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Student acceptance of ChatGPT in higher education: A mixed-method study of attitudes, intentions, and concerns

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Abstract

ChatGPT has become a widely accessible tool for university students, yet the factors influencing its acceptance or hesitation remain underexplored. This study investigates undergraduate students' attitudes, intentions, and behaviors toward using ChatGPT in higher education, using a mixed-method design with the Technology Acceptance Model (TAM). A revised TAM survey, incorporating constructs such as Perceived Ease of Use, Perceived Usefulness, Attitude, Behavioral Intention, and Actual Use, was administered to 687 students across nine institutions during December 2024. Results indicate that students who perceive ChatGPT as useful exhibit more positive attitudes, leading to stronger Behavioral Intentions and higher Actual Use for academic tasks outside the classroom. Additionally, open-ended responses and interviews highlighted both benefits and concerns. Key benefits included time savings, ease of information gathering, and enhanced creativity. Concerns focused on a lack of understanding of ChatGPT's functionalities, fear of over-reliance, mistrust of generated content, and risks to academic integrity. These findings suggest that while many students recognize ChatGPT's potential as a study aid, challenges related to user education and ethical use must be addressed. This study contributes to the growing discourse on AI integration in higher education by offering evidence-based insights and practical strategies for leveraging ChatGPT as an effective, ethical tool to support student learning in higher education.

Abbreviations:

AU= Actual Use
ATU= Attitude Towards Use
BIU= Behavioral Intention to Use
GenAI= Generative Artificial Intelligence
PU= Perceived Usefulness
PEU= Perceived Ease of Use
SEM= Structural Equation Model
TAM= Technology Acceptance Model

Introduction

The rapid rise of generative artificial intelligence (GenAI) tools, particularly ChatGPT, is reshaping the landscape of higher education. As Chen (2023) notes, the integration of AI into education is advancing rapidly, necessitating a closer examination of how students perceive and utilize these technologies. García-Peñalvo (2023) highlights that ChatGPT has transformed the discourse around technology in academia, prompting new and urgent questions about its role. Furthermore, Lo (2023) emphasizes the widespread global adoption of ChatGPT among students for academic success, signaling its profound impact on higher education. It is essential that we keep a close eye on the impact of AI within higher education and continue to reevaluate its role as a tool for students (Rudolph et al., 2025).

ChatGP's popularity is underpinned by its ability to provide personalized learning experiences, streamline academic tasks, and enhance engagement (Schiff, 2022; Wang et al., 2024). In addition, research indicates its potential to improve collaboration and provide real-time feedback, fostering more efficient learning environments (Almusaed et al., 2023; Judijanto et al., 2024). Another clear benefit it offers is its ability to deliver vast amounts of information quickly and support individualized responses aligns with the growing demand for personalized education (Gill et al., 2024). However, the growing reliance on ChatGPT raises critical concerns. Farrokhnia et al. (2023) caution against its potential to diminish critical thinking skills and jeopardize academic integrity through plagiarism. Kleebayoon and Wiwanitkit (2023) echo these concerns, pointing out the ease with which students can misuse AI for academic dishonesty, while Lin and Chang (2020) call for greater ethical considerations in its use.

Since the rise of ChatGPT in higher education, the lack of research focused on student opinions about its impact has become apparent (Sullivan et al., 2023) leading to a need for more student-centered data. Research shows that while many students recognize its efficiency and accessibility (Monib et al., 2024), concerns about the reliability and accuracy of its outputs persist. As Sok and Heng (2023) argue, balancing the benefits and challenges of ChatGPT is critical as its influence grows. Challenges such as insufficient knowledge of AI, negative attitudes, and difficulty aligning its use with coursework goals further complicate its integration into education (Chiu et al., 2023). Addressing these issues requires a deeper understanding of how students accept and adapt to this technology.

The Technology Acceptance Model (TAM), developed by Davis (1989), provides a valuable framework for exploring ChatGPT's role in higher education. According to TAM, students' acceptance of technology is influenced by their perceptions of its usefulness and ease of use. Recent studies applying TAM to ChatGPT adoption reveal varied insights. Research by Kumar and Anu (2024), Mourtajji and Arts-Chiss (2024), Shahzad et al. (2024), and Yilmaz et al. (2023) demonstrates the model's efficacy in understanding student attitudes and behaviors. Chawla et al. (2024) further highlight the importance of using mixed-method approaches to capture nuanced perspectives on ChatGPT's acceptance across cultural contexts.

This study aims to advance understanding of ChatGPT's impact on higher education through three key research questions:

RQ1. How accepting are higher education students of ChatGPT as a tool for completing academic work in terms of attitudes, intentions, and behaviors?

RQ2. What specific benefits and concerns do students report as reasons for their acceptance or hesitation to use ChatGPT?

RQ3. Based on the findings from RQ1 and RQ2, what recommendations can be made for using ChatGPT as an effective learning tool within higher education?

By addressing these questions, the research seeks to provide evidence-based strategies to harness ChatGPT's potential effectively while addressing its associated challenges.

Literature review

Technology Acceptance Model (TAM) research on ChatGPT

The Technology Acceptance Model (TAM), introduced by Davis (1989), is a cornerstone framework for understanding how students accept technology (Granić & Marangunić, 2019). It emphasizes that perceived usefulness (PU) and perceived ease of use (PEU) are key determinants of behavioral intention to use (BIU) and actual use (AU). Venkatesh and Davis (2000) validated the TAM's predictive power, establishing its application across diverse contexts, including educational technologies. Its relevance has only grown with the increasing integration of AI tools like ChatGPT into academic settings.

Recent studies applying TAM to ChatGPT reveal nuanced insights into student acceptance. Romero-Rodríguez et al. (2023), in their study of Spanish students, identified user experience as a decisive factor in acceptance, suggesting that intuitive design and responsiveness are paramount. This aligns with Liu and Ma (2024), who noted that PEU directly influences PU, which in turn shapes BIU, creating a domino effect in determining whether students adopt ChatGPT. Similarly, Sarraf et al. (2023) confirmed that PU and PEU are consistent predictors of AU, reinforcing the foundational principles of TAM.

Behavioral intention to use ChatGPT appears to be a particularly strong predictor of its actual adoption. Jo (2024) highlights that BIU significantly influences AU, a finding supported by Strzelecki (2023), who observed this relationship in a study of Polish students. Strzelecki et al. (2024) extended these findings by identifying habit and performance expectancy as influential factors, emphasizing that sustained use and demonstrated utility enhance acceptance. Additionally, Mutammimah et al. (2024) introduced attitudes toward use (ATU) as an intermediary

factor, showing that positive attitudes amplify BIU and, subsequently, AU.

However, challenges such as the tool's reliability can undermine these positive trajectories. Ngo (2023) found that vague and inconsistent outputs negatively impact PU, leading to reduced adoption rates. These findings point to a critical need for improving the accuracy of ChatGPT's responses and educating students about its limitations. Addressing these issues is vital for fostering a positive attitude toward the tool, as emphasized by Li and Zhang (2024), who argue that PU significantly influences ATU. The interconnected nature of these variables underscores the complexity of integrating ChatGPT into academic environments effectively.

Benefits for students using ChatGPT for academic work

The potential benefits of ChatGPT in education are numerous and transformative. Xiao and Zhi (2023) found that students value the speed and personalization of feedback provided by the tool, which allows them to address their academic challenges more effectively. Similarly, Rasul et al. (2023) observed that personalized learning facilitated by ChatGPT leads to improved academic performance by catering to individual needs and enhancing knowledge retention. The ability to deliver targeted feedback makes ChatGPT a valuable asset for students seeking to optimize their learning strategies.

Moreover, the efficiency ChatGPT brings to academic work cannot be understated. Zhang and Aslan (2021) highlighted its capacity to save time, enabling students to complete complex tasks more quickly. Mariani et al. (2023) and Ooi et al. (2023) both identified the combination of speed and data variety as a primary reason for ChatGPT's growing popularity in higher education. These attributes not only streamline academic workflows but also encourage self-directed learning. Du and Alm (2024) noted that the accessibility of knowledge through ChatGPT empowers students to explore topics independently, fostering a sense of autonomy in their studies.

