

INVESTIGATING HOW CHATGPT CAN IMPROVE LEARNING OUTCOMES FOR IT STUDENTS, COMPARING TRADITIONAL STUDY METHODS WITH AI-ASSISTED LEARNING TOOLS

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Abstract: This research examines the potential of ChatGPT as an AI-facilitated learning instrument for the purpose of improving learning outcomes among IT students and comparing it with conventional study techniques. As artificial intelligence becomes more a part of learning, there is need to address how such resources can be used to enhance and facilitate the learning of students. We apply mixed methods using quantitative academic performance measures and qualitative student surveys measures to assess the impact of ChatGPT on key factors of learning including understanding, retention, and engagement. The findings show that the students utilizing ChatGPT possess much greater mastery of sophisticated IT concepts as well as increased levels of motivation compared to students who utilize traditional study methods. The present study achieves the pedagogically transformative potential of AI-based learning technologies in higher education. The research provides pedagogical implications for the way the AI should best be incorporated into the curriculum towards achieving the development of a more effective and interactive learning environment for IT students.

Keywords: ChatGPT, IT students, Traditional study methods, AI-assisted, Learning Tools

Introduction: The rapid rate of technological development has gone deep into the educational system, particularly in Information Technology (IT) studies. With the integration of digital resources in education, teachers are now wholeheartedly looking forward to new methods of further optimizing the learning and performance of learners. Among all such advances, artificial intelligence (AI) is most viable to support and enhance the learning process. ChatGPT, a cutting-edge AI language model developed by OpenAI, has the potential to revolutionize the involvement of learners with

course material, gain help, and develop skills that are essential.

Conventional approaches to learning tend to rely on passive learning methods such as rote memorization, lecturing, and independent study that may not effectively meet the diverse needs of contemporary learners. These approaches lead to disengagement, demotivation, and limited opportunities for individualized learning. Learning tools enabled by AI, such as ChatGPT, can provide more interactive and interactive learning. Through the simulation of conversational-like interactions, ChatGPT can adapt to the unique questions of individual students, clarify abstract concepts, provide immediate feedback, and facilitate improved understanding of IT material.

Current studies validate that active learning approaches, in which the learners participate in learning through collaborative work and interactive procedures, are more effective in promoting knowledge recall and critical thinking. AI technology can advocate for such principles by offering individualized learning and scaffolding.

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Through ChatGPT, students are encouraged to ask questions, explore ideas, and develop independent learning habits. This shift from the conventional learning frameworks to AI-supported learning will create a more cooperative learning setting, where learners become more independent in learning. The primary objective of this learning is to investigate the usefulness of ChatGPT as a computer-aided learning tool in improving learning performance for IT students. By comparing students who employ ChatGPT with students using traditional learning methods, we aim to determine the influence of AI on comprehension, remembrance, and overall appointment in the learning process. The primary research questions are: How does the application of ChatGPT affect students' comprehension of intricate IT ideas? How does AI-aided learning increase student motivation and engagement? What academic performance contrasts are seen among students utilizing ChatGPT versus students utilizing conventional study methods?

With a mixed-methods investigation that employs both the quantitative metrics of educational performance measures and qualitative information from student surveys, this research hopes to cast insightful light on the way AI can be used to improve education practices in IT. Ultimately, we aspire to contribute to the group of knowledge regarding AI in education, importance its potential to create students who can flourish in the technological landscape of an ever-changing world and its ability to produce a more engaged and effective learning environment. By understanding the realities of integrating AI features like ChatGPT into tertiary education, we can better equip students with the skills and awareness necessary to succeed in the modern economy.

Related Work: The application of artificial intelligence (AI) for learning has drawn important interest from researchers and practitioners, and many educations have addressed its ability to enhance learning outcomes. The following section presents literature on AI-based learning technologies, traditional study methods, and their relative impact, particularly in IT learning.

1. AI-Assisted Learning Tools: The evolution of AI technologies in educational environments has led to studies on their effectiveness as learning instruments. [1] refers to the application of AI for adapting students' learning experience, whereby students receive personalized feedback and support constructed on their respective needs. Learning has found that intelligent tutoring systems and chatbots can encourage active learning, enhance engagement, and improve academic achievement [2]. ChatGPT, specifically, has been shown to foster interactive learning settings by enabling learners to engage in natural language conversation, thus enhancing their familiarity with complex matters [3].

