Impact of ChatGPT Usage among Higher Education Students: A Survey-Based Study in Madurai City

1*Dr.N.Selvalakshmi.   2Dr.P.Brintha, 3Dr.M.Prabhu

1*, 2, 3Assistant Professor, PG & Research Department of Commerce, Thiagarajar College, Madurai, Tamilnadu, India.

Abstract

This study looks at how ChatGPT is used by Madurai's higher education students and how it affects their educational experiences. The impacts of ChatGPT use on academic achievement, critical thinking skills, and student engagement are still the major emphasis. Partial Least Square-Structural Equation Modelling (PLS-SEM) is used to analyse data collected from 53 structured questionnaires. According to the findings, using ChatGPT has a favourable impact on students' involvement in the learning process. Use of ChatGPT continued to have a major effect on critical thinking skills. Lastly, the results showed that using ChatGPT improved students' academic achievement in higher education. These findings suggest that ChatGPT and other AI technologies play a significant, beneficial, and constructive role in the education and learning process of Madurai higher education students. The conclusion is that ChatGPT is a helpful tool that supports students during their learning process by offering resources and recommendations. It improves academic accomplishment by raising ambition, effort, and participation in academic work. By increasing students' enthusiasm in studying, ChatGPT encourages them to acquire knowledge and helps their academic success.

Keywords

ChatGPT Usage Higher Education Madurai, Academic Achievement, Critical Thinking Abilities, Student Engagement, Constructivism Learning Theory.

Introduction

GPT is a potent AI tool created by OpenAI that can conversely produce contextually relevant replies to human input. Because of its qualities, it is especially helpful for a variety of duties in the field of higher education (Tajik & Tajik 2024). ChatGPT and DALL-E, which OpenAI unveiled in 2022, are two noteworthy instances of these concepts. These models have gained a lot of traction since they were put together using the GPT architecture (Sallam, 2023). Sánchez (2023) asserts that because ChatGPT has the potential to improve students' learning experiences, its integration into the classroom has attracted a lot of interest. It can successfully meet the demands of each individual student because of its capacity to provide timely and customised replies.

As a result, ChatGPT shows promise as a technique that greatly improves cognitive growth and active student participation. It enables a more dynamic and efficient information acquisition process by adapting to individual learning rates and offering ongoing support, thus enhancing the educational experience for students. Enhancing educational management efficiency, facilitating global learning, personalising learning experiences, creating more intelligent educational content, and improving the efficiency of educational practices are just a few of the benefits that have resulted from incorporating

1* Corresponding Author vivekan2006@gmail.com

artificial intelligence (AI) into education (Montenegro-Rueda et al., 2023). Modern technologies are essential for improving the process of teaching and learning. Education is an ongoing process in which information acquisition is only one aspect of learning.

In this regard, AI has the potential to transform education by giving pupils individualised learning experiences.All things considered, AI has promise for improving student outcomes by increasing the effectiveness and accessibility of education.(Ochoa & Jara, 2020). For example, Děchtěrenko et al. (2024) said that students may find it difficult to solve problems including sophisticated scientific investigations, case study analysis, engineering design, essay writing, and decision-making.

For a variety of educational objectives, generative AI tools such as ChatGPT can be quite helpful in improving the problem-solving process. In issue-solving situations, ChatGPT's capacity to generate various problem representations, pertinent information, and prototype solutions is very beneficial.By using these features, ChatGPT may greatly improve students' problem-solving skills and encourage more comprehension, creativity, and critical thinking in higher education.

Furthermore, the study of Faiz and Hazilan (2024) demonstrates ChatGPT's application for English language learning and translation, which is another significant use case. As stated, it is now more crucial than ever to provide flexible and enhanced learning environments that cater to the various needs of students. Numerous advantages of integrating ChatGPT into language instruction have made it a well-liked tool among students.

