Generative Artificial Intelligence in Education: Evaluating Students' Self-Efficacy and Utilization in Their Homework

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Abstract: This study examines how generative artificial intelligence (GAI) tools, such as ChatGPT, Rytr, and Grammarly, affect education. It uses the Expectation-Confirmation Model (ECM) to analyze four main factors: Expectation Confirmation, Perceived Usefulness, Satisfaction, and Information Systems Continuance. Additionally, two more factors—Utilization and Self-Efficacy—were included. Researchers conducted a survey and analyzed the responses from 31 faculty members and administrative staff. The findings show that Expectation Confirmation and Perceived Usefulness significantly influence user satisfaction and the ongoing use of GAI tools. However, satisfaction alone does not guarantee long-term use of these technologies. Educators generally believe that GAI can improve learning outcomes, and most participants want to keep using these tools. The study notes its limitations, as it mainly focuses on quantitative data and a specific educational environment.

Keywords: Generative AI-Tools, Utilization, Academic Performance, Self-efficacy

1. Introduction

The use of generative artificial intelligence (GAI) in education has grown significantly, with various applications emerging (Ubah et al., 2022). Recent studies have explored AI's impact on online education (Dogan et al., 2023). A key development is generative AI models like ChatGPT, which can create educational materials such as text and images, often rivaling human output. This is changing teaching methods. While many in the educational community appreciate tools like Rtyr, Scispace, Quillbot, and Grammarly for their efficiency and ease of use, there are concerns about potential risks to academic integrity and learning practices (Ferhan et al., 2023). The introduction of AI chatbots like ChatGPT has shifted educational strategies, but some educators are worried (Romero et al., 2023). Despite this, ChatGPT's ability to analyze data and improve through machine learning provides valuable support for students. It's crucial to maintain academic integrity, especially when assessing student assignments. There is a growing need to study the effects of AI in academic settings, particularly for undergraduate students (Iffat et al., 2023). Research by Raneem Rashad Saqr et al. (2023) found that student traits, like self-efficacy, significantly affect e-learning goals. The expectation confirmation hypothesis suggests that users' initial expectations about AI systems influence their continued use (Yu et al., 2024). Thus, it's important to evaluate AI's effectiveness in enhancing student engagement and academic success. These are the formulated research questions:

1. How effective are GAI tools in improving students' academic performance?
2. How do educators determine the appropriate level of usage of GAI tools?
3. How do educators' acceptance of GAI influence their evaluation?

Findings from this study evaluated the students' academic performance and the continuance of GAI in their studies through the lens of ECM and the added constructs.

2. Related Literature

AI in education enhances self-directed learning, effectiveness, flexible learning, determination, automatic assessment, data analysis, and practical skills development. It adapts to user needs and promotes equitable access. AL-Tkhayneh et al. (2023) noted that AI improves learning experiences and manages large data efficiently but may struggle with behavior regulation and human connections. The discussion on the growing use of AI, particularly GAI tools, adds to the body of knowledge regarding technological advancements in educational settings. Benefits include individualized instruction and intelligent guidance (Rizvi, 2023). GAI tools like ChatGPT show promise, yet uncertainties remain regarding their impact on academic achievement (Gao et al., 2024). Users expect accurate, creative, and useful AI-generated content, influencing satisfaction and acceptance. The Expectation Confirmation Model (ECM) includes constructs like Perceived Usefulness and Satisfaction illustrated in Figure 1, which affect continuance intention (Majeed et al., 2018; Bhattacherjee, 2001). Venkatesh and Bala (2008) highlighted perceived usefulness as a key factor in user intention. Satisfaction significantly impacts students' intention to use GAI (Shukla, 2023), while self-efficacy reflects a student's confidence in task execution (Hazzam & Wilkins, 2023).

