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Exploring The Impact of ChatGPT on English Education Department Student's Motivation and Performance

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ABSTRACT

This study investigates the impact of the AI tool ChatGPT on the motivation and academic performance of higher education students. Anchored in the theoretical framework of Self-Determination Theory (SDT), the research hypothesizes that the use of ChatGPT would positively influence student learning outcomes by fulfilling the psychological needs of autonomy, competence, and relatedness. Utilizing a mixed-methods approach, the study involved a quantitative analysis comparing the motivation scores and GPAs of ChatGPT users (n = 25) with non-users (n = 10), and a qualitative analysis exploring students' experiences and perceptions of using ChatGPT. The participant was 35 students of 7th semester of English Education Department in University of Muhammadiyah Gresik. The results revealed that students who utilized ChatGPT demonstrated significantly higher motivation and academic performance, with mean motivation scores of 44.88 for users versus 17.60 for non-users, and mean GPAs of 3.63 for users compared to 3.06 for non-users. Qualitative findings further illuminated these results, with themes such as 'Enhanced Academic Efficiency and Productivity' and 'Better Understanding and Independent Learning' emerging, underscoring how ChatGPT facilitated more efficient and in-depth learning experiences. The study confirms the positive impact of ChatGPT on student motivation and performance, aligning with and expanding upon the principles of SDT. It highlights the potential of integrating AI tools in educational strategies, while also acknowledging the need for cautious interpretation due to limitations like the violation of homoscedasticity assumptions. This research opens new avenues for the strategic use of AI in education and sets a foundation for future exploration in this evolving field.

Keywords:
ChatGPT, Student Motivation, Student Performance

1. Introduction

In recent years, artificial intelligence (AI) has emerged as a transformative force across various sectors, including education. Traditional teaching methods, which have long dominated educational environments, have undergone a paradigm shift in the 21st century due to the integration of AI-driven tools. This shift represents a move toward a more inclusive, flexible, and effective learning environment.

The application of AI in education has shown promising results, offering personalized and dynamic learning experiences. Early uses of AI in education were observed in computer-based training systems, but it has since evolved into a key

element in modern educational contexts. For instance, the study conducted by Neo et al. (2022) highlighted the potential of AI, particularly chatbots like MERLIN, to enhance student learning and motivation. AI's impact on education is not confined to one geographical location. Dr. Padma C and Dr. Rama C's study (2022) in the Indian education industry emphasized AI's disruptive methods in personalizing learning experiences. Moreover, AI has extended its influence to medical education, with Nagi et al.'s (2023) scoping review revealing its potential to improve individualized learning experiences. Tiwari (2023) conducted a comprehensive literature review on AI and machine learning in education, underlining AI's potential to personalize and enhance students' educational experiences. However, the review also stressed the need for further research to understand AI's promise and limitations in education fully.

Motivation plays a pivotal role in student engagement and performance. Psychological factors such as autonomy, competence, and relatedness, as highlighted by Ryan & Deci (2000), significantly influence motivation. Another aspect impacting motivation includes engaging activities, exemplary behavior demonstration, enhancing enthusiasm, offering affirmative feedback, and fostering strong relationships (Agus et al., 2022). Additionally, there is a strong association between student performance and their motivation (Juliana et al., 2022). Furthermore, student performance influenced by various factors, including individual characteristics, family background, institutional support, and teacher-student interactions, as noted by Jou et al. (2022).

In conventional teaching methods, sustaining student interest can be a challenge. However, AI tools, like ChatGPT, offer a potential solution by providing personalized, adaptive learning experiences. Previous research has shown the positive effects of AI on understanding challenging subjects and improving problem-solving abilities. For instance, studies conducted by Jiao et al. (2022), Bressane et al. (2022) ,Jokhan et al. (2022), and Huang (2022) have highlighted these benefits. Furthermore, Corsten & Skousen (2023) have emphasized the advantages of AI-generated questions in evaluations.

The integration of AI in education has the potential to enhance both student performance and motivation. Various AI-driven tools and techniques cater to diverse learning needs. Research indicates the positive impact of interactive learning methods (Trajkovik et al., 2018) and the importance of fostering productive online learning communites (Ho et al., 2023). ChatGPT, developed by OpenAI, stands out for its conversational abilities and adaptability. Its applications span various fields, including medical and agriculture, making it a suitable choice for educational contexts (Williams, 2023). ChatGPT is recognized for its conversational skill. In contrast to conventional AI, it communicates via chat, responding to questions and even pointing out errors, making it suitable for a variety of uses, particularly in education. Its application in medical, helping with ophthalmic jobs (Ting et al., 2023) and in agriculture, for decision-making and production optimization (Siche & Siche, 2023), both serve as examples of its adaptability. The real-time feedback and conversational aspect of ChatGPT in education suggest a revolutionary potential in improving learning experiences.