Beyond efficiency, ChatGPT may contribute to cognitive and creative development. Dahri et al. (2024) reported that frequent use of ChatGPT enhances cognitive growth, particularly when high-quality outputs are leveraged for academic purposes. Chawla et al. (2024) added that ChatGPT supports creativity by allowing students to experiment with ideas and approaches in their work. While concerns about critical thinking have been raised, Kiryakova and Angelova (2023) and Xu et al. (2024) argue that ChatGPT can stimulate deeper engagement by motivating students to think critically about the information presented. Bai et al. (2023) further assert that by reducing cognitive load in information retrieval, ChatGPT enables students to focus on higher-order analytical tasks, potentially enhancing their critical thinking skills.

Student concerns about using ChatGPT for academic work

Despite its advantages, significant concerns remain about ChatGPT's integration into academic settings. A recurring issue is trust in the tool's accuracy. Esmaeil et al. (2023) highlighted that students often question the reliability of ChatGPT's outputs, which can lead to hesitancy in adopting the tool. This sentiment is echoed by Cheng et al. (2022), who found that trust plays a pivotal role in determining whether students view ChatGPT as a credible learning aid. Choudhury and Shamszare (2023) added that trust must be built through consistent and accurate performance, which is essential for fostering long-term acceptance.

Amin et al. (2024) demonstrated through a Systemic Equation Model (SEM) study that trust is a significant factor influencing ChatGPT's acceptance among Bangladeshi students. Conversely, a lack of trust can exacerbate concerns about misinformation, as observed by Dahri et al. (2024). Their findings suggest that while ChatGPT's outputs can be beneficial, any perceived inaccuracies can erode confidence, limiting its effectiveness as an educational tool.

Over-reliance on ChatGPT presents another challenge. So much so that some institutes may consider banning ChatGPT altogether to prevent students becoming too dependent on it (Kutty et al., 2024). In line with this, Ye et al. (2024) warned that excessive dependence on the tool might lead to inert thinking, where students struggle to apply knowledge creatively or critically. Van Dis et al. (2023) and Howard and Smith (2023) cautioned that ChatGPT's ease of use could foster addictive behavior, reducing students' willingness to engage in independent academic work. Morales-García et al. (2024) found that such reliance could also diminish motivation, as students may defer challenging tasks to ChatGPT, thereby weakening their problem-solving skills.

Ethical concerns further complicate ChatGPT's use. Many students express feelings of guilt when using the tool for academic purposes. Bae et al. (2024) and Jo (2024) reported that students often perceive their reliance on ChatGPT as akin to cheating, particularly in the absence of clear guidelines on its appropriate use. Aylsworth and Castro (2024) noted that this lack of clarity leaves students uncertain about the ethical boundaries of using AI tools, creating an environment of ambiguity and discomfort.

Educators also face challenges in integrating ChatGPT effectively. ElSayary (2024) highlighted that many teachers struggle to interpret data from ChatGPT and use it to guide students. Al-Mughairi and Bhaskar (2024) added that unclear guidance on ethical and pedagogical considerations leaves educators unsure of how to incorporate ChatGPT into their teaching. Iqbal et al. (2022) pointed out that teacher reluctance to embrace ChatGPT stems from fears of plagiarism and misuse, which ultimately deprive students of opportunities to learn how to use the tool responsibly.

By addressing these benefits and concerns, this literature review provides a comprehensive understanding of the factors influencing ChatGPT's integration into higher education. A nuanced approach that balances its potential

advantages with the need to mitigate its limitations will be essential for maximizing its impact on academic success.

Methodology

Research design

This study used an explanatory sequential mixed-method design, in which the quantitative phase informs the qualitative phase (Creswell & Clark, 2011). In particular, the quantitative phase involved the collection and analysis of numerical data via an online survey. The qualitative phase included semi-structured interviews and a thematic analysis of the interview material, which built on the survey results (Creswell & Clark, 2011) with the help of QualCoder software. The interview results supplement the quantitative findings by offering particular experiences from students enrolled in higher education across various institutions and nations, illustrating their acceptance and adoption of GenAI- ChatGPT Technology for learning purposes. This helps ensure a more nuanced understanding.

It is also worth noting that we have suggested the structural model (See Figure 1) based on the modified TAM and research questions to illustrate the predicted correlations between elements in the quantitative model. The following five hypotheses are included:

Hypothesis 1: PEU positively predicts PU

Hypothesis 2: PEU positively predicts ATU

Hypothesis 3: PU positively predicts ATU

Hypothesis 4: ATU positively predicts BIU

Hypothesis 5: BIU positively predicts AU

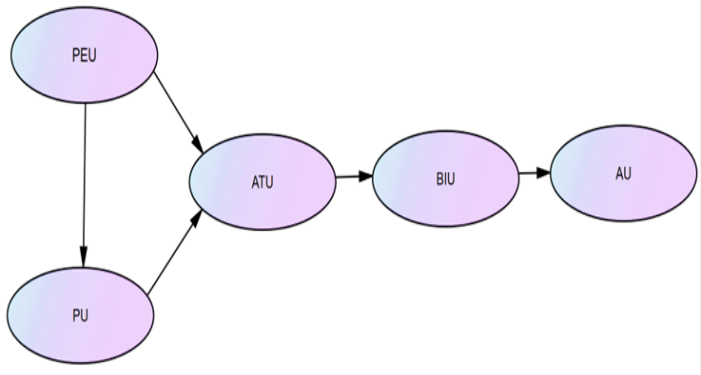

Figure 1. Structured model.

PEU= Perceived Ease of Use

PU= Perceived Usefulness

ATU= Attitude Towards Use

BIU= Behavioral Intention to Use

AU= Actual Use

Context and participants

Examining the variables affecting undergraduate students' adoption and usage of ChatGPT as a standard learning tool in higher education across nine institutions in three nations is the goal of this study. The study also evaluates students' awareness of using GenAI (ChatGPT) from multiple perspectives. During December 2024, the researchers collected a total of 687 quantitative data points (utilizing purposive sampling techniques to gather survey responses), 157 open-ended survey responses and 25 qualitative in-depth interview responses. These data were collected from undergraduate students in higher education across Japan, China, and New Zealand. These three regions were selected because they can uncover a wide view of student perspectives of ChatGPT and help fill the gap in research undertaken across this wide area within research.

The primary objective of the study is to gain a deeper understanding of the impact of ChatGPT on students' learning in higher education and to identify the factors influencing undergraduate students' use of ChatGPT. Additionally, the study seeks to shed light on the possible advantages and difficulties of integrating ChatGPT in higher education settings. To achieve this, we will adopt a mixed-methods approach, grounded in the TAM, and design a quantitative survey to collect data.

During the data collection period, 687 participants (387 male and 300 female) completed an online survey. All participants were undergraduate students, distributed across first-year, second-year, third-year, and fourth-year students in various majors. 157 of the students gave open-ended responses to each of the 15 survey questions to explain their answers in more detail. Furthermore, the final question of the survey asked participants if they were willing to participate in follow-up interviews, requesting their contact details. Qualitative data were collected by randomly selecting 25 respondents from the provided contact information.

Quantitative data collection and analysis

After revising the initial questionnaire, the final online survey was designed using the Sojump platform (http://www.sojump.com/) (see Appendix A for the survey questions). The survey was distributed to students from Japan, China, and New Zealand higher education institutions. It was circulated via posters and emails sent to students' inboxes, with a random selection from tutorial classes to participate. Participants could select their preferred language to read the questions in using a dropdown menu. In order to reduce the centrality effect, the survey in this study was in the form of a six-point Likert scale. Over 1,000 surveys were distributed, and 687 valid responses were collected. Upon completion of the survey, the author downloaded the 687 sample responses from the Sojump platform for further processing and analysis. The data collected from valid surveys will be used to measure the TAM and external constructs.