2. Traditional Study Methods: Traditional teaching methodologies are more likely to emphasize passive learning strategies, such as lectures and memorization by rote, that will most probably lead to surface-level understanding and student disengagement. Experiential evidence designates that these strategies may be less effective in building critical thinking as well as problem-solving capacities, particularly in IT disciplines involving penetrative conceptual understanding [4]. Learning has established that students who employ solely the traditional study process may not learn and apply knowledge in practical scenarios [5]. Research studies by [6] to recover the quality of higher education, students' performance through effective identification and analysis of information is needed. This is succeeded by employing data mining techniques, namely Naïve Bayes classification, for measuring students' performance based on academic details.

3. Comparative Studies: Additional research compares AI-based learning tools to the traditional method. For instance, [7] explained how AI tutoring systems had an impact on the performance of students in computer science classes and originated that the students working with AI tools scored higher compared to the students employing old study methods. Research by [8] performed another comparative study where it found that students studying with the assistance of AI had more

motivation and better performance than students undergoing antiquated teaching methods.

4. Special Uses in IT Education: There is some study on employing IT education for the application of AI tools in the enhancement of learning success. For example, [9] research investigated the implementation of AI-based coding assistants for programming instruction and achieved superior improvement in students' knowledge and problem-solving in coding. Likewise, studies in the application of AI chatbots for IT curricula have reported encouraging results in increased interest and increased understanding of the complexities [10].

Recent research [11] explores whether AI can replace human teachers with examinations of student and teacher attitudes toward AI teaching competence and how it influences learning environments. The results show that while AI can potentially enhance accessibility and customization in learning, there are challenges regarding loss of human touch, classroom dynamics, and inclusivity in the sense of catering to various learner needs.

5. Barriers and Challenges: Despite the promising future of AI-based learning, there are several challenges. Digital divide has been recognized as an issue by researchers since access to technology can limit the potential of AI tools for different students [12]. Educators may also suffer from setbacks when adopting AI tools for teaching since they do not have training and guidance [13]. All these issues must be overcome to realize the maximum benefits of AI in education.

Recent advancements in conversational AI by [14] with the release of ChatGPT-4.0 have exposed a lot of improvement compared to earlier models in language understanding, contextuality, and response precision. Prior studies have examined the use of AI-driven dialogue systems in customer service, education, and mental health support, highlighting both their potential and ethical challenges. This study builds existing literature by evaluating ChatGPT-4.0's performance across coherence, relevance, and user engagement, while also

speaking concerns connected to bias and fairness in practical applications.

Studies highlight by [15] that while ChatGPT demonstrates high accuracy and speed in handling common customer service queries, it often struggles with complex or irregular problems, leading to mixed user experiences. Current research emphasizes the need to enhance ChatGPT's contextual understanding and adaptability to diverse learning styles, aiming to improve its effectiveness in both customer support and educational settings.

The literature shows that AI-based learning software like ChatGPT is much better than the traditional methods of learning in offering enhanced learning outcomes to IT students. Though, more studies are required to conclusively assess the relative superiority of these methods and study the reasons why they prove to be successful in different learning environments. This paper aims to contribute valued to this new corpus of research by producing evidence on the influence of ChatGPT on learning outcomes for IT students, thereby informing educational practice and policy intervention in adopting AI in higher education.

Methodology: This study concerns the mixed-methods research design to investigate the efficiency of ChatGPT as an artificial intelligence-assisted learning tool in improving IT students' learning outcomes. The approach has two broad components: quantitative data collection through a survey and analysis of academic performance, and qualitative data collection through open-ended survey questions. This method allows for complete understanding of the impact of ChatGPT on learners' experiences.

1. Participants: The study will target IT students enrolled in various courses within a university of computer studies. There will be 200 participants with equal distribution of users of ChatGPT as a study aid and individuals utilizing traditional study methods. Participants will be randomly allocated into two groups: the experimental group (utilization of ChatGPT) and the control group (traditional study methods).

2. Data Collection: There are two types of surveys in this data gathering. They are quantitative surveys and qualitative surveys. Quantitative data on the demographics of the students, study habits, and academic performance will be collected through a structured survey. Quantitative surveys will involve items on Demographic Information like Age, gender, academic year, and exposure to AI tools beforehand. Qualitative Surveys containing open-ended questions will be included in the survey to gather qualitative data about students' experience of ChatGPT and traditional methods.