The potential of ChatGPT to revolutionise students' educational experiences is therefore shown by the rising interest in its use in the classroom. As a useful instructional tool, ChatGPT not only improves learning outcomes but also creates a more stimulating and encouraging learning atmosphere. It can have a big impact on students' academic and cognitive development by adjusting to their demands and encouraging active engagement [Sánchez (2023)]. Thus, this study's focus on ChatGPT is justified since it distinguishes itself from other AI language models in a number of ways, including by providing cutting-edge natural language processing capabilities.

The ChatGPT model may be used for a variety of academic activities, such as writing essays, translating languages, and helping with research, because of its capacity to provide replies that are both logical and contextually relevant. Because of its popularity and adaptability, ChatGPT is a great place to focus on analysing how it affects student learning and productivity. ChatGPT is the perfect choice for this study because of its distinctive conversational capabilities and wide range of academic applications, which distinguish it from other AI tools.

Literature Review

ChatGPT and Students' Academic Achievement

Students' academic achievement is linked to their accomplishment of learning goals and educational objectives within a particular academic context (Chen & Yang, 2019). It establishes knowledge, skills, and competencies through formal pedagogy and academic experiences. Academic attainment is estimated through various indicators, including grades, test scores, performance evaluations, and

[1*] **Corresponding Author** vivekan2006@gmail.com

abilities in subject-specific content and standards (Rawashdeh et al., 2021). ChatGPT is a valuable tool for educators and learners to improve learning experiences and performance (Tanvir et al., 2023).

ChatGPT and Students' Critical Thinking Abilities

Students' critical thinking abilities are their approach to systematically analyze, assess, and synthesize information. It involves applying higher-order cognitive skills, including logical reasoning, problem-solving, decision-making, and metacognition, to discern the validity, applicability, and importance of information and arguments (Barta et al., 2022; Zhou, 2018). In this regard, the versatility of ChatGPT in higher education has acquired attention as a compelling area due to its myriad applications (Essel et al., 2024). Several researchers (Mollick & Mollick, 2022; Tlili et al., 2023) have even supported incorporating ChatGPT into instructional practices to improve interactive learning experiences. Also, it guarantees students' cognitive skills development (Exintaris et al., 2023).

ChatGPT and Students' Engagement

Student engagement is the extent to which students are actively involved and ingrained in their learning experiences. It contains different dimensions, including behavioural, emotional, and cognitive engagement. Engaged students partake attentively in classroom activities, show a readiness to learn, and positively interact with peers and educators. This engagement is mirrored in students' confidence, curiosity, enjoyment of learning tasks, and sense of belonging and association with the learning community (Ali et al., 2023; Firat, 2023; Hamid et al., 2023).

Concerning ChatGPT and students' engagement, the generative AI models have intrigued public interest because of their unique ability to produce content nearly resembling human-created material. ChatGPT has especially shown exceptional performance across different domains of application. It excels in tasks such as generating readable content and essays, working as a chatbot, decoding languages, answering questions, and assisting in programming code and existing literature. It shows that ChatGPT provides a range of abilities beyond helping students with assessment design, essay generation, and language translation. It enables users to ask and answer myriad questions, outline texts, converse with them, and interact with peers (Sok, 2023).

Research Objectives and Research Questions

Considering the role and importance of ChatGPT for students in higher education, this research aims to examine the impact of ChatGPT usage on student learning, including their engagement in educational activities, critical thinking abilities, and academic attainment in their higher education.

Despite the applicability of constructivist theory in academic research, there remains a theoretical gap in comprehending how ChatGPT aligns with the principles of constructivism and affects students' learning processes. While Constructivist Theory highlights the active construction of knowledge through social interactions and means of experiences, its application to the incorporation of ChatGPT in educational settings has yet to be investigated.

[1*] **Corresponding Author** vivekan2006@gmail.com

As people experience the world and reflect upon those experiences, they build their own representations and incorporate new information into their pre-existing knowledge (schemas). Thus, this research addresses three research questions:

(i)   How does ChatGPT affect students' engagement?