A six-point Likert scale is used in the survey, with 1 denoting "strongly disagree" and 6 denoting "strongly agree." The gathered data will be analyzed using descriptive statistics,

such as mean, standard deviation, and frequency distribution. The proposed connections between the constructions will also be tested using structural equation modelling, or SEM. The degree to which users' attitudes and behavioral intentions about using ChatGPT can be explained by the TAM model will be revealed via SEM analysis. The impact of external constructs on users' attitudes and intentions will also be investigated in this study.

We used SPSS 26.0 and AMOS 26.0 to run the quantitative data analysis in five steps utilizing SEM (Kline, 2023). The first was cleansing the data. Mahalanobis distance item skewness and kurtosis were used to filter the data for multivariate outliers and abnormalities. The results showed that the data were symmetric and non-skewed, making them appropriate for additional analysis, once inaccurate data points were eliminated. Based on the item means and standard deviations, we conducted descriptive analysis in the second stage to produce easily comprehensible insights. Third, we tested the reliability and validity of the data by calculating Cronbach's alpha (α) for each variable and conducting confirmatory factor analysis. Reliability and validity are crucial for subsequent data analysis. In the fourth step, we examined the relationships hypothesized in the model through path analysis and mediation analysis. Finally, we tested whether learners' adoption of new GenAI technologies could be explained by their experience with GenAI-ChatGPT using two group difference tests based on the established model.

Qualitative data collection and analysis

For the open-ended responses in the survey, participants could select their preferred language to read the questions in using a dropdown menu and were instructed to write their responses in the language in which they felt most capable of explaining their opinions. These responses were used for the qualitative portion of the study. Thematic analysis (Braun & Clarke, 2021) was used to identify and analyze key themes with the help of QualCoder software. Responses were translated using AI and coded separately by both researchers to create themes. After both researchers compared their results, the theme overlap rate reached over 95%, ensuring a high degree of consistency in the analysis.

Findings

Descriptive statistics

Descriptive statistical analysis was conducted on the demographic information of the 637 respondent samples. The results showed the following: (1) In terms of gender distribution, there were 384 male respondents and 300 female respondents (3 students preferred not to say), indicating a higher number of male users compared to female users. The sample data were collected via an online survey of 637 undergraduate students. After removing missing and outlier data, the final response count was 603. The data revealed that 54.7% of the respondents were male, while 45.3% were female. In terms of age, 96% of respondents were aged between 18 and 24 years. All participants were undergraduates.

The mean (M) and standard deviation (SD) values of the various dimensions of the questionnaire are presented in Table 1. The results indicate that students hold relatively high behavioral intentions, attitudes, and perceptions regarding the use of Gen AI ChatGPT in higher education. This suggests a strong willingness to continue using ChatGPT in the future. For instance, the item PU, Q8 ("ChatGPT helps me complete academic tasks more efficiently than traditional methods") yielded a mean of 5.11 (SD = 0.97), indicating that students in higher education have a highly positive attitude towards using generative AI for completing assignments or academic tasks. Furthermore, students express a high level of confidence about their future use of ChatGPT, with a promising outlook (Q4, M = 4.66, SD = 1.064). However, students' familiarity with using ChatGPT is not particularly high (see Table 1 below).

Table 1. Descriptive statistics.

Construct	Survey Item	M	SD	Alpha
PEU	Q1	4.95	1.027	0.875
PEU	Q7	4.81	1.327	0.875
PU	Q2	4.45	0.969	0.816
PU	Q8	5.11	0.970	0.816
PU	Q13	3.53	1.170	0.816
PU	Q15	4.02	1.458	0.816
ATU	Q3	4.27	1.161	0.809
ATU	Q9	4.43	1.313	0.809
ATU	Q14	4.17	1.359	0.809
BIU	Q4	4.66	1.064	0.812
BIU	Q10	4.35	1.478	0.812
BIU	Q12	3.74	1.593	0.812
AU	Q5	4.25	1.354	0.834
AU	Q6	4.30	1.088	0.834
AU	Q11	4.36	1.129	0.834

Reliability/validity checks

Before testing the structural model, it is necessary to check the reliability and validity of the measurement model to ensure that the structural equation model has better practical significance. We tested the reliability and validity of the data by calculating Cronbach's alpha (α) for each variable and conducting confirmatory factor analysis. Each item's validity, reliability, and factor load must be measured. Reliability is a measure of correspondence. When a measurement yields consistent results under consistent conditions, it is deemed trustworthy. To be deemed reliable, the load value for each

item must be equal to or larger than 0.7. Our Cronbach's alpha (α) = 0.923 (see Table 1 for every item's alpha (α)). This value means that the internal consistency of the survey is high.

The degree to which a construct's indicators collectively measure that construct is known as validity. When establishing convergent validity, the extracted mean variance (AVE), which computes the average of the squared loads of the construction-related items, is typically used. More than half of the variance in the project may be explained by the structure if the AVE value is 0.5 or more (Hair, Jr et al., 2016). During the reliability and convergent validity analysis in AMOS, it was found that some items had factor loadings lower than 0.60, meaning that the standardized coefficients did not meet the threshold. As a result, items with factor loadings below 0.60 were removed. After deleting these items, the discriminant validity (CR) values for the latent variables in the measurement model were re-examined. Suppose the CR values are above the standard threshold of 0.70. This value was recommended by Kline (2016) and thus indicated adequate internal reliability. In that case, each item is significant, the standardized coefficients are greater than 0.60, and the AVE is greater than 0.50 (Hu et al., 1999), which suggests that the measurement model owns good reliability and high internal consistency (which is crucial for both preliminary and subsequent research), as well as demonstrating convergent validity, as shown in Table 3 (convergent validity and discriminant validity). To examine discriminant validity, we followed the advice of Henseler et al. (2015) and computed all factors' Heterotrait-Monotrait Ratio of Correlations (HTMT), which were all below .90 and suggested the achievement of discriminant validity.

Table 2. Goodness-of-fit indices.

Goodness-of-fit	Threshold values	Value	Standard
χ^2 (CMIN)	-	118.639	-
DF	-	85	-
CMIN/DF	<3.000	1.396	Good
P-value	>0.050	0.122	Model fit is acceptable
RMSEA	<0.05	0.024	Good
GFI	>0.9	0.978	Good
CFI	>0.9	0.963	Good

We constructed a structural model and conducted the analysis using AMOS. The results showed a good model fit, with the following fit indices (The proposed model exhibited a satisfactory fit to the data, with the following fit indices: Kline 2016; Liu and Wang 2024; Wang et al., 2024): CFI = 0.963 ≥ 0.900, GFI = 0.978 ≥ 0.900, RMSEA = 0.024 ≤ 0.05, CMIN =118.639, DF= 85, CMIN/DF = 1.396 ≤ 3, The results of the subsequent hypothesis testing are shown in Table 2. The resulting p-value = 0.122, which is greater than 0.05, suggests that the model does not significantly differ from the data, indicating a good overall model fit. This further supports the adequacy of the proposed model alongside other strong fit indices. RMSEA is a significant absolute fit measure. Our model yielded an RMSEA of 0.024 ≤ 0.05, demonstrating an excellent fit according to Hu and Bentler (1999). CFI and GFI are key relative fit indices, with recommended values above 0.90 for acceptable model fit (Kline, 2016). The data from our model yielded a CFI of 0.963 and a GFI of 0.978, both indicating strong relative fit. The chi-square to degrees of freedom ratio (χ^2/df) is a primary measure of parsimony, with values typically ranging from 1 to 3, and a more stringent threshold being below 2 (Schumacker & Lomax, 2016). Our result was χ^2/df = 1.396, indicating that the fit between the hypothesized model and the data sample is acceptable (see Table 2).

Table 3. Convergent validity and discriminant validity.