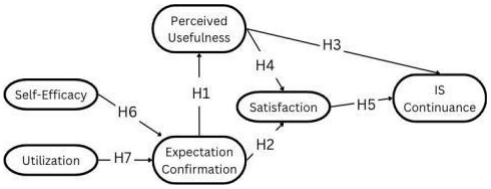

Figure 1. Theoretical Model of the Study

3. Research Methodology

This study employed a quantitative research design to retest the ECM model in a new context using fresh data. It focused on six constructs: Utilization, self-efficacy, expectation confirmation, perceived usefulness, satisfaction, and IS continuation, as operationalized in Table 1. Participants included faculty and staff from six colleges and one research office at TUP Manila, with thirty-one respondents completing surveys via Google Forms or printed questionnaires. Demographic data collected included optional name, department, college affiliation, and understanding of GAI. The survey was adapted from the original ECM and piloted with twenty respondents. Analysis was conducted using the Partial Least Squares (PLS) algorithm in SmartPLS4, ensuring the indicators accurately reflected the constructs. Validity and reliability, as shown in Table 2, indicated good internal consistency with Cronbach's Alpha and Composite Reliability (CR) values of 0.811 and 0.824, respectively, exceeding the 0.70 threshold. The Average Variance Extracted (AVE) score was 0.726, surpassing the minimum requirement of 0.50, confirming sufficient convergent validity.

Table 1. *Operationalization of Constructs*

Construct/Hypotheses	Operational Definition	Questions and References

Expectation Confirmation(EC) H1: EC has a positive effect on PU to use GAI H2: EC has a positive effect on S to use GAI	It refers to user's expectation and confirmation degree pre- and post-using IS.	[E1] GenAI resources will improve my students' academic performance. [E2] Students exceeded my expectations in their use of the AI technologies. [E3] When utilizing GenAI, students perform better overall than I had anticipated. Luo et al. (2017) and Mohd & Ab (2019)
Perceived Usefulness(PU) H3: PU has a positive effect on ISC to use GAI H4: PU has a positive effect S to use GAI	It refers to users' perceptions of the expected benefits of using the ASEAN biodiversity website	[PU1] The GenAI will help my students learn more effectively. [PU2] Students will do better in school with the help of the GenAI. [PU3] The GenAI will improve my students' learning outcomes. [PU4] I think GenAI are useful. Luo et al. (2017), Mohd & Ab (2019) and Baharum & Jaafar (2015)
Satisfaction(S) H5: S has a positive effect on ISC to use GAI	It is defined as a positive emotional state results from the utilization of the AI-tools	[S1]I am satisfied with the features of GenAI [S2]I am satisfied with the performance of the students while using GenAI in their coursework [S3]I am satisfied with the general effect of the AI-tools. Luo et al. (2017) and Mohd & Ab (2019)
Self-Efficacy(SE) H6: SE has a positive effect on EC to use GAI	It refers to person's belief in their abilities to manage series of action that required to achieve the desire type of performance.	[SE1] To what extent do students feel at ease using GenAI? [SE2] The level to which students can use GenAI to successfully complete the course work [SE3] Students' comprehension of utilizing GenAI ethically. Mohd and Ab (2019)
Utilization(U) H7: Utilization(U) has a positive effect on Expectation Confirmation(EC) to use GAI	It is defined as the behavior of employing GenAI in completing the task.	[U1] Using GenAI holistically in higher education [U2] Allowing GenAI during the whole course of study [U3] Embracing GenAI to provide direction or support. Mohd and Ab (2019)
IS Continue(ISC)	During the post-consumption stage to using IS, an individual psychologically ends up with intention to continue/discontinue.	[ISC1]I will continue to encourage the students to use AI-tools [ISC2]I personally impressed by the AI-tools [ISC3]I decided to continue the AI-tools for the academic purposes. Luo et al. (2017) & Mohd and Ab (2019)

4. Results

4.1 Structural Model Testing

Using the Partial Least Squares algorithm in SmartPLS, we analyzed the relationships in our model. Table 3 shown the coefficients for H1, H2, H3, H4, and H6 are positive, indicating direct relationships. However, H5 (1.928) and H7 (1.29) are not statistically significant, with t-values below 2. The p-values for H1 (0.000), H2 (0.013), H3 (0.041), H4 (0.00), and H6 (0.00) are below 0.05, confirming significance at a 95% confidence level. In contrast, H5 (0.054) and H7 (0.197) lack sufficient evidence for a causal relationship. Expectation Confirmation (H2) and Perceived Usefulness (H4) positively influence user satisfaction with GAI technologies, while Self-efficacy (H6) also has a positive effect. Utilization (H7) and satisfaction (H5) do not significantly influence the continuation of the information system.

4.2 Discriminant Validity

The discriminant validity evaluates the extent to which the constructs inside the model are distinct from each other (Hair et al., 2019). The test scores of the Fornell-Larcker Criterion have been retrieved and are presented in Table 2. The bolded diagonal values reflect the square root of the Average Variance Extracted (AVE) for each build. The remaining numbers represent the correlations between the constructs. If the diagonal values are the highest in their corresponding column, it suggests that the notion demonstrates strong discriminant validity. Table 3 shows that the diagonal values have the highest values throughout all the constructs in the model, indicating the existence of discriminant validity.