While AI integration in education shows promise, there are limitations and gaps in current research. Many studies have been conducted in controlled settings, potentially limiting their applicability to real classrooms. Additionally, most research has focused on short-term outcomes, raising questions about the long-term effectiveness of AI-driven educational tools. The lack of diversity in research settings is another concern, as studies have often been conducted in well-resourced institutions.

This research addresses these gaps by conducting a comparative study between users and non-users of AI, such as ChatGPT, in the English Education Department at the University of Muhammadiyah Gresik. This inclusive approach ensures a more equitable and representative examination of ChatGPT's impact on a diverse range of student populations and socioeconomic levels, contributing to a comprehensive understanding of AI's role in education.

2. Methods

A mixed-method research design was used in this study to investigate ChatGPT's impact on student performance and motivation. To collect data at one specific moment in time, a cross-sectional survey methodology was utilized. Both students that use and did not use ChatGPT for academic purposes represented the target population. The participants comprised students from the English Education Department at the University of Muhammadiyah Gresik, specifically those in their 7th semester. As it stated in Table 1, total of 35 students were selected to ensure a representative sample. The interview by open-ended questions were done by randomly selected.

Table 1 Frequency of Participants' Gender

	Frequency	Percent	Valid Percent	Cumulative Percent
Male	4	11.4	11.4	11.4
Female	31	88.6	88.6	100
Total	35	100	100	

Open-ended questions provided qualitative insights, while scaled items measured motivation on ChatGPT. Demographic information is also included in the questionnaire. This study employed a structured questionnaire grounded in the Self-Determination Theory (SDT) framework by Ryan and Deci (2000, 2017, 2019) to investigate ChatGPT's impact on student motivation. The questionnaire in Table 2 was thoughtfully adapted to align with SDT's core elements: Autonomy, Competence, and Relatedness. It encompassed demographic inquiries for comparative analysis, assessed ChatGPT's academic usage frequency, explored autonomy through questions like "I feel that using ChatGPT allows me to study topics that I am personally interested in," examined competence via items like "ChatGPT contributes to my understanding of complex topics," and probed relatedness and motivation. To investigate student performance, researcher gathered their grade point average (GPA) for the whole semester, this aimed to get an overview of the learning outcomes that

students had achieved during college. Additionally, open-ended queries gathered qualitative insights (table 3).

Table 2 Questionnaire Details

No	Section	Question Items
1	Q1 – Q3	Demographic Information
2	Q4 – Q5	General Usage of ChatGPT
3	Q6 – Q8	Autonomy
4	Q9 – Q11	Competence
5	Q12 – Q14	Relatedness
6	Q15 – Q17	Impact on Motivation

Table 3 Open-Ended Questions Details

No	Question	Details
1	Q1	What types of academic tasks do you use ChatGPT for?
2	Q2	What do you like most about using ChatGPT for your studies?
3	Q3	How could ChatGPT improve or support your academic motivation and performance?

The questionnaires' validity and reliability were ensured through expert reviews, and being tested by using Cronbach's alpha test.

Table 4 Reliability Test for Questionnaire

Reliability Statistics

Cronbach's Alpha	N of Items
0.976	16

In Table 4, Cronbach Alpha for this questionnaire was calculated as 0,976 which means it has high score. By this score, it could be concluded that this questionnaire was reliable and could be used to conduct this research.

Descriptive statistics was employed to analyze quantitative data from closed-ended questions in order to gather demographic data and response patterns. To assess the impact of ChatGPT hypotheses, the users and non-users of ChatGPT were compared with their total result in motivation questionnaire and their grade point average (GPA) by using individual sample T-Test. Moreover, Thematic analysis, by identifying themes and patterns, was used to the qualitative data obtained from open-ended questions.