(ii)   How does ChatGPT affect critical thinking abilities? and

(iii)   How does ChatGPT affect students' academic achievement?

In light of the growing integration of artificial intelligence tools like ChatGPT in educational settings and their prospect to improve learning outcomes, the following three hypotheses were formulated to examine how this tool impacts critical dimensions of the student learning experience.

H1- ChatGPT usage has a positive effect on students' engagement in educational activities.

H2 - ChatGPT has a positive effect on students' critical thinking abilities.

H3 - ChatGPT usage has a positive effect on students' academic achievement.
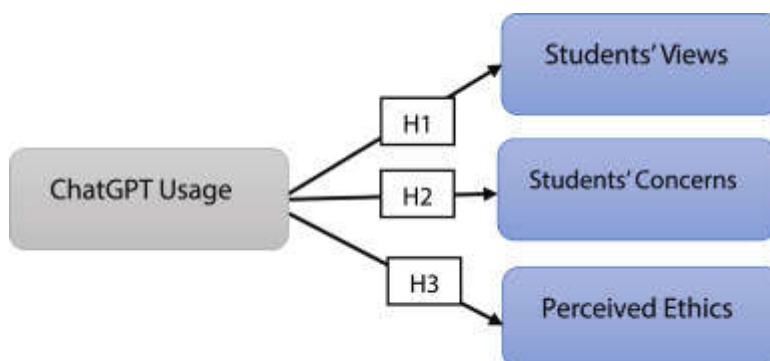
Research Methodology

This research is based on empirical and systematic research rules.This research involves a cross-sectional design, which provides generalizable results within a precise period (Abbott & McKinney,

[1]* **Corresponding Author** vivekan2006@gmail.com

2013). This study was conducted from June 2024 to October 2024. The researchers gathered data by employing structured questionnaires designed on a five-point Likert scale. The respondents accessed the directory after obtaining permission from their respective mentors. Once the data was obtained, they were evaluated and coded for analysis. The data analysis involved descriptive and inferential statistics through SPSS and partial least square-structural equation modeling.

For data gathering purposes, the researchers personally visited the selected institutions and distributed questionnaires among the study respondents. It is worth noting that the questionnaires were randomly distributed without any further criteria based on age, major, gender, and others. Once the data was gathered, the acquired questionnaires were carefully evaluated. Therefore, 53 questionnaires were finalized for the current study, indicating a response rate of 93.8%.

Analysis and Findings

This section is based on data analysis and study findings. First, descriptive statistics calculate the respondents' profiles, including their gender, age, study level, and university majors. Further, structural equation modelling is used based on a two-step approach, including inner model analysis and outer model analysis (Barrett, 2007).

Respondents' Profile

"Regarding the respondents' profile, first, the respondents' gender was calculated. It was found that most of the respondents (76.7%) were male, and 23.3% were female. Further, based on the age groups of the respondents, 47.9% are 17 to 20 years old, 28.6% are 21 to 25 years old, 18.7% are 26 to 30 years old, and 4.8% are 31 years old or above. According to study level, 52.4% of the respondents are undergraduate students (bachelor's level), 22.4% are postgraduate students (master's level), and 2.8% are doctorate students (Ph.D. level). Finally, 39% of respondents majored in sociology, 29.4% majored in medical sciences, 15% majored in management sciences, 8.7% majored in communication, and 8.7% marked 'others.