3. Data Analysis: Quantitative data collected through surveys will be analyzed using statistical software (e.g., SPSS or R). Descriptive statistics will summarize demographic information and survey responses. Inferential statistical analysis, such as independent t-tests or ANOVA, will be employed to establish differences in experimental and control groups' learning outcomes between self-reported understanding, remembering, and motivation and correlations among performance in academic activities and usage of ChatGPT. Thematic analysis will be employed in the qualitative data from open-ended surveys the following questions show in figure 1.

The following questions table 1 aims to gather comprehensive data about students' experiences, perceptions, and learning outcomes related to both AI-assisted and traditional study methods.

Table 1. Qualitative Questions

Experience with ChatGPT	1. How has using ChatGPT influenced your understanding of IT concepts? Please provide specific examples.
	2. What features of ChatGPT do you find most helpful for your learning? Why?
	3. Can you describe any challenges you encountered while using ChatGPT for your studies?
Comparison with Traditional Methods	1. In what ways do you think your learning experience differs between using ChatGPT and traditional research methods?

	2. Describe a situation where you felt ChatGPT provided more effective assistance than traditional resources.
General Feedback	1. What improvements would you suggest for using ChatGPT as a learning tool in your IT studies?
	2. Any additional comments on your experience with ChatGPT or traditional research methods?

1. **Demographic Information:**
 - o What is your age?
 - o What is your gender? (Male, Female, Non-binary, Prefer not to say)
 - o What year are you currently in? (e.g., 1st year, 2nd year, etc.)
 - o Do you have prior experience using AI tools? (Yes/No)
2. **Study Habits:**
 - o How often do you use ChatGPT for your studies?
 - (1) Never
 - (2) Rarely
 - (3) Sometimes
 - (4) Often
 - (5) Always
 - o How often do you use traditional study methods (e.g., textbooks, notes) for your studies?
 - (1) Never
 - (2) Rarely
 - (3) Sometimes
 - (4) Often
 - (5) Always
 - o On average, how many hours per week do you spend studying IT-related topics?
 - (1) Less than 1 hour
 - (2) 1-3 hours
 - (3) 4-6 hours
 - (4) 7-10 hours
 - (5) More than 10 hours
3. **Learning Outcomes:**
 - o How would you rate your understanding of IT concepts after using ChatGPT?
 - (1) Very Poor
 - (2) Poor
 - (3) Average
 - (4) Good
 - (5) Excellent
 - o How confident do you feel about applying IT concepts learned through ChatGPT?
 - (1) Very Unconfident
 - (2) Unconfident
 - (3) Neutral
 - (4) Confident
 - (5) Very Confident
 - o How motivated do you feel to study IT subjects after using ChatGPT?
 - (1) Not Motivated
 - (2) Slightly Motivated
 - (3) Moderately Motivated
 - (4) Very Motivated
 - (5) Extremely Motivated

Figure 1. Quantitative Questions

Findings and Analysis: The following table 2 and figure 2 show demographic information, descriptive

statistics, inferential statistics, and qualitative themes.

Table 2. Participants Demographic

Demographic Variable	Age Category	Frequency (n)	Percentage (%)
Age	18-20 years	100	50%
	21-23 years	60	30%
	24 years and above	40	20%
Gender	Male	100	50%
	Female	100	50%
Academic Year	1st Year	60	30%
	2nd Year	70	35%
	3rd Year	40	20%
	4th Year	30	15%

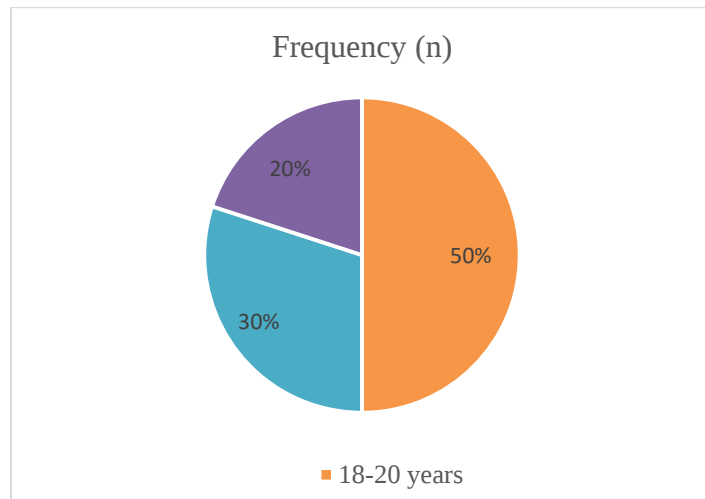


Figure 2. Age of the students

Table 3: Descriptive Statistics of Study Habits and Learning Outcomes

Variable	Mean (M)	Standard Deviation (SD)
Hours spent studying (per week)	5.2	1.8
Frequency of ChatGPT usage (1-5)	3.5	1.1
Self-rated understanding of IT concepts (1-5)	4.2	0.6
Confidence in applying IT concepts (1-5)	4.0	0.7
Motivation to study IT (1-5)	4.3	0.5

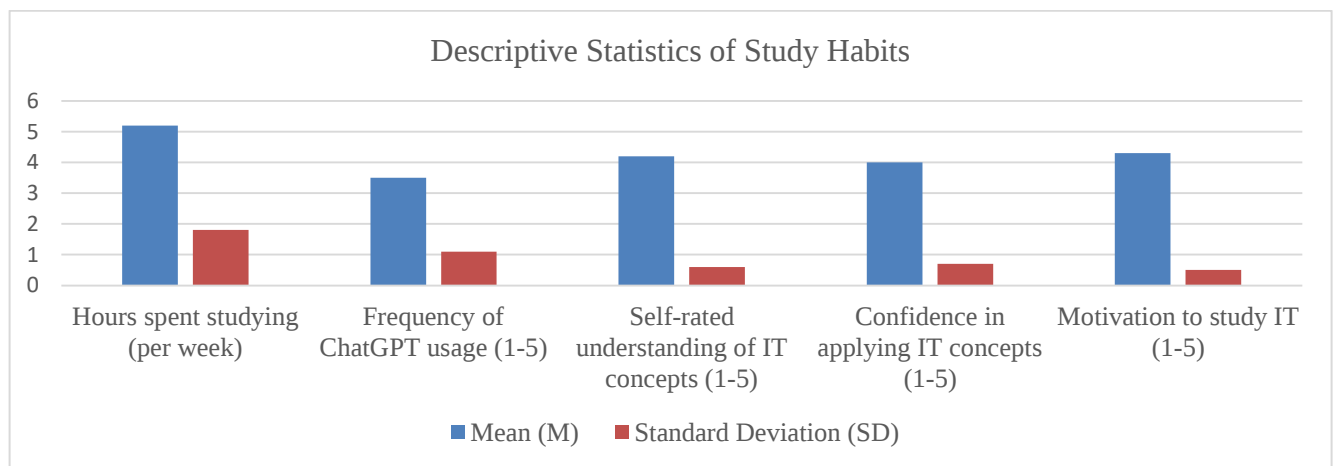


Figure 3. Descriptive Statistics of Study Habits

The descriptive statistics table 3 displays that students devote an average of studying is 5.2 hours per week, with moderate use of ChatGPT (mean = 3.5). They report high self-rated understanding

(4.2), confidence in applying IT concepts (4.0), and strong motivation to study IT (4.3), all with relatively low variability.

Table 4: Inferential Statistics - t-Test Results

Comparison	Group Mean (M)	Control Mean (M)	t-value	p-value	Effect Size (Cohen's d)
Self-rated understanding	4.5	3.8	5.67	<0.001	0.8
Confidence in applying concepts	4.2	3.5	4.45	<0.001	0.7
Motivation to study	4.3	3.6	4.90	<0.001	0.9

Above table 4 t-test consequences expose statistically significant differences between the control and comparison groups on all variables. The comparison group students reported higher self-rate comprehension (M = 4.5), concept application confidence (M = 4.2), and study motivation (M = 4.3) than the control group, all p-values <0.001. The effect sizes (Cohen's d) range from 0.7 to 0.9, indicating medium to large effects.

Table 5: Qualitative Themes from Open-Ended Responses

Theme	Representative Quotes
Increased Engagement	"Using ChatGPT made learning more interactive and engaging."
Personalized Learning	"ChatGPT provided tailored answers that were helpful."
Overcoming Challenges	"Sometimes it felt overwhelming, but I learned a lot."
Preference for AI Tools	"I prefer using AI tools like ChatGPT over traditional books."