Table 2. *Discriminant Validity - Fornell-Larcker Criterion*

	EC	ISC	PU	S	SE	U
EC	0.947					
ISC	0.807	0.969				
PU	0.782	0.894	0.893			
S	0.843	0.892	0.88	0.937		
SE	0.893	0.778	0.777	0.794	0.868	
U	0.734	0.768	0.782	0.804	0.726	0.89

Table 3. *Path coefficients and the results of the significance tests*

Hypotheses	*Construct*	*Standard deviation (STDEV)*	*T statistics (|O/STDEV|)*	*P values*	*Decision*
H1	*EC->PU*	*0.103*	*7.634*	*0*	*Supported*
H2	*EC->S*	*0.161*	*2.476*	*0.013*	*Supported*
H3	*PU->ISC*	*0.237*	*2.047*	*0.041*	*Supported*
H4	*PU->S*	*0.162*	*3.521*	*0*	*Supported*
H5	*S->ISC*	*0.241*	*1.928*	*0.054*	*Rejected*
H6	*SE->EC*	*0.132*	*5.77*	*0*	*Supported*
H7	*U->EC*	*0.14*	*1.29*	*0.197*	*Rejected*

5. Discussion

This study involved 31 faculty and staff members from the TUP Manila campus. The findings highlight the importance of how useful GAI solutions are perceived, as this perception

positively influences their use and increases enjoyment among students (Boubker, 2024). These insights are valuable for Higher Education Institutions (HEIs) to modernize teaching methods in today's digital age. Research indicates a direct link between GAI's ability to deliver quality output and students' perception of its usefulness, interest in using it, and satisfaction (Tian et al., 2024). Additionally, student satisfaction is crucial for their willingness to use GAI for research, which can enhance academic productivity and knowledge creation. GAI tools are often seen as transparent and user-friendly, appealing especially to students seeking quick solutions (Masa'deh et al., 2024). Educators should also consider the balance between leveraging AI for efficiency and ensuring that it does not undermine critical thinking and creativity among students. Wang et al. (2022) suggested ways to improve the effectiveness of AI in education, including boosting digital literacy for educators and learners, using AI to enhance teaching and learning methods, and fostering student creativity and academic performance. Many respondents had prior knowledge of GAI and planned to use these tools mainly for information retrieval and paraphrasing (Yusuf et al., 2024). Educators' acceptance of GAI tools significantly influences their evaluation methods and criteria. Furthermore, Gustilo et al. (2023) emphasized that using Algorithmically driven writing tools (ADWTs) in education requires careful consideration of ethical principles, promoting collaboration and empowerment among all involved, while prioritizing human intelligence over exclusive reliance on AI. When educators are open to integrating GAI into their teaching practices, they are more likely to adopt innovative assessment strategies that incorporate GAI outputs as part of the learning process. This acceptance can lead to a more holistic evaluation of student performance, considering not only traditional metrics but also the creative and analytical skills demonstrated through GAI-assisted projects.

6. Conclusion

Educators believe Generative AI (GAI) can enhance learning outcomes, with many eager to continue using these tools. Expectation Confirmation and Perceived Usefulness positively influence user satisfaction and the desire for further GAI use, with self-efficacy playing a significant role (Yusuf et al., 2024). However, satisfaction alone does not strongly endorse ongoing use, and utilization levels do not significantly impact expectation confirmation. A key factor for user happiness is the belief that AI can improve student performance, as positive experiences with AI contribute to overall contentment. Clarity and comprehensibility of GAI technologies enhance satisfaction, especially for those seeking quick solutions. Challenges such as student complacency and professional development concerns regarding GAI are noted (Yusuf et al., 2024). This study explores the interplay between students' self-efficacy and their engagement with GAI, highlighting the cycle of expectation, satisfaction, and continued use. Understanding how GAI affects student satisfaction and expectations is crucial for effective educational applications (Kumar et al., 2023). Comprehending teachers' perspectives on GAI in pedagogy is also essential to leverage its benefits (Kizilcec, 2023). To optimize GAI in education, targeted professional development and awareness campaigns are essential. Regular feedback mