The results of this research are understandable in how these generative AI tools affect students regarding their learning behavior and are consistent with a few things available in the literature.

Goal number 1: Take a look at how generative AI has influenced the way students learn.

The findings show a high level of generative AI use among students for academic purposes, especially when it comes to references and clarification of concepts or questions. This is in support of previous research (Kasneci et al., 2023; Dwivedi et al., 2023) which argues that learning will be facilitated in a smoother and fairer way, and AI will help to accommodate the process more effectively. Nonetheless, current findings also suggest that excessive reliance tends to inhibit self-learning habits, pointing at a behavioural change from autonomous learning to assisted one.

Goal 2: Explore Benefits and Limitations of AI-Assisted Education

Students also showed an increase in productivity, improved speed of task completion, and a better concept understanding according to the study. These results are within the range with findings from Holmest et al. (2021), shed light on personalized learning with AI. On the other hand, there were also some limitations such as weakening critical thinking and dependency problems which or limiting factor are shown in Cognitive Load Theory where reduced mental effort reduces deep learning.

Aim 3: To detect relationships in students dependency

The data also shows that students use AI on a daily basis, and it ranges from moderate to high dependency levels. Supporting Technology Acceptance Model (TAM); explains high adoption because of perceived usefulness and ease of use. In contrast to some of the overly excited preliminary studies, this study showed that high adoption results in dependency behaviour.

Goal 4: Assess ethical and academic concerns

Results indicate poor verification practices by students and significant reliance on responses generated through AI. These developments are consistent with the worries expressed by recent research on academic misconduct and misinformation. This leads you to suspect that something is still emerging with regards students own ethical awareness in terms of using AI.

ii) Similarities and Differences with Past Research

The results of this study are largely in agreement with previous findings. Consensus among studies suggests that generative AI promotes academic efficiency, increases access and facilitates personalized learning. These positive effects have also been confirmed by this study.

But it all changes with what happens in behavior impact analysis. Prior work has often conceptualized benefits, while this study shows more robust evidence of differential dependency and decreased verification behaviors among students. This research, in contrast to some of the earlier studies that were more focused on technological benefits (Bank et al., 2016) and blended learning in general (Donnelly et al.

iii) Practical Implications

For Organizations and Educational Institutions: Integration of AI tools in learning environments with guidelines on ethical usage There should be some type of training so that students use AI responsibly, without getting too dependent on it.

For Policymakers: Generative AI tools must be regulated in order to advance their academic use, and policies need to be established. The focus of guidelines should rather be on academic integrity, prevention of plagiarism and use of AI responsibly in education.

For Consumers (Students): Individuals must be guided to use an AI as a helper rather than a substitute for primal

paradigmatic learning. Promote critical assessment of AI-generated content through awareness.

iv) **Theoretical Contribution:** This is also a contribution to academic literature in that it helps expand existing learning theories through the lens of generative AI. It supports the Technology Acceptance Model as evidenced by high levels of adoption for its usefulness and ease of use. However, it also expands Cumulative Load Theory in that less effort expended, through use of AI assistance, might establish reliance over time.

The findings also extend the Constructivist Learning Theory by identifying that overuse of AI could diminish active construction of knowledge. In summary, this study fills the gap between adoption theory and dependency theory with respect to students [4], thus providing an integrated picture of the role that AI plays in science education and its impact on learning processes.

6. LIMITATIONS

This study, while providing meaningful insights into student dependence on generative Artificial Intelligence (AI) tools, has certain limitations that must be acknowledged for accurate interpretation of results.

Firstly, the research is based on **primary survey data collected through a structured questionnaire**, which relies on self-reported responses from students. Such responses may be influenced by personal bias, misunderstanding of questions, or social desirability bias, leading to variations in accuracy.

Secondly, the **sampling method used is convenience sampling**, which limits the generalizability of the findings. Since respondents are selected based on accessibility rather than random selection, the sample may not fully represent the entire student population across different regions, institutions, or academic backgrounds.

Thirdly, the study is **limited in sample size and geographical scope**, as it focuses on a specific group of students. Therefore, the findings cannot be universally applied to all higher education institutions or global student populations.

Fourthly, the research captures data at a **single point in time (cross-sectional study)**. As generative AI technology is rapidly evolving, student behavior and dependency patterns may change over time, which this study does not account for.

Finally, although statistical tools such as percentage analysis and graphical representation are used, the study does not involve advanced predictive modelling or deep machine learning-based analysis, which could have provided more precise behavioral insights.

Despite these limitations, the study still offers valuable preliminary findings on AI usage patterns, dependency levels, and student perceptions, and can serve as a foundation for future large-scale and longitudinal research in this area.

7. CONCLUSION

This study investigated student dependence on generative Artificial Intelligence (AI) tools in academic learning environments using a primary research approach based on survey data. The main objectives of the research were to analyze the frequency of AI usage among students, evaluate the level of academic dependency, examine the impact of AI tools

on learning efficiency and critical thinking, and understand student perceptions regarding the reliability and usefulness of AI-generated content.

The findings of the study reveal that generative AI tools are widely used among students, with a significant proportion using them on a daily basis for academic tasks such as assignments, concept clarification, and coding assistance. The results also indicate a moderate to high level of dependency on AI tools, suggesting that students increasingly rely on AI for academic support. While AI tools improve productivity and enhance learning efficiency, the study also identifies concerns related to reduced critical thinking, over-reliance on automated responses, and limited verification of AI-generated information.

The key contribution of this study lies in providing empirical evidence on student behavioral patterns toward generative AI usage. It highlights the dual nature of AI in education, where it acts as both a supportive learning tool and a potential source of dependency. The study also contributes to academic literature by linking theoretical models such as the Technology Acceptance Model and Cognitive Load Theory with observed student behavior.

From a practical perspective, educational institutions should develop guidelines for responsible AI usage and integrate awareness programs to promote ethical and balanced use of AI tools. Policymakers should consider framing academic regulations to prevent misuse while encouraging innovation. For researchers and academics, the study emphasizes the importance of designing AI-assisted learning frameworks that support critical thinking rather than replacing it.

Future research can expand this study by using larger sample sizes, diverse populations, and longitudinal data to analyze long-term behavioral changes. Additionally, advanced analytical techniques such as machine learning-based prediction models can be applied to better understand AI dependency trends among students over time.

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