Final Measurement Model

The Fornell-Larcker Criterion analysis shows that the measures used to evaluate academic achievement critical thinking abilities, Student engagement, and ChatGPT usage in the study are distinctive. Each construct has a higher level of shared variance with itself (represented by the square root of the Average Variance Extracted) corresponding to its correlation with other constructs. This implies that the study successfully indicates that academic achievement, critical thinking abilities, student engagement, and ChatGPT usage differ and do not indicate any correlation (Cheung & Wang, 2017) (see in below figure). The Final Measurement Model image shown in here.
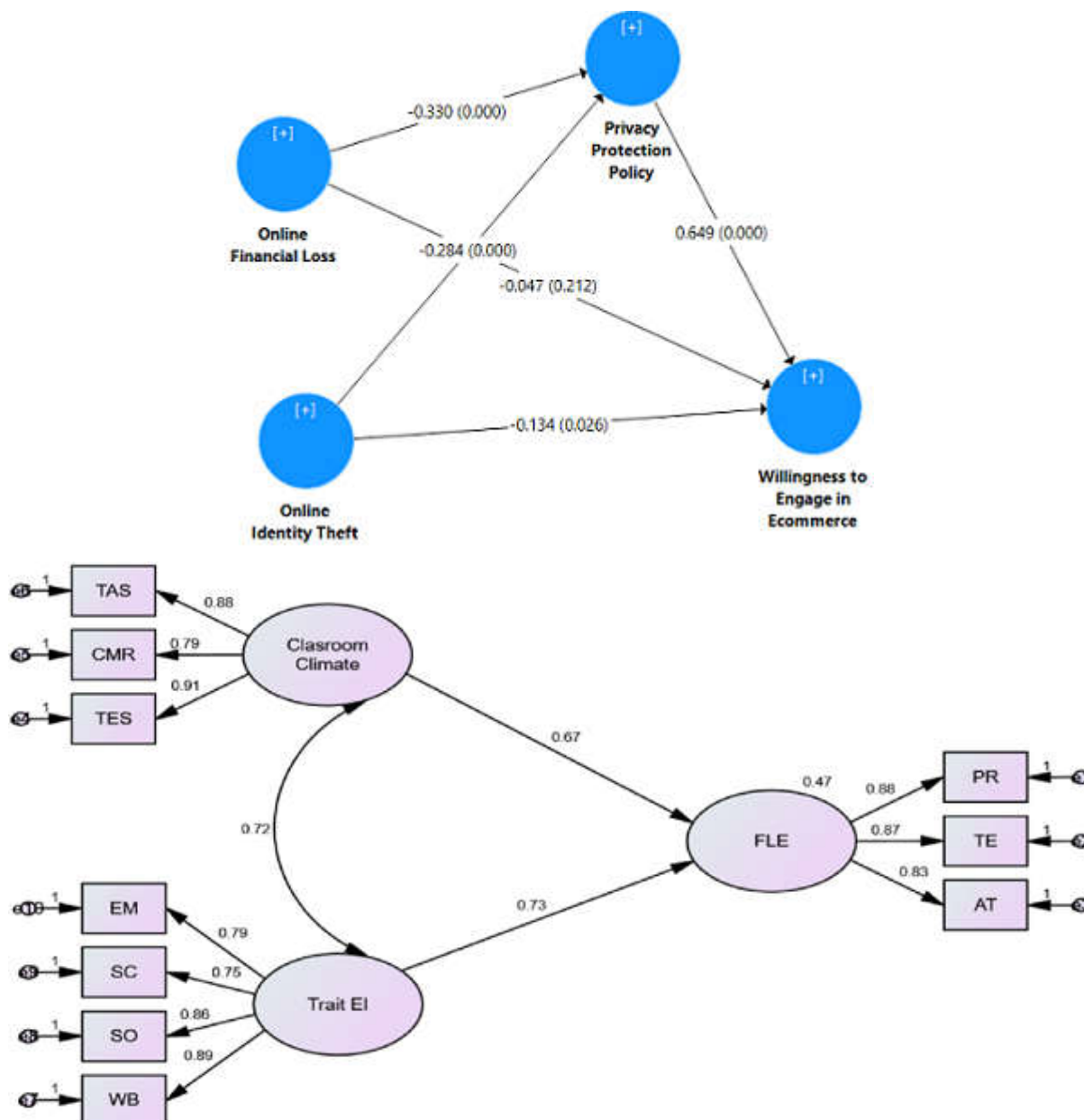
Also the Fornell-Larcker criterion is a discriminant validity test that identifies the degree to which a construct considerably differs from the other constructs in a structural equation modeling (SEM). Hence it confirms that every construct has its identity indicating the reliability of the overall model in deterring multicollinearity issues. The Fornell-Larcker Criterion is a statistical test portraying discriminant validity of different constructs in a model ensuring their independence. It was proposed