Construct	AVE (>0.5)	CR (>0.7)	HTMT (<0.9)				
			PEU	PU	ATU	BIU	AU
PEU	0.67	0.82	-				
PU	0.56	0.93	0.61	-			
ATU	0.62	0.88	0.58	0.85	-		
BIU	0.52	0.78	0.52	0.78	0.81	-	
AU	0.69	0.89	0.53	0.76	0.77	0.68	-

Table 4. Hypotheses test results.

Hypothesis	B	*p*	t-value	r	Result
H1 PEU→ PU	0.75***	***	11.86	0.58	Supported
H2 PEU→ ATU	0.44***	0.067	1.15	0.46	Unsupported
H3 PU → ATU	0.57***	0.024	7.36	0.48	Supported
H4 ATU→ BIU	0.95***	***	16.98	0.69	Supported
H5 BIU→ AU	0.91***	***	16.12	0.66	Supported

Note: p<0.001***; *r* >.5=large effect size, while .5>*r* > .3=medium effect size.

Hypotheses testing and quantitative results

This study analyzes the hypotheses in the model through hypothesis testing, where PEU = Perceived Ease of Use, PU = Perceived Usefulness, ATU = Attitude Towards Use, BIU = Behavioral Intention to Use, and AU = Actual Use. The results of the hypothesis tests are presented in Table 4, where four out of the five hypotheses are supported. The findings indicate that PEU had a strong positive effect on PU, PU had a strong positive effect on ATU, ATU had a strong positive effect on BIU, and BIU also positively predicts AU. However, PEU did not significantly predict ATU. See Figure

2 for the full structural equation model and all hypothesised paths.

The way students in higher education use ChatGPT and the factors influencing their adoption of the tool can be clearly identified. The analysis reveals that Perceived Ease of Use (PEU) has a significant positive effect on students' Perceived Usefulness (PU). This indicates that the ease of use, user-friendly design, and convenience of the tool directly influence whether students adopt and how they use ChatGPT for learning, communication, and problem-solving. Additionally, PU has a direct impact on students' attitudes towards Use (ATU), suggesting that the usability and perceived value of the tool play a key role in shaping students' attitudes toward using it. ATU has a strong positive influence on Behavioral Intention to Use (BIU) ($\beta = 0.95$, $p < 0.001$), demonstrating that students' behaviors are largely governed by their attitudes.

However, PEU does not significantly predict ATU ($p > 0.05$), indicating that students' attitudes towards using ChatGPT are not strongly influenced by perceived ease of use or that the correlation between the two factors is weak.

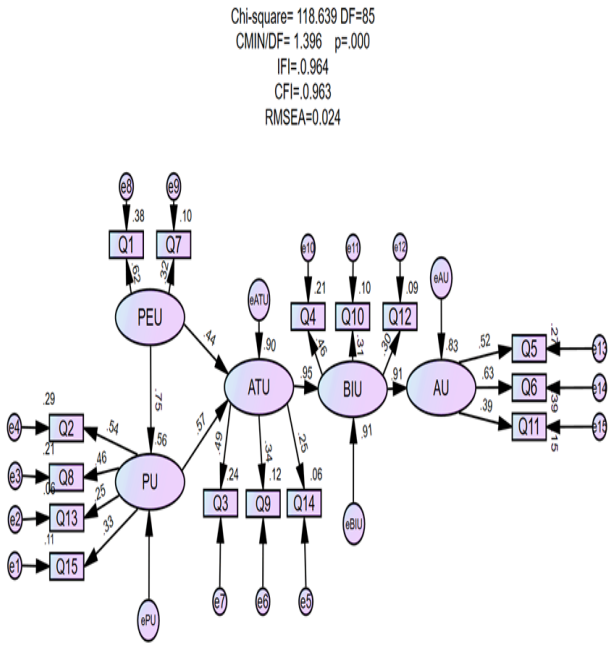

Figure 2. The final structural model.

Note: R^2 (PU = 56%; ATU=90%; BIU=91%; AU=83%); PEU= Perceived Ease of Use; PU= Perceived Usefulness; ATU= Attitude Towards Use; BIU= Behavioral Intention to Use; AU= Actual Use)

Qualitative results

Each of the 15 questions in the survey (Appendix A) was followed by an open-ended question asking students to explain their answers with as much detail as possible. 157 of the students gave detailed responses, which were used for a thematic analysis. Also, 25 students volunteered to give post-survey interviews to explain their responses in even greater detail. After all the data was collected, short responses that did not give clear reasons (such as "I don't like it" or "I don't use it") were removed and the data was received several times to code and group all of the survey and interview responses. Overall themes were then generated using QualCoder software for perceived benefits (Table 5) and concerns (Table 6) for the use of ChatGPT. Responses related to these themes were given as reasons for many of the survey questions, demonstrating a clear picture of the overall attitude of students towards the use of ChatGPT. The main benefits and concerns are summarized below.

Perceived benefits for the use of ChatGPT

Table 5 shows the three main benefits that students reported for using ChatGPT for their academic work. The first of these was studying more effectively and saving time. ChatGPT was reported as being very useful for helping make the undertaking and completion of academic work smoother and quicker than before the use of AI. One interview response which also related to this is below:

> "Sometimes the homework assigned by teachers requires us to be very fast, for example, only 11 weeks, so using ChatGPT can obviously help me find the materials I want in the shortest time, and it can. Very good, logical way to develop my own answers, so I think it was actually more productive (P1, Q6)."

Table 5. Benefit themes for the use of ChatGPT.

Benefit theme	Survey items (no. of related responses)	Example open-ended student responses
Studying more efficiently and saving time	Q1(8), Q2(35), Q3(35), Q4(32), Q5(36), Q6(20), Q8(35), Q9(50), Q10(40), Q14(35)	- "It allows me to complete tasks efficiently and spend time on what I need to do." - "What would normally take 2 hours can be done in 10 minutes." - "ChatGPT helps me complete assignments quickly." - "It is productive because you can use your time efficiently." - "It's faster to use ChatGPT than to look it up on various sites."
Acquiring new knowledge and perspectives	Q3(28), Q4(40), Q6(35), Q8(15), Q9(35), Q12(27), Q13(5), Q15(35)	- "It's fun because you gain a lot of knowledge." - "I can learn things outside of my knowledge." - "Using ChatGPT increases the amount of information I can get." - "It suggests things that you wouldn't think of on your own, so it will broaden your horizons." - "When I get stuck, it gives me new perspectives to think about things."
Generating new ideas and support with creativity	Q1(10), Q2(30), Q4(25), Q5(30), Q6(25), Q8(10), Q9(25), Q10(30), Q11(15), Q12(10)	- "It provides a variety of unique ideas, which inspire new ideas." - "I think it's very useful for coming up with ideas." - "It suggests ideas that I wouldn't have thought of." - "It gives you ideas and stimulates your imagination. It teaches me ideas that I would never have thought of." - "It suggests things that you wouldn't think of on your own, so it will broaden your horizons and make you more creative."

The next benefit reported was *acquiring new knowledge and perspectives*. Students viewed ChatGPT as a useful way to gather the information they needed to complete their academic work. A related interview response is below:

> "I later found out that ChatGPT is a much more complex AI that can learn a wide range of knowledge. For example, it can help me write articles and provide writing prompts and relevant examples. I will use this forever (P9, Q4)."

The final benefit found was generating new ideas and support with creativity. Students reported that ChatGPT was useful for helping them when they were stuck with finding ways to develop their work. An example of a related interview response is below:

> "ChatGPT has the potential to assist me in completing academic learning tasks by offering alternative ways to express ideas and helping me understand how to structure sentences more effectively. It's like having an additional resource to consult when I'm working on assignments or essays (P3, Q3)."

Concerns with the use of ChatGPT

Table 6 shows the four main concerns expressed by students for using ChatGPT for their academic work. The first of these was over-reliance affecting one's thinking. The students expressed concerns about becoming too dependent on the technology in a way which may negatively affect the development of their own critical thinking. An example interview response related to this overall concern is below:

> "One concern I foresee is the potential for overreliance on ChatGPT, which may hinder the development of independent thinking skills. Additionally, there may be challenges in discerning the appropriateness of generated content in specific academic contexts (P4, Q12)."