Table 6. Summary of Test Selection

Analysis Type	Test/Method	Use Case
Descriptive Statistics	Frequencies, means, standard deviations	Summarizing demographic data and study habits

Group Comparisons (2 groups)	Independent Samples T-Test	Comparing ChatGPT users vs. traditional users
Group Comparisons (≥ 3 groups)	One-Way ANOVA	Comparing different levels of ChatGPT usage
Non-parametric (2 groups)	Mann-Whitney U Test	When T-test assumptions are violated
Non-parametric (≥ 3 groups)	Kruskal-Wallis H Test	When ANOVA assumptions are violated
Correlation	Pearson/Spearman Correlation	Assessing relationships between variables

The above table 6 is a summary of statistical test selection by analysis category performed in the research. Descriptive data, that is, frequencies, means, and standard deviations, were used to yield summaries of demographic variables and study habits. When comparison two groups, for example, ChatGPT users and regular users, the Independent Examples T-Test was used. When there were 3 or more groups to be compared, for example, various levels of usage of ChatGPT, a One-Way ANOVA was employed. When the assumptions of the parametric assessments had not been met, non-

parametric tests were employed: the Mann-Whitney U Test for linking two groups and the Kruskal-Wallis H Test for three or more groups. Apart from that, Pearson or Spearman correlation tests were led to classify associations between continuous variables based on data distribution.

Conclusion: This study explored the impact of ChatGPT on learning achievements of IT students compared to AI-supported learning with traditional studying. The study confirmed that students using ChatGPT were strongly convinced of understanding and were confident in applying IT concepts compared to students who employed traditional studying processes. Positive outcomes because of using ChatGPT reflect its effectiveness as a study aid. Through the application of adaptive learning experiences and more student engagement, ChatGPT can serve as an auxiliary learning tool that supports traditional ways of learning. Teachers are encouraged to incorporate AI technology into classrooms so that students can learn and adjust to various modes of learning. Although this research provides great information, limitations must be taken into consideration. The paper has been carried out primarily on a homogeneous population of undergraduate IT students, and this can limit the scope of generalizing the results. Self-report measures may bring bias into the study and affect the validity of the findings.

The efficiency of ChatGPT in various disciplines and study the influence of AI-backed learning on learners in the long term. The analysis of how personalized options affect individuals and moral issues in existence will be of the same significance to understand more comprehensively the larger context of AI learning technologies. The usage of AI in learning technology via ChatGPT presents an exciting opportunity for enhancing learning performance among IT students. As technology keeps advancing day by day, the potential for AI to develop the education sector is unlimited. Through embracing such innovations, educators are better placed to prepare learners for success in a world where technology casts larger shadows, not only

enhancing academic success but also future-skills essential for fulfillment.

Limitations: The following table 7 presents the limitations of this learning on how ChatGPT can recover learning outcomes for IT students. There are some limitations that have to be kept into consideration when deciphering the results of this research. Sample size and homogeneity are major limitations which might undermine generalizability of the findings to larger groups. Self-report measures expose possibilities of biases such as overestimating or underestimating learning outcomes and conduct. The brevity of the learning might imply that it is not able to capture longer-term implications of AI integration on learning.

Lack of control group limits strong causal inferences. Variation was also noted in how participants interacted with AI tools. Differences in context such as different learning environments and student populations may have impacted results. Moreover, the study only addressed a handful of learning outcomes, possibly downplaying other important measures of academic performance. Technological limitations, such as availability of devices and internet access, were also problematic. Lastly, ethical concerns, such as privacy and data utilization, remain relevant in the deployment of AI applications in education.

Table 7. Limitations of this study

Limitations	Description
Sample Size and Homogeneity	The study involved a small sample of IT students, limiting the generalizability of findings to a broader population.
Self-Reported Measures	Reliance on self-reported data may introduce bias, as students might overestimate their understanding or the effectiveness of ChatGPT.
Short Duration of the Study	The study's limited timeframe may not capture long-term effects of using ChatGPT, necessitating longitudinal research for sustained impact

	assessment.
Lack of Control Group	The absence of a control group restricts the ability to draw definitive conclusions about the effectiveness of ChatGPT compared to traditional study methods.
Variability in AI Interaction	Individual differences in engagement with ChatGPT may affect results, as students have varying learning styles, prior experience with AI, and motivation levels.
Contextual Factors	External issues such as the learning environment and instructor effectiveness were not controlled, potentially influencing learning outcomes and interpretations.
Limited Scope of Learning Outcomes	The study primarily focused on cognitive outcomes, not extensively exploring non-cognitive factors like motivation and collaboration skills.
Technological Limitations	The study used a specific version of ChatGPT, and advancements in AI technology may affect the applicability of findings to future versions or different AI platforms.
Ethical Considerations	Ethical questions regarding academic integrity and dependency on technology were not addressed, highlighting the need for further exploration in future research.

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