[1*] **Corresponding Author** vivekan2006@gmail.com

in 1981 by Claes Fornell and David F. Larcker. The idea was to find the discriminant validity in an SEM by comparing each construct's average variance extracted (AVE) square root with the correlation between that construct and others in the model. The difference is validated if the former is greater than the latter.

This method is implemented in diverse fields like finance marketing research human resources psychology education and healthcare to ensure that the measurement model is reliable and will provide the correct outcome.

However the discriminant validity Fornell-Larcker criterion was criticized by many statisticians for its inability to properly articulate the discriminant validity for all kinds of Structural Equation Models (SEMs). Therefore an alternative approach was introduced the HeteroTrait-MonoTrait (HTMT) ratio of correlations derived from the multitrait-multimethod matrix. It was superior and more accurate than the previous techniques.

[1]* **Corresponding Author** vivekan2006@gmail.com

Table 1 Fornell-Larcker-Criterion-Analysis-for-Checking-Discriminant-Validity Table

Empty Cell	Academic Achievement	Critical Thinking Abilities	Students' Engagement	ChatGPT Usage
Academic Achievement	0.723			
Critical Thinking Abilities	0.417	0.727		
Students' Engagement	0.292	0.617	0.815	
ChatGPT Usage	0.38	0.518	0.349	0.713

One of the most often used methods for evaluating the discriminant validity of measurement models is the Fronell-Larcker criteria. This criteria requires that the correlation between a construct and any other construct be less than the square root of the average variance retrieved by the construct. The correlation values derived by applying the Fornell-Larcker criteria are displayed in Table 1.

The **Fornell-Larcker criterion** is a decision rule based on a comparison between the squared construct correlations and the average variance extracted (AVE). See in below programme.

calculateFLCriterion {cSEM}

R Documentation

Fornell-Larcker criterion

Description

Computes the Fornell-Larcker matrix.

Usage

```
calculateFLCriterion(
  .object            = NULL,
  .only_common_factors = TRUE,
  ...
  )
```

Arguments

.object

An R object of class cSEMResults resulting from a call to csem().

.only_common_factors

Logical. Should only concepts modeled as common factors be included when calculating one of the following quality criteria: AVE, the Fornell-Larcker criterion, HTMT, and all reliability estimates. Defaults to TRUE.

[1]* **Corresponding Author** vivekan2006@gmail.com

...

Ignored.

Details

The Fornell-Larcker criterion (FL criterion) is a rule suggested by Fornell and Larcker (1981) to assess discriminant validity. The Fornell-Larcker criterion is a decision rule based on a comparison between the squared construct correlations and the average variance extracted (AVE).

The FL criterion is inherently tied to the common factor model. It is therefore unclear how to meaningfully interpret the FL criterion in the context of a model that contains constructs modeled as composites.

Value

A matrix with the squared construct correlations on the off-diagonal and the AVE's on the main diagonal (Ref).

Discussion of Results

The results of the study supported the preliminary propositions, indicating the effective role of ChatGPT in streamlining the educational journey and learning process among higher education students in Madurai.

Effect of ChatGPT on Student's Engagement

Regarding the first study hypothesis, "**ChatGPT usage positively affects students' engagement in educational activities**." Study respondents agreed that ChatGPT is more interactive, human-like, and engaging for the students, increasing their confidence in their research. They further agreed that ChatGPT is easy to use and more engaging for them. Also, respondents agreed that ChatGPT helps and shares their educational burden in the best possible manner.