The second main concern was *mistrust of the reliability and accuracy*. Students expressed doubts about how much they could depend on the information they were receiving from ChatGPT during work. An example interview response related to this is below:

> "I don't believe it, because I once found that what it generated for me was not very accurate, it often wanted to learn more things through him, but I found that the things it generated were not a lot, and sometimes the things it generated may be for me. It is that the path of those references is not correct, so I sometimes do not believe it. Every time I take it over, I have to look at it again (P2, Q13)."

The third concern expressed was a sense of cheating and guilt. Students felt that it was too easy to complete work with ChatGPT and had a fear of being punished or having a feeling of academic dishonesty for using it to complete work. An example interview response is below:

Table 6. Concern themes for the use of ChatGPT.

Concern theme	Survey items (no. of related responses)	Example open-ended student responses
Over-reliance affecting one's thinking	Q1(7), Q2(28), Q4(15), Q6(15), Q8(5), Q9(15), Q10(27), Q11(8), Q12(21), Q15(26)	- "I don't want to rely on it as it might affect my critical thinking." - "Because it reduces the opportunities to think for yourself." - "I want to acquire the ability to think for myself." - "I think that relying too much on ChatGPT will weaken your ability to think for yourself." - "It is very useful for completing tasks efficiently, but depending on how you use it, it can reduce your thinking ability."
Mistrust of the reliability and accuracy	Q1(10), Q2(20), Q4(20), Q5(28), Q8(10), Q9(10), Q13(10), Q14(15)	- "ChatGPT isn't always correct, so you need to double-check." - "It's a good way to get information, but it's not guaranteed to be accurate." - "I don't trust the accuracy of the information on ChatGPT." - "I don't ask much because the answers are unreliable." - "I might think so if the content was more understandable and reliable."
A sense of cheating and guilt	Q2(12), Q3(19), Q4(18), Q8(5)	- "Even if you write a good report, if it's discovered that you used ChatGPT, your grade may go down." - "Because it will be obvious that ChatGPT wrote it." - "It makes you cheat and write reports." - "It automatically summarizes and translates, but I feel a little guilty about using it for assignments." - "Because it makes me feel like I'm cheating."

> "I won't use it. When it comes to ChatGPT, my primary concern is that the answers I generate might be too similar to those of other students, as there are times when I make minor modifications to the generated answers before submitting assignments (P8, Q4)."

The final main concern expressed was unfamiliarity with effective use. Students who did not know how to use it effectively to improve their academic work did not feel confident doing so and would hesitate to use it. An example interview response showing this is below:

> "I won't. I'm not very familiar with generative AI, especially tools like ChatGPT, as an academic learning tool. I've heard about it and I don't know too many prompts. I only use ChatGPT to paraphrase my writing tasks coz my academic writing was very weak, and I can only write very simple and easy short sentences (P6, Q4)."

Discussion

The findings of this study highlight the dual nature of ChatGPT as both a beneficial and potentially problematic tool for higher education students. Its rapid adoption reflects its utility in academic tasks, but the associated concerns underscore the need for balanced and informed integration into learning environments. This discussion synthesizes

the factors influencing ChatGPT adoption, the perceived benefits and concerns of its use, and actionable strategies to maximize its potential while addressing its challenges.

Structural Equation Modeling for the use of ChatGPT

The adoption and use of ChatGPT among students are influenced by several key factors identified through structural equation modeling (SEM). The findings demonstrate that student 'Perceived Ease of Use (PEU) plays a significant role in shaping their Perceived Usefulness (PU) of ChatGPT (as found by Liu & Ma, 2024). This relationship underscores how the simplicity, user-friendly design, and convenience of ChatGPT encourage students to adopt it for various academic purposes, such as learning, problem-solving, and communication. Furthermore, PU has a strong and direct impact on students' Attitude Towards Use (ATU) (in line with the findings by Li & Zhang, 2024), indicating that the perceived value and utility of ChatGPT are central to forming positive attitudes toward its use. These attitudes, in turn, influence Behavioral Intention to Use (BIU) (as shown by Mutammimah et al., 2024), which directly predicts actual usage behaviors (AU) (as found by Jo, 2024). However, PEU does not significantly impact ATU (unlike the findings by Supriyanto et al., 2024) suggesting that ease of use alone does not determine students' attitudes toward ChatGPT. Instead, students place greater emphasis on its functional value and alignment with their academic goals. These findings provide a foundation for understanding how students perceive and integrate ChatGPT into their academic work.

Specific benefits of ChatGPT

ChatGPT is widely acknowledged by students as a valuable tool for improving efficiency and productivity (Mariani et al., 2023; Xiao & Zhi, 2023; Zhang & Aslan, 2021). Its ability to streamline the completion of academic tasks enables students to save significant amounts of time, as illustrated by student responses highlighting how hours of work can be condensed into minutes. This efficiency allows students to reallocate their time to other academic or personal priorities, suggesting that ChatGPT can support effective time management. Furthermore, its capability to generate new ideas and provide diverse perspectives fosters creativity and critical thinking in academic work (Chawla et al., 2024; Kiryakova & Angelova, 2023; Xu et al., 2024). By presenting novel ways of approaching problems, ChatGPT encourages students to expand their intellectual horizons and consider alternative viewpoints.

In addition to supporting efficiency and creativity, ChatGPT provides students with opportunities to acquire new knowledge beyond their existing expertise (Dahri et al., 2024; Du & Alm, 2024; Rasul et al., 2023). Many students value its ability to offer writing prompts, relevant examples, and alternative approaches, making it a versatile resource for tackling academic challenges. These benefits align with the growing need for personalized and adaptive learning tools that cater to diverse student needs.

Specific concerns regarding ChatGPT

Despite its benefits, several concerns temper students' enthusiasm for ChatGPT. Chief among these is the fear of over-reliance (Kutty et al., 2024; Morales-García et al., 2024; Van Dis et al., 2023; Ye et al., 2024), which could impair the development of critical thinking skills (Mhlanga, 2023; Monib et al., 2024; Shiri, 2023). Students worry that habitual use of ChatGPT might reduce opportunities for independent thought and problem-solving, a concern that is particularly relevant in higher education, where fostering cognitive growth is paramount.

Another significant concern involves the reliability and accuracy of ChatGPT's outputs (Cheng et al., 2022; Dahri et al., 2024; Esmaeil et al., 2023). Many students expressed doubts about the factual correctness of its responses, emphasizing the need for careful validation and cross-referencing. This mistrust (Amin et al., 2024; Choudhury & Shamszare, 2023) stems from experiences where generated content was either incomplete or inaccurate, which undermines confidence in using the tool for academic purposes.

Feelings of guilt and concerns about academic dishonesty also emerge as barriers to widespread acceptance (Aylsworth & Castro, 2024; Bae et al., 2024; Jo, 2024). Students perceive the use of ChatGPT in academic tasks as akin to cheating, fearing punitive actions or the erosion of academic integrity (Howard & Smith, 2023; Singh et al., 2023). This apprehension is compounded by a lack of clear institutional policies on acceptable use (Al-Mughairi & Bhaskar, 2024; ElSayary, 2024).

Lastly, unfamiliarity with effective use limits the potential of ChatGPT for some students. Those who lack confidence or training in using generative AI report difficulty in fully utilizing its capabilities, which restricts its perceived utility (Iqbal et al., 2022; Singh et al., 2023).

