Investigating the Implementation of ChatGPT in English Language Education: Effects on Student Motivation and Performance Levels

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A B S T R A C T

In the era of rapid advancements in Artificial Intelligence (AI), ChatGPT (Chat Generative Pre-Trained Transformer) emerges as a pivotal tool reshaping educational landscapes. This research, based on self-determination theory, investigates how ChatGPT influences the motivation and academic performance of 35 seventh-semester English education students. Utilizing mixed methods, it contrasts the experiences of 25 ChatGPT users with those of 10 non-users. The quantitative analysis demonstrates notably higher levels of motivation and GPAs among ChatGPT users (with a mean motivation score of 44.88 and a mean GPA of 3.63) compared to non-users (with a mean motivation score of 17.60 and a mean GPA of 3.06). Qualitative insights highlight themes such as 'Improved Comprehension and Independent Learning' and 'Increased Academic Efficiency and Productivity,' illustrating how ChatGPT supports effective and thorough learning experiences. In keeping with the tenets of self-determination theory, these results demonstrate that ChatGPT has a beneficial effect on students' motivation. The study also recommends more experimental studies to investigate how students' motivation and performance can be improved by using ChatGPT.

Introduction

The proliferation of AI (Artificial Intelligence) in the last several years has had far-reaching consequences across many industries, education being just one of them. The advent of AI-powered tools has caused a dramatic shift in today's classrooms, which have traditionally relied on time-tested instructional techniques. With this change comes an effort to create a classroom that is more adaptable, welcoming, and productive for all students.

Personalized and interesting learning opportunities are two ways in which technology is changing the face of education. From its humble beginnings in online teaching systems, artificial intelligence (AI) has grown into an integral part of today's classrooms. For example, research by Neo et al. (2022) shows that chatbots like MERLIN, which are powered by AI, can improve both student motivation and their learning outcomes. Various areas will feel the effects of AI on classroom instruction. In their study, Drs. Padma C. and Rama C. (2022) investigate the potential of artificial intelligence to transform the delivery of individualized education in India. Furthermore, medical education is also seeing advancements in AI; a scoping review by Nagi et al. (2023) emphasizes how AI could enhance personalized learning in this domain. In her extensive literature review on AI in education, Tiwari (2023) drawn attention to the ways AI may enhance and customize the learning experience for students. The assessment however emphasized the need of further research into the pros and cons of AI in the classroom. Khalaf Ismail Makhlouf (2021) on Saragih et al., (2023) stated that AI-based application

impacts students' English as a Foreign Language (EFL) speaking skills, highlighting the potential benefits of integrating AI technology into educational settings for language learning.

Student performance and engagement are heavily influenced by motivation, as noted by Ryan & Deci (2000). They highlight autonomy, competence, and relatedness as key factors affecting motivation. Agus et al. (2022) further emphasize that motivation is influenced by engaging activities, positive role models, passion, supportive feedback, and strong interpersonal relationships. The correlation between motivation and student achievement is well-established (Juliana et al., 2022). Important factors in student performance that Jou et al. (2022) highlight include personal traits, familial history, institutional backing, and interactions between teachers and students.

In the institutional context, GPA serves as a reliable indicator of student success (Mirchandani et al., 2001). It offers a nuanced perspective on academic accomplishments influenced by factors such as intelligence, personality, and motivation, with conscientiousness identified as a significant predictor (Kappe & Van Der Flier, 2012). Standardized test scores contribute to external validity by comparing against national benchmarks. Additionally, GPA takes into consideration study habits, social anxiety, and interactions with faculty (Khanna et al., 2018), thus providing a comprehensive measure of performance.

Maintaining students' engagement with traditional teaching methods may prove challenging (Itagi & Tatti, 2015). On the other hand, artificial intelligence (AI) solutions like ChatGPT provide hope by delivering flexible and customized learning experiences. The effectiveness of AI in simplifying difficult concepts and enhancing problem-solving skills has been demonstrated in earlier research. Research by experts such as Bressane et al. (2022), Huang (2022), and Jokhan et al. (2022) has highlighted the advantages of using Artificial Intelligence (AI)-generated assessment questions, as pointed out by Corsten & Skousen (2023).

There is hope that incorporating AI into the classroom can increase both motivation and academic performance. Various AI-powered resources are accessible to cater to the needs of diverse student populations. According to studies, virtual learning communities should be actively encouraged to reap the benefits of interactive learning techniques (Ho et al., 2023; Trajkovik et al., 2018). Among these, OpenAI's ChatGPT stands out due to its conversational skills and adaptability. It is well-suited to educational settings due to its versatility, which extends to sectors like agriculture and medicine (Williams, 2023). Being able to participate in chat-based interactions, provide answers, and even point out mistakes makes ChatGPT ideal for usage in the classroom because of its conversational nature, which distinguishes it from traditional AI.