Effect of ChatGPT on Student's Critical Thinking Abilities

The second study hypothesis, "**ChatGPT has a positive effect on students' critical thinking abilities**," also remained supported and revealed that they usually need clarification on the precision and reliability of the information provided by ChatGPT, which enhances their critical thinking skills.

According to study respondents, the responses provided by ChatGPT prompted them to doubt their validity, leading them to seek further clarification or evidence regarding the information provided. Study respondents also agreed that they actively explore alternative viewpoints or sources of information when utilizing ChatGPT to ensure a comprehensive understanding of the topic. Besides, they agreed that they need clarification about the accuracy and suitability of ChatGPT's output, which often encourages them to evaluate information or conduct additional research independently. Thus, incorporating critical thinking (CT) skills into the curriculum may need improvement, such as narrow time and the availability of teaching personnel.

Effect of ChatGPT on Student's Academic Achievement

Finally, concerning the third hypothesis, "**ChatGPT usage has a positive effect on student's academic achievement**," the study respondents agreed that they actively explore alternative

[1*] **Corresponding Author** vivekan2006@gmail.com

viewpoints or sources of information when using ChatGPT to ensure a comprehensive understanding of a topic.

According to the respondents, ChatGPT brings innovative ideas ready to be shared with other students, and they can acquire strong writing guidance from ChatGPT. Study respondents also agreed that ChatGPT has increased their understanding, improved their academic performance, and enhanced their learning pace effectively. Also, the constant availability of ChatGPT assures that students can access academic support whenever needed, catering to their individual learning needs and programs. This flexibility empowers students to take ownership of their learning processes, encouraging self-reliance and self-regulation, which are key factors behind their success and academic achievement.

Effect of ChatGPT on Behavioural engagement

Students actively participate in using ChatGPT, according to the review. For instance, a lot of students utilise it to improve their writing, come up with ideas, and polish their assignment drafts. According to research, students who use ChatGPT are more likely to turn in their assignments on time, and this LLM helps them finish their learning assignments more quickly. Although behavioural involvement has advantages, there are drawbacks as well, such plagiarism and cheating. This review focuses on research that shows instances of academic dishonesty caused by students abusing ChatGPT. The researchers emphasise that in order to optimise the benefits of behavioural engagement with ChatGPT, this abuse is a serious risk that must be addressed.

Effect of ChatGPT on Emotional engagement

Numerous pupils conveyed their contentment and delight with their ChatGPT encounters. For instance, students in a recent research expressed great pleasure with the learning experience offered by ChatGPT and said the LLM was fascinating, entertaining, and pleasurable. Nonetheless, the Novelty Effect may have an impact on these favourable emotional reactions. Since many of the students were new to ChatGPT, they gave positive reviews. According to one survey, for instance, pupils said that "the future is exciting" and "ChatGPT is awesome." This implies that the initial zeal can fade with time, and further investigation is required to comprehend ChatGPT's long-term emotional effects on pupils.

By offering a relaxed setting where students may ask questions and get help without feeling intimidated, ChatGPT has been demonstrated to lower student anxiety. According to a recent research, ChatGPT helped students feel less anxious by removing their worries about unsolved issues. On the other hand, ChatGPT has a mixed effect on social interaction. According to several research, the lack of one-on-one interactions between students and instructors has resulted in a decrease in social contact. However, other research discovered that ChatGPT improved social interaction by encouraging students to collaborate and have meaningful conversations.