Actionable recommendations

Educators play a crucial role in mitigating the concerns associated with ChatGPT while amplifying its benefits. They should design assignments and learning activities that require students to critically evaluate and validate ChatGPT's outputs. This approach not only reduces over-reliance but also strengthens students' analytical and problem-solving skills. Educators must also emphasize ethical usage, guiding students to be transparent about how and when ChatGPT is used in academic work. To ensure that students harness ChatGPT effectively, institutions should support faculty-led workshops on crafting effective prompts, interpreting AI-generated content, and integrating the tool as a supplementary resource rather than a substitute for learning. For students, developing strategies to validate ChatGPT's outputs is essential to overcoming mistrust in its reliability. Cross-referencing AI-generated information with credible sources can help build confidence in its use. Students should adopt a balanced approach, using ChatGPT as a tool for idea generation and efficiency while ensuring that their independent efforts remain central to their academic pursuits. Transparency in how ChatGPT is utilized is also

vital, as it helps students navigate ethical concerns and avoid perceptions of academic dishonesty.

Researchers can contribute to a deeper understanding of ChatGPT's impact by examining its role across diverse cultural and educational contexts. Further studies should investigate the long-term implications of ChatGPT use on cognitive skills such as creativity and critical thinking. Collaboration with AI developers to improve the transparency and explainability of ChatGPT outputs is another critical avenue for building trust and enhancing its adoption in higher education.

Educational institutions must take proactive steps to integrate AI literacy into curricula, ensuring that both students and educators are equipped to use ChatGPT responsibly. Establishing clear policies on the acceptable use of generative AI in academic work can provide a framework that upholds integrity while promoting innovation. Institutions should also invest in professional development programs for educators, equipping them with the tools and knowledge needed to effectively integrate ChatGPT into teaching methodologies.

Study limitations

While this study provides valuable insights, certain limitations must be acknowledged. The research primarily focused on a sample of students from Asian educational contexts, which may limit the generalizability of findings to broader, more diverse populations. Additionally, the depth of data collected through open-ended responses was constrained, with some participants offering minimal insights (e.g., "I don't enjoy it") that lacked elaboration. This limitation is partly attributed to the anonymity maintained during data collection; a measure designed to encourage honest feedback. However, the inability to follow up with respondents restricted opportunities for clarification and deeper exploration of their perspectives. These constraints highlight the need for future studies to adopt more inclusive sampling and consider mixed-methods approaches that balance anonymity with avenues for richer data collection.

Conclusions

This study explored the acceptance of ChatGPT among higher education students, examining their attitudes, intentions, and behaviors, as well as the specific benefits and concerns that shape their use of this generative AI tool. The findings revealed a nuanced perspective, with students acknowledging both the advantages and potential drawbacks of incorporating ChatGPT into their academic workflows.

Regarding RQ1, significant relationships were found between PU and ATU, ATU and BIU, PEU and PU, as well as BIU and AU. Most importantly, the findings indicate that higher education learners tend to associate the simple operational characteristics of ChatGPT with its usefulness in seeking help and supporting learning in the context of higher education, directly influencing their positive attitude towards using ChatGPT. Therefore, an important implication of this study is that scholars, experts, and educators in higher education from diverse backgrounds should provide students with the necessary expertise, actively guide or assist them in using GenAI for learning, and ensure the correct use of ChatGPT. Additionally, they should help students design effective prompts, differentiate between accurate and misleading information, and foster their critical thinking abilities.

In addressing RQ2, this study identified three primary benefits of ChatGPT that contribute to its acceptance among students. Learners appreciated its ability to save time, enhance efficiency, and streamline academic tasks, as well as its capacity to provide new knowledge and perspectives that broaden their understanding. Additionally, ChatGPT's support for creativity through idea generation was seen as a valuable tool for overcoming academic challenges and developing innovative solutions. However, these advantages were counterbalanced by concerns, including the risk of over-reliance, which could hinder critical thinking, mistrust in the accuracy and reliability of generated content, feelings of guilt or perceptions of academic dishonesty, and unfamiliarity with effective use. These findings emphasize the nuanced relationship students have with ChatGPT, recognizing its potential while remaining cautious about its limitations.

To address RQ3, this study emphasizes the importance of actionable strategies to harness ChatGPT's benefits while mitigating its challenges. Educators have a vital role in fostering critical thinking and guiding ethical AI use by integrating targeted training and curriculum design. Students should focus on developing skills to validate AI-generated outputs and adopt transparent practices to ensure responsible usage. Researchers can contribute by exploring the impact of ChatGPT across cultural and educational contexts, as well as collaborating with AI developers to enhance its transparency and reliability. Institutions, in turn, must establish clear policies and incorporate AI literacy programs to equip all stakeholders with the knowledge and tools necessary for effective and responsible engagement with ChatGPT.

In summary, while students are increasingly accepting ChatGPT as a learning tool, their attitudes reflect a balance of optimism and caution. By addressing the reported benefits and concerns through thoughtful implementation and policy-making, ChatGPT can become an integral and effective component of higher education, empowering students to learn more efficiently and creatively while fostering the critical skills essential for academic success.

Declarations

Availability of data and materials

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

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Appendix

Appendix A. Revised TAM questionnaire (with scales including Perceived Ease of Use, Perceived Usefulness, Attitude, Behavioral Intention, and Actual Use)

Survey Item	Question for students	Construct
Q1	ChatGPT is easy to use for completing my academic tasks.	Perceived Ease of Use
Q2	Using ChatGPT enhances my academic performance.	Perceived Usefulness
Q3	I enjoy using ChatGPT for my academic assignments.	Attitude Toward Use
Q4	I intend to use ChatGPT for my future academic work.	Behavioral Intention to Use
Q5	I frequently use ChatGPT to assist with my assignments.	Actual Use
Q6	Using ChatGPT makes my learning more creative and productive.	Actual Use
Q7	Learning how to use ChatGPT was simple and straightforward for me.	Perceived Ease of Use
Q8	ChatGPT helps me complete academic tasks more efficiently than traditional methods.	Perceived Usefulness
Q9	I believe using ChatGPT is a valuable addition to my learning tools.	Attitude Toward Use
Q10	I will continue using ChatGPT even after completing my current course.	Behavioral Intention to Use
Q11	I use ChatGPT regularly to seek assistance on specific academic problems.	Actual Use
Q12	ChatGPT encourages me to explore more creative solutions in my assignments.	Behavioral Intention to Use
Q13	I trust the responses generated by ChatGPT for academic purposes.	Perceived Usefulness
Q14	My peers encourage the use of ChatGPT for academic purposes.	Attitude towards use
Q15	Using ChatGPT has improved my critical thinking skills when solving academic problems.	Perceived Usefulness

References

Al-Mughairi, H., & Bhaskar, P. (2024). Exploring the factors affecting the adoption AI techniques in higher education: insights from teachers' perspectives on ChatGPT. *Journal of Research in Innovative Teaching & Learning*. https://doi.org/10.1108/JRIT-09-2023-0129

Almusaed, A., Almssad, A., Yitmen, I., & Homod, R. Z. (2023). Enhancing student engagement: Harnessing "AIED"'s power in hybrid education—A review analysis. *Education Sciences, 13*(7), 632. https://doi.org/10.3390/educsci13070632

Amin, M. A., Kim, Y. S., & Noh, M. (2024). Unveiling the drivers of ChatGPT utilization in higher education sectors: The direct role of perceived knowledge and the mediating role of trust in ChatGPT. *Education and Information Technologies*, 1-27. https://doi.org/10.1007/s10639-024-13095-y

Aylsworth, T., & Castro, C. (2024). Should I Use ChatGPT to write my papers?. *Philosophy & Technology, 37*(4), 117. https://doi.org/10.1007/s13347-024-00809-w

Bae, M., Wang, J., Xue, H., Chong, S. M., Kwon, O., & Ki, C. W. (2024). Does ChatGPT help or hinder education? Exploring its benefits, challenges, student guilt, and the need for educator training. *International Journal of Fashion Design, Technology and Education*, 1-16. https://doi.org/10.1080/17543266.2024.2430585

Bai, L., Liu, X., & Su, J. (2023). ChatGPT: The cognitive effects on learning and memory. *Brain-X, 1*(3), e30. https://doi.org/10.1002/brx2.30

Braun, V., & Clarke, V. (2021). *Thematic analysis: A practical guide*. SAGE Publications.