Its versatility is evident in its applications in agriculture (Siche & Siche, 2023) for decision-making and production optimization, as well as in medicine (Ting et al., 2023) for assisting with ophthalmology tasks. Efficacious chatbot-based learning platforms, such as ChatGPT (Chat Generative Pre-Trained Transformer), have been shown time and time again to boost student engagement and achievement. Research in terms of learning outcomes and intrinsic motivation, chatbot-based approaches perform better than traditional methods Hamilton et al., (2021) and Fidan and Gencel (2022). While Kohnke (Kohnke, 2023) highlights chatbots' ability to boost motivation and self-directed language learning, Cai et al. (2020) shows how students' motivation and academic performance are affected by realistic digital learning theaters powered by artificial intelligence.

Despite the promising future of AI in the classroom, current limitations and gaps in data hinder its full implementation. Many studies have been conducted in laboratory

settings, which may not accurately reflect real-world classroom dynamics. Furthermore, the majority of previous research has focused on education in a general sense, neglecting specific investigations into the use of ChatGPT in EFL instruction. This research addresses a notable gap in educational literature, particularly concerning the effects of ChatGPT on student motivation and performance in English language learning. While broader applications of ChatGPT or AI in education have been explored in previous studies, none have specifically examined these two crucial aspects. Therefore, this study serves as a pioneering effort to fill this void by emphasizing the impact of ChatGPT on student motivation and performance. By employing both quantitative and qualitative analyses, this research aims to provide comprehensive insights into the implications of ChatGPT in educational settings. This endeavor paves the way for further exploration and understanding in this field.

Research Method

This study utilised a mixed-method research approach to investigate how ChatGPT affected student motivation and performance. An instantaneous snapshot in time was captured by means of a cross-sectional survey. Students who used ChatGPT for schoolwork and those who didn't were both included in the research. Students from the University of Muhammadiyah Gresik's English Education Department, who were in their seventh semester, took part. This research took all of the population in seventh semester that is 35 students, as detailed in Table 1. The interviews consisted of randomly selected open-ended questions.

Table 1 Participants' Gender Frequency

	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	

In this study, motivation was assessed using scaled items on ChatGPT, while qualitative insights were gathered through open-ended questions. The questionnaire also included demographic information. We evaluated ChatGPT's impact on students' motivation using a structured questionnaire based on Ryan and Deci's Self-Determination Theory (SDT) paradigm (2000, 2017, 2019). This questionnaire was fine-tuned to fit in with SDT's three pillars: relatedness, competence, and autonomy (see Table 2 for details). The study also examined demographic variables, relatedness, motivation, motivation, and the frequency of academic ChatGPT usage. Researchers also calculated students' GPAs for the entire semester to get a better picture of how well they did. The purpose of this was to compile a synopsis of each student's college-level learning outcomes. Table 3 also shows that qualitative insights were gathered through the use of open-ended questions.

Table 2 Questionnaire Details

No	Section	Question Items
1	Q1 – Q3	Detail About Demographic
2	Q4 – Q5	The Use 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 kinds of assignments do you use ChatGPT for at school?
2	Q2	What about using ChatGPT for research do you find most appealing?
3	Q3	How may ChatGPT enhance or boost your academic performance and motivation?

The reliability and validity of the surveys were confirmed through expert reviews and Cronbach's alpha test.

Table 4 Reliability Test for Questionnaire

Reliability Statistics

Cronbach's Alpha	N of Items
0.976	16

With a Cronbach alpha of 0.976, as shown in Table 4, the questionnaire is very reliable. Since this was the case, it seems the questionnaire was valid and appropriate for the   research.
We learned about demographics and response patterns by analyzing quantitative data obtained from closed-ended questionnaire using descriptive statistics. We compared the grades and overall results of the questionnaire between ChatGPT users and those who was not user using an individual sample T-test to test our hypotheses.

In addition, the qualitative data collected from the free-form questions was analysed using thematic analysis to uncover recurring themes and patterns. This method enabled a thorough analysis of the participants' qualitative data.
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Result and Discussion

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	

In Table 5, it's evident that a larger number of students, totaling 25, opted to utilize ChatGPT compared to the 10 students who chose not to use it. This indicates a strong preference for ChatGPT among the study participants. Table 6 further illustrates how frequently students use ChatGPT. While the majority of students use ChatGPT on occasion, it is interesting to note that 10 students did not use it at all, compared to 8 students who used it almost constantly and 6 students who used it occasionally. Regardless of these differences in usage frequency, the total data shows that more students used ChatGPT than did not.

Table 5's findings show that most participants were interested in using ChatGPT, which may indicate that most students think it's a good tool for a variety of tasks. Table 6 reveals that many students use ChatGPT occasionally, indicating that it serves as a helpful resource that is not consistently utilized. This finding aligns with research conducted by Thorp (2023), which highlights ChatGPT as a highly beneficial tool in the fields of science and education. Furthermore, ChatGPT has become increasingly prevalent in the learning process, particularly among students.

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			27.175	30.972	<.001	27.28	1.004	25.233	29.327

This study seeks to understand how ChatGPT influences the drive of ESL students. Table 7 displays a notable disparity in average motivation scores between ChatGPT users and non-users, with users scoring an average of 44.88 compared to 17.60 for non-users. However, Table 8 reveals a significant Levene's test result (Sig. = 0.001), indicating unequal variances between the groups. Therefore, we used data with equal variances not assumed.