Effect of ChatGPT on Cognitive engagement

According to several studies, ChatGPT helped students study, which improved their comprehension and performance. According to a recent study, ChatGPT is successful in improving learning outcomes

[1*] **Corresponding Author** vivekan2006@gmail.com

because the experimental group that utilised it had higher post-test scores than the control group. On the other hand, a recent study revealed that students who used ChatGPT performed better during their study sessions but worse during their final test. This was due to the fact that students were three times more likely to employ the most common prompt—"ask for answers"—than "asking for help."
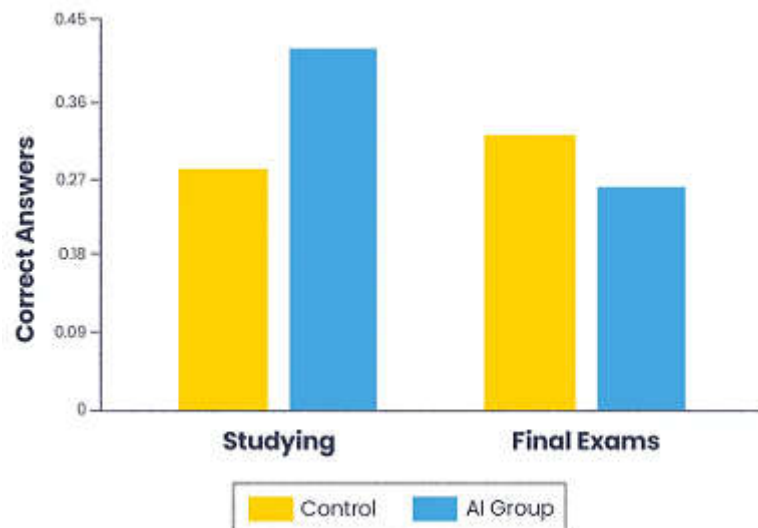
Conclusion

This study explored the influence of ChatGPT on students' learning experiences, particularly focusing on their engagement in higher education, critical thinking skills, and academic success in Madurai, Tamil Nadu. The findings of this research provide important insights for the educational field concerning the effects of ChatGPT on student learning results. Consequently, this research paper makes substantial contributions to understanding how ChatGPT technology can effectively improve student learning outcomes and outlines a framework for incorporating AI into educational practices.

Additionally, the findings of this study have real-world implications for educational policy and the advancement of technology. Policymakers can leverage the insights gained to establish guidelines that ensure the ethical and effective incorporation of AI technologies in academic environments. Ultimately, this research emphasizes data-driven decision-making in education, fostering a deeper comprehension of how technology can enhance student learning experiences in optimal ways.

Thus, ChatGPT serves as a valuable resource that stimulates student curiosity and engagement, supporting them throughout their educational journey by offering practical resources, direction, and interactive elements. When utilized effectively, ChatGPT plays a vital role in advancing educational development and achieving improved outcomes in students' academic pursuits, thereby sustaining their motivation to learn.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

[1]* **Corresponding Author** vivekan2006@gmail.com

Reference

- Abbott, M. L., & McKinney, J. (2013). Understanding and Applying Research Design. John Wiley & Sons.

- Adam A.M.Sample Size Determination in Survey ResearchJournal of Scientific Research and Reports (2020), pp. 90-97

- Adiguzel T., Kaya M.H., Cansu F.K.Revolutionizing education with AI: Exploring the transformative potential of ChatGPTContemporary Educational Technology, 15 (3) (2023).

- Ali J.K.M., Shamsan M.A.A., Hezam T.A., Mohammed A.A.Q. Impact of ChatGPT on Learning Motivation: Teachers and Students' Voices Journal of English Studies in Arabia Felix, 2 (1) (2023)

- Caratiquit K.D., Caratiquit L.J.C.ChatGPT as an academic support tool on the academic performance among students: The mediating role of learning motivationJournal of Social, Humanity, and Education, 4 (1) (2023)

- https://doi.org/10.5455/aim.2023.31.300-304

- https://digitalcommons.uri.edu/cgi/viewcontent.cgi?article=1547&context=cba_facpubs

- Fornell C, Larcker DF (1981). "Evaluating structural equation models with unobservable variables and measurement error." *Journal of Marketing Research*, **XVIII**, 39–50.

- https://chat.openai.com

[1*] **Corresponding Author** vivekan2006@gmail.com