Chawla, U., Mohnot, R., & Singh, H. V. (2024). Unleashing the potential: An empirical study on student application of ChatGPT in education using serial mediation modeling. *Education and Information Technologies*, 1-35. https://doi.org/10.1007/s10639-024-12702-2

Chen, S. Y. (2023). Generative AI, learning and new literacies. *Journal of Educational Technology Development and Exchange, 16*(2), 1–19. https://doi.org/10.18785/jetde.1602.01

Cheng, M., Li, X., & Xu, J. (2022). Promoting Healthcare workers' adoption intention of Artificial-Intelligence-assisted diagnosis and treatment: The chain mediation of social influence and human–computer trust. *International Journal of Environmental Research and Public Health, 19*(20), 13311. https://doi.org/10.3390/ijerph192013311

Chiu, T. K., Xia, Q., Zhou, X., Chai, C. S., & Cheng, M. (2023). Systematic literature review on opportunities, challenges, and future research recommendations of artificial intelligence in education. *Computers and Education: Artificial Intelligence, 4,* 100118. https://doi.org/10.1016/j.caeai.2022.100118

Choudhury, A., & Shamszare, H. (2023). Investigating the impact of user trust on the adoption and use of ChatGPT:

Survey analysis. *Journal of Medical Internet Research, 25*, e47184. https://doi.org/10.2196/47184

Creswell, J. W., & Plano Clark, V. L. (2011). *Designing and conducting mixed methods research* (2nd ed.). Thousand Oaks, CA: Sage.

Dahri, N. A., Yahaya, N., & Al-Rahmi, W. M. (2024). Exploring the influence of ChatGPT on student academic success and career readiness. *Education and Information Technologies,* 1-45. https://doi.org/10.1007/s10639-024-13148-2

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly, 13*, 319–340. https://doi.org/10.2307/249008

Du, J., & Alm, A. (2024). The Impact of ChatGPT on English for Academic Purposes (EAP) students' language learning experience: A self-determination theory perspective. *Education Sciences, 14*(7), 726. https://doi.org/10.3390/educsci14070726

ElSayary, A. (2024). An investigation of teachers' perceptions of using ChatGPT as a supporting tool for teaching and learning in the digital era. *Journal of Computer Assisted Learning, 40*(3), 931-945. https://doi.org/10.1111/jcal.12926

Esmaeil, A. A. A., Dzulkifli, D. N. A. K., Maakip, I., Matanluk, O. O., & Marshall, S. (2023). Understanding student perception regarding the Use of ChatGPT in their argumentative writing: A qualitative Inquiry. *Jurnal Komunikasi: Malaysian Journal of Communication, 39*(4), 150–165. https://doi.org/10.17576/JKMJC-2023-3904-08

Farrokhnia, M., Banihashem, S. K., Noroozi, O., & Wals, A. (2023). A SWOT analysis of ChatGPT: Implications for educational practice and research. *Innovations in Education and Teaching International*, 1-15. https://doi.org/10.1080/14703297.2023.2195846

García-Peñalvo, F. J. (2023). The perception of Artificial Intelligence in educational contexts after the launch of ChatGPT: Disruption or panic? *Education in the Knowledge Society, 24*, 1–9. https://doi.org/10.14201/eks.31279

Gill, S. S., Xu, M., Patros, P., Wu, H., Kaur, R., Kaur, K., Fuller, S., Singh, M., Arora, P., & Parlikad, A. K. (2024). Transformative effects of ChatGPT on modern education: Emerging era of AI chatbots. *Internet of Things and Cyber-Physical Systems, 4,* 19–23. https://doi.org/10.1016/j.iotcps.2023.06.002

Granić, A., & Marangunić, N. (2019). Technology acceptance model in educational context: A systematic literature review. *British Journal of Educational Technology, 50*(5), 2572–2593. https://doi.org/10.1111/bjet.12864

Hair, Jr, J. F., Sarstedt, M., Matthews, L. M., & Ringle, C. M. (2016). Identifying and treating unobserved heterogeneity with FIMIX-PLS: Part I–method. *European Business Review, 28*(1), 63-76. https://doi.org/10.1108/EBR-09-2015-0094

Henseler, J., Ringle, C. M., & Sarstedt, M. (2015). A new criterion for assessing discriminant validity in variance-based structural equation modelling. *Journal of the Academy of Marketing Science, 43*, 115–135. https://doi.org/10.1007/s11747-014-0403-8

Howard, M. C., & Smith, M. B. (2023). Employee regret and disappointment: Creation of a scale and foundational application of the approach/avoidance framework. *Applied Psychology, 72*(2), 419–450. https://doi.org/10.1111/apps.12367

Hu, L. T., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling: A Multidisciplinary Journal, 6*(1), 1–55. https://doi.org/10.1080/10705519909540118

Iqbal, N., Ahmed, H., & Azhar, K. A. (2022). Exploring teachers' attitudes towards using ChatGPT. *Global Journal for Management and Administrative Sciences, 3*(4), 97-111. https://doi.org/10.46568/gjmas.v3i4.163

Jo, H. (2024). From concerns to benefits: A comprehensive study of ChatGPT usage in education. *International Journal of Educational Technology in Higher Education, 21*(1), 35. https://doi.org/10.1186/s41239-024-00471-4

Judijanto, L., Atsani, M. R., & Chadijah, S. (2024). Trends in the development of artificial intelligence-based technology in education. *International Journal of Teaching and Learning, 2*(6), 1722–1723. https://injotel.org/index.php/12/article/view/197

Kiryakova, G., & Angelova, N. (2023). ChatGPT—A challenging tool for the university professors in their teaching practice. *Education Sciences, 13*(10). https://doi.org/10.3390/educsci13101056

Kleebayoon, A., & Wiwanitkit, V. (2023). Artificial intelligence, chatbots, plagiarism and basic honesty: Comment. *Cellular and Molecular Bioengineering,* 1-2. https://doi.org/10.1007/s12195-023-00759-x

Kline, R. B. (2016). *Principles and practice of structural equation modeling* (4th ed.). Guilford Press.

Kline, R. B. (2023). *Principles and practice of structural equation modeling*. Guilford publications.

Kumar, P., & Anu. (2024). Evaluating ChatGPT adoption through the lens of the technology acceptance model: Perspectives from higher education. *International Journal of Technological Learning, Innovation and Development, 15*(4), 370-383. https://doi.org/10.1504/IJTLID.2024.140316

Kutty, S., Chugh, R., Perera, P., Neupane, A., Jha, M., Li, L., Gunathilake, W., & Perera, N. C. (2024). Generative AI in higher education: Perspectives of students, educators and administrators. *Journal of Applied Learning and Teaching, 7*(2), 47–60. https://doi.org/10.37074/jalt.2024.7.2.27

Li, N., & Zhang, L. (2024). Predicting Chinese language learners' ChatGPT acceptance in oral language practices: The role of learning motivation and willingness to communicate.