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The t-test results reveal a significant difference in the mean motivation scores between ChatGPT users and non-users ($p < 0.05$, p-value of 0.001). It appears that students who use ChatGPT are more motivated than those who do not, suggesting that it has a positive effect on student motivation.

The study is in line with earlier research that has shown the possible advantages of using ChatGPT in the classroom (Huang, 2022; Jokhan et al., 2022; Tiwari, 2023; Yin et al., 2021). Despite the significance of the findings, caution is warranted due to the unequal variances, which could potentially affect the interpretation of the t-test results. Therefore, generalizing these findings should be approached with careful consideration of this limitation. Nevertheless, the research provides valuable insights into how ChatGPT usage positively influences student motivation in higher education, as noted by Fidan & Gencel (2022).

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			3.498	9.217	.007	.57180	.16347	.20334	.94026

Table 9 shows that non-ChatGPT users have an average GPA of 3.06, which is lower than that of ChatGPT users (3.63). Compared to non-users, ChatGPT users have a significantly higher average GPA—about 0.57 points higher. However, Levene's test (Table 10) reveal a significant significance value (Sig. = 0.001), indicating that the data is not homogeneous (unequal variances) between the groups that use ChatGPT and those that do not. Since this suggests a substantial difference in variability between the two groups, we used data with equal variances not assumed.

The t-test results show a p-value of 0.007, indicating statistically significant difference in average GPA between the groups using ChatGPT and those that do not ($p < 0.05$).

These findings indicate that students using ChatGPT demonstrate higher performance compared to non-users of ChatGPT, consistent with research by Yin et al. (2021), which suggests a significant effect on student performance through the use of chatbots, particularly ChatGPT. While this study did not experimentally investigate the enhancement of student performance, Biro et al.'s (2023) research indicates improved student performance after using the Persona Chatbot, suggesting a potential impact of ChatGPT usage on student performance. Users of ChatGPT have a higher average GPA than those who do not use ChatGPT, suggesting that this is not a coincidental finding.

These findings highlight the need for future research into the potential benefits of ChatGPT on students' academic performance.

Thematic Analysis on Open-Ended Interview

To answer research questions regarding other effects on the use of ChatGPT by students, we conducted thematic analysis of open-ended interview results. The findings revealed seven sub-themes which will be explained below.

1. Increased Effectiveness and Efficiency in the Classroom:

Academic activities including research, essay writing, and concept comprehension were found to be facilitated by ChatGPT, according to respondents. Research conducted by Chinonso et al. (2023), supports these findings, indicating that ChatGPT has the potential to improve students' learning efficiency and productivity.

2. Information Availability and Quality Enhancement:

One of the most important ways ChatGPT helped students succeed in school was by giving them easy access to a wealth of useful information. Information retrieval accessibility and quality can be enhanced with ChatGPT, according to Mijwil et al. (2023).

3. Help with Organizing and Time Management:

Several students have reported that ChatGPT has helped them become more organized with their study habits and time management, which has translated into higher grades.

4. Improved Comprehension and Self-Directed Study:

In line with the results of Crawford et al. (2023) ChatGPT was recognized as a tool that promotes independent learning and helps students better understand complex material..

5. Effects on Fluency in Language and Interpersonal Expression:

Most people who took the survey saw ChatGPT as a helpful resource for improving communication and language abilities, especially for individuals who are learning a new language or who are having trouble reading and writing. Consistent with this, Ali et al. (2023), discovered that ChatGPT promotes the development of students' reading and writing skills but has no effect on their oral communication abilities.

6. Raised Interest in Acquiring Knowledge:

Results corroborated those of Turner et al. which found that ChatGPT increased students' desire to learn by making it easier for them to actively participate in class and providing them with more resources to supplement their education.

7. Opposition to Utilizing Technology:

Some respondents were adamant about sticking with tried-and-true methods of education rather than utilizing chatbots like ChatGPT; they also claimed that their motivation and grades remained unchanged.

Conclusion

Students, particularly those in their seventh semester of English language classes, have been observed to utilize ChatGPT as a learning tool, which appears to positively impact their motivation to learn the language. This study demonstrates a significant difference in motivation between ChatGPT users and non-users, as well as higher cumulative GPAs among ChatGPT users. Moreover, thematic analysis of interview data supports the notion that ChatGPT contributes to increased motivation and enhanced academic performance among students.

While the findings of this study shed light on the potential benefits of ChatGPT in education, it is suggested to approach the application of these findings to a broader context with caution due to the primarily descriptive nature of the study. Further investigation and testing are recommended to delve deeper into how ChatGPT usage influences student motivation and English language learning outcomes. This could involve conducting experimental studies to explore specific mechanisms through which ChatGPT affects motivation and performance, as well as examining its long-term effects on language acquisition and communication skills. Additionally, considering factors such as individual differences in learning styles and preferences could provide valuable insights into the optimal integration of ChatGPT into educational practices.

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