3. Result

General usage of ChatGPT

Table 5 The Use of ChatGPT

	Frequency	Percent	Valid Percent	Cumulative Percent
Yes	25	71.4	71.4	71.4
No	10	28.6	28.6	100

Total	35	100	100

Table 6 Frequency of ChatGPT Usage

	Frequency	Percent	Valid Percent	Cumulative Percent
Never	10	28.6	28.6	28.6
Once in a While	6	17.1	17.1	45.7
Sometimes	11	31.4	31.4	77.1
Almost Always	8	22.9	22.9	100
Total	35	100	100	

Table 5 clearly demonstrates that the percentage of students utilizing ChatGPT (25 students) exceeds those who did not use it (10 students). The data presented in Table 6 shows the varying frequency of ChatGPT usage across students. It has been observed that a majority of the students occasionally utilize ChatGPT. Evidence indicates that 10 students who did not use ChatGPT is significantly higher numbers in comparison to 8 students who almost always and 6 students once in while utilize ChatGPT. Nevertheless, when considering the whole data, users of ChatGPT show a higher frequency compared to students who did not use it.

Impact on Student Motivation

Table 7 Group Statistic in Student Motivation

	Students	N	Mean	Std. Deviation	Std. Error Mean
QMotivation	Users	25	44.88	4.604	.921
	Non-users	10	17.6	1.265	.400

Table 8 T-Test on Student Motivation

	Levene's Test for Equality of Variances		t-test for Equality of Means						
	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
								Lower	Upper
QMotivation	12.506	<.001	27.175	30.972	<.001	27.28	1.004	25.233	29.327

In Table 7, it can be observed that the average scores on the motivation questionnaire for ChatGPT users and non-users are quite different, with a mean of 44.88 for users and 17.60 for non-users.

However, it's important to note that the results of Levene's test in Table 8 indicate that the data does not meet the assumption of homogeneity (unequal variances), with a significance value (Sig.) of 0.001. This suggests that the variances

between the groups of ChatGPT users and non-users are significantly different, which is a violation of the assumption for the t-test.

The results of the T-test show that the p-value is 0.001 ($p < 0.05$). A p-value smaller than the predetermined significance level ($\alpha = 0.05$) indicates that the difference in mean scores on the motivation questionnaire between ChatGPT users and non-users is statistically significant.

Therefore, we can conclude that ChatGPT users have significantly higher motivation scores compared to non-users. This finding suggests that the use of ChatGPT may positively influence student motivation.

However, it's important to consider the violation of the equal variances assumption as a limitation of the analysis. This violation may impact the interpretation of the T-test results, and it's advisable to exercise caution when generalizing these findings. Additionally, further research could explore the underlying reasons for the observed differences in motivation scores between the two groups.

Impact on Student Performance

Table 9 Group Statistic in Student Performance

	Students	N	Mean	Std. Deviation	Std. Error Mean
QPerformance	Users	25	3.63	.089	.017
	Non-users	10	3.06	.513	.162

Table 10 T-Test on Student Performance

	Levene's Test for Equality of Variances		t-test for Equality of Means						
	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
								Lower	Upper
QPerformance	20.362	<.001	5.479	33	<.001	.57180	.10435	.35949	.78411

In Table 9, it can be observed that the average GPA of ChatGPT users (3.63) is higher than that of non-ChatGPT users (3.06). This difference is quite significant, with ChatGPT users having an average GPA that is approximately 0.57 points higher than non-ChatGPT users.

However, it should be noted that the results of the Levene's test in Table 10 indicate that the data does not meet the assumption of homogeneity (unequal variances), with a significance value (Sig.) of 0.001. This implies that the variances between the ChatGPT user and non-ChatGPT user groups are significantly different. Therefore, caution is warranted when interpreting the results of the T-test.

The T-test results indicate that the p-value is 0.001 ($p < 0.05$). A p-value smaller than the predetermined significance level ($\alpha = 0.05$) suggests that the difference in

average GPA between the ChatGPT user and non-ChatGPT user groups is statistically significant.

Consequently, we can conclude that ChatGPT users have a higher average GPA compared to non-ChatGPT users, and this difference is not merely due to chance. These findings may have practical implications, such as indicating that the use of ChatGPT may positively contribute to students' academic performance.

However, it is important to remember that these results are based on data that may exhibit unequal variances, which is a limitation in the analysis. Therefore, caution should be exercised when generalizing these findings, and it is essential to acknowledge the presence of other factors that may influence students' GPA but were not considered in this study.

Qualitative Insight from Open-Ended Questions

The thematic analysis of interviews conducted with all respondents revealed that there are several points that refer to the main theme "Impact of ChatGPT on Students' Motivation and Academic Performance." There are approximately 7 sub-themes that support the main theme, which are:

1. Enhanced Academic Efficiency and Productivity

Many respondents cited the use of ChatGPT as a means to enhance efficiency and productivity in academic tasks, such as research, essay writing, and concept comprehension.

2. Improved Access and Quality of Information

ChatGPT is credited with providing instant access to diverse and relevant information, which is seen as a key factor in strengthening academic performance.

3. Support in Time Management and Organization

Some respondents indicated that ChatGPT assists them in better time management and organization of study materials, directly supporting an improvement in academic performance.

4. Better Understanding and Independent Learning

ChatGPT is identified as a tool that supports better comprehension of complex material and encourages independent learning.

5. Influence on Language Skills and Communication

ChatGPT is also acknowledged as a useful tool in enhancing language skills and communication, especially for those learning a new language or needing assistance in writing.

6. Increased Motivation for Learning

Responses indicate that ChatGPT has played a role in enhancing learning motivation through more dynamic engagement with subject matter and broader accessibility to learning resources.

7. Resistance to Technology Use

A number of respondents expressed resistance to using technology like ChatGPT, relying on traditional learning methods and not reporting any change in motivation or academic performance.

4. Discussion

This study provides a detailed exploration into the impact of ChatGPT on higher education students' motivation and academic performance, integrating quantitative findings with rich qualitative insights and established theoretical frameworks.

Consistent with the Self-Determination Theory (SDT) by Ryan and Deci (2000), the quantitative data demonstrated a significant positive correlation between the use of ChatGPT and student motivation, with ChatGPT users scoring notably higher (mean: 44.88) compared to non-users (mean: 17.60). This was mirrored in academic performance, with ChatGPT users achieving higher GPA scores (mean: 3.63) than non-users (mean: 3.06), aligning with studies by Neo et al. (2022)and Dr. Padma C and Dr. Rama C (2022).

The qualitative data revealed several key themes that explain the quantitative findings. Participants frequently cited 'Enhanced Academic Efficiency and Productivity' as a significant benefit of using ChatGPT, noting that it facilitated quicker and more effective research and assignment completion. Additionally, the theme of 'Better Understanding and Independent Learning' emerged, with students reporting that ChatGPT helped clarify complex concepts, fostered independent inquiry, and personalized their learning experiences. These qualitative insights align with the SDT's emphasis on autonomy and competence, suggesting that ChatGPT not only aids in information acquisition but also in cultivating a more engaging and self-driven learning environment.

Combining these qualitative narratives with the quantitative results offers a comprehensive picture of ChatGPT's impact. The higher motivation and GPA scores among ChatGPT users can be partly attributed to the tool's ability to enhance learning efficiency and promote deeper understanding, as described by the study participants.

Echoing Tiwari (2023), Jokhan et al. (2022), and Huang (2022), this study underscores the practical utility of integrating AI tools like ChatGPT in educational settings. However, the noted unequal variances in the data, a concern raised by Corsten & Skousen (2023), suggests that these findings should be interpreted with some caution.

Acknowledging the limitations, including statistical concerns, the study highlights the need for further research. Future studies could focus on exploring these findings in diverse educational settings and over longer periods to fully understand the long-term impact of AI tools in education.

5. Conclusion

This research began with the hypothesis, rooted in the principles of Self-Determination Theory (SDT), that the integration of AI tools like ChatGPT in higher education would significantly enhance student motivation and academic performance. This hypothesis was anchored in the belief that ChatGPT could satisfy the key psychological needs identified by SDT – autonomy, competence, and relatedness – thus positively influencing student learning outcomes.

The findings that is presented have not only validated this hypothesis but also provided a deeper understanding of the dynamic role of AI in education. The empirical data revealed that students using ChatGPT showed significantly higher motivation scores and GPAs compared to their counterparts who did not use the tool.

Furthermore, the qualitative data, with themes like 'Enhanced Academic Efficiency and Productivity' and 'Better Understanding and Independent Learning', illustrated how ChatGPT contributes to a more efficient, personalized, and in-depth educational experience. These outcomes demonstrate a remarkable convergence between our theoretical expectations and the practical realities observed in the study.

As we look to the future, the potential for extending this research and applying its findings is vast. Future studies could explore the long-term impact of AI tools like ChatGPT in various educational contexts, examining their influence across different academic disciplines and student populations. The practical application of these findings also presents exciting prospects. Integrating AI into different facets of education, from curriculum development to teacher training and student support, could significantly enhance the educational landscape.

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