Journal of Technology & Chinese Language Teaching, 15(1). lizhanglauliang.pdf

Lin, M. P.-C., & Chang, D. (2020). Enhancing post-secondary writers' writing skills with a chatbot. *Journal of Educational Technology & Society, 23*(1), 78–92. http://index.j-ets.net/Published/23_1/ETS_23_1_06.pdf

Liu, G., & Ma, C. (2024). Measuring EFL learners' use of ChatGPT in informal digital learning of English based on the technology acceptance model. *Innovation in Language Learning and Teaching, 18*(2), 125-138. https://doi.org/10.1080/17501229.2023.2240316

Liu, G. L., & Y. Wang. (2024). Modeling EFL teachers' intention to integrate Informal Digital Learning of English (IDLE) into the classroom using the theory of planned behavior. *System, 120*, 103193. https://doi.org/10.1016/j.system.2023.103193

Lo, C. K. (2023). What is the impact of ChatGPT on education? A rapid review of the literature. *Education Sciences, 13*(4), 410. https://doi.org/10.3390/educsci13040410

Mariani, M. M., Machado, I., Magrelli, V., & Dwivedi, Y. K. (2023). Artificial intelligence in innovation research: A systematic review, conceptual framework, and future research directions. *Technovation, 122*, 102623. https://doi.org/10.1016/j.technovation.2022.102623

Mhlanga, D. (2023). *Open AI in education, the responsible and ethical use of ChatGPT towards lifelong learning*. SSRN. https://doi.org/10.2139/ssrn.4354422

Monib, W. K., Qazi, A., & Mahmud, M. M. (2024). Exploring learners' experiences and perceptions of ChatGPT as a learning tool in higher education. *Education and Information Technologies*, 1-23. https://doi.org/10.1007/s10639-024-13065-4

Morales-García, W. C., Sairitupa-Sanchez, L. Z., Morales-García, S. B., & Morales-García, M. (2024). Development and validation of a scale for dependence on artificial intelligence in university students. *Frontiers in Education, 9,* 1323898. https://doi.org/10.3389/feduc.2024.1323898

Mourtajji, L., & Arts-Chiss, N. (2024). Unleashing ChatGPT: Redefining technology acceptance and digital transformation in higher education. *Administrative Sciences, 14*(12), 325. https://doi.org/10.3390/admsci14120325

Mutammimah, H., Rejeki, S., Kustini, S., & Amelia, R. (2024). Understanding teachers' perspective toward ChatGPT acceptance in English language teaching. *International Journal of Technology in Education, 7*(2), 290-307. https://doi.org/10.46328/ijte.656

Ngo, T. T. A. (2023). The perception by university students of the use of ChatGPT in education. *International Journal of Emerging Technologies in Learning (Online), 18*(17), 4. https://doi.org/10.3991/ijet.v18i17.39019

Ooi, K. B., Tan, G. W. H., Al-Emran, M., Al-Sharafi, M. A., Capatina, A., Chakraborty, A., …, & Wong, L. W. (2023). The potential of generative artificial intelligence across disciplines: Perspectives and future directions. *Journal of Computer Information Systems,* 1-32. https://doi.org/10.1080/08874417.2023.2261010

Rasul, T., Nair, S., Kalendra, D., Robin, M., de Oliveira Santini, F., Ladeira, W. J., Sun, M., Day, I., Rather, R. A., & Heathcote, L. (2023). The role of ChatGPT in higher education: Benefits, challenges, and future research directions. *Journal of Applied Learning and Teaching, 6*(1), 41-56. https://doi.org/10.37074/jalt.2023.6.1.29

Romero-Rodríguez, J. M., Ramírez-Montoya, M. S., Buenestado Fernández, M., & Lara-Lara, F. (2023). Use of ChatGPT at university as a tool for complex thinking: Students' perceived usefulness. *Journal of New Approaches in Educational Research, 12*(2), 323-339. https://doi.org/10.7821/naer.2023.7.1458

Rudolph, J., Ismail, F., Tan, S., & Seah, P. (2025). Don't believe the hype. AI myths and the need for a critical approach in higher education. *Journal of Applied Learning and Teaching, 8*(1), 06-27. https://doi.org/10.37074/jalt.2025.8.1.1

Sarraf, S., Kar, A. K., & Janssen, M. (2023). How do system and user characteristics, along with anthropomorphism, impact cognitive absorption of chatbots – introducing SUCCAST through a mixed methods study. *Decision Support Systems, 178*(November 2023), 114132. https://doi.org/10.1016/j.dss.2023.114132

Shahzad, M. F., Xu, S., & Javed, I. (2024). ChatGPT awareness, acceptance, and adoption in higher education: The role of trust as a cornerstone. *International Journal of Educational Technology in Higher Education, 21*(1), 46. https://doi.org/10.1186/s41239-024-00478-x

Schiff, D. (2022). Education for AI, not AI for education: The role of education and ethics in national AI policy strategies. *International Journal of Artificial Intelligence in Education, 32*(3), 527–563. https://doi.org/10.1007/s40593-021-00270-2

Schumacker, R. E., & Lomax, R. G. (2016). *A beginner's guide to structural equation modeling* (4th ed.). Routledge. https://doi.org/10.4324/9781315749105

Shiri, A. (2023). ChatGPT and academic integrity. *Information Matters, 3*(2), 1-5. https://doi.org/10.2139/ssrn.4360052

Singh, H., Tayarani-Najaran, M. H., & Yaqoob, M. (2023). Exploring computer science students' perception of ChatGPT in higher education: A descriptive and correlation study. *Education Sciences, 13*(9), 924. https://doi.org/10.3390/educsci13090924

Sok, S., & Heng, K. (2023). *ChatGPT for education and research: A review of benefits and risks*. https://doi.org/10.2139/ssrn.4378735

Strzelecki, A. (2023). To use or not to use ChatGPT in higher education? A study of students' acceptance and use of technology. *Interactive Learning Environments*, 1–14. https://

doi.org/10.1080/10494820.2023.2209881

Strzelecki, A., Cicha, K., Rizun, M., & Rutecka, P. (2024). Acceptance and use of ChatGPT in the academic community. *Education and Information Technologies,* 1-26. https://doi.org/10.1007/s10639-024-12765-1

Sullivan, M., Kelly, A., & McLaughlan, P. (2023). ChatGPT in higher education: Considerations for academic integrity and student learning. *Journal of Applied Learning and Teaching, 6*(1), 31-40. https://doi.org/10.37074/jalt.2023.6.1.17

Supriyanto, E., Setiawan, A., Chamsudin, A., Yuliana, I., & Wantoro, J. (2024). Exploring student perceptions and acceptance of ChatGPT in enhanced AI-assisted learning. In *2024 International Conference on Smart Computing, IoT and Machine Learning* (SIML) (pp. 291-296). IEEE. https://doi.org/10.1109/SIML61815.2024.10578145

Van Dis, E. A., Bollen, J., Zuidema, W., Van Rooij, R., & Bockting, C. L. (2023). ChatGPT: Five priorities for research. *Nature, 614*(7947), 224-226. https://doi.org/10.1038/d41586-023-00288-7

Venkatesh, V., & Davis, F. D. (2000). A theoretical extension of the Technology Acceptance Model: Four longitudinal field studies. *Management Science, 46*(2), 186–204. https://doi.org/10.1287/mnsc.46.2.186.11926

Wang, L., Chen, X., Wang, C., Xu, L., Shadiev, R., & Li, Y. (2024). ChatGPT's capabilities in providing feedback on undergraduate students' argumentation: A case study. *Thinking Skills and Creativity, 51*, 101440. https://doi.org/10.1016/j.tsc.2023.101440

Xiao, Y., & Zhi, Y. (2023). An exploratory study of EFL learners' use of ChatGPT for language learning tasks: Experience and perceptions. *Languages, 8*(3), Article 212. https://doi.org/10.3390/languages8030212

Xu, X., Wang, X., Zhang, Y., & Zheng, R. (2024). Applying ChatGPT to tackle the side effects of personal learning environments from learner and learning perspective: An interview of experts in higher education. *Plos One, 19*(1 January). https://doi.org/10.1371/journal.pone.0295646 Article e0295646.

Ye, J. H., Zhang, M., Nong, W., Wang, L., & Yang, X. (2024). The relationship between inert thinking and ChatGPT dependence: An I-PACE model perspective. *Education and Information Technologies*, 1-25. https://doi.org/10.1007/s10639-024-12966-8

Yilmaz, H., Maxutov, S., Baitekov, A., & Balta, N. (2023). Student attitudes towards Chat GPT: A Technology Acceptance Model survey. *International Educational Review, 1*(1), 57–83. https://doi.org/10.58693/ier.114

Zhang, K., & Aslan, A. B. (2021). AI technologies for education: Recent research & future directions. *Computers and Education: Artificial Intelligence, 2*, 100025. https://doi.org/10.1016/j.caeai.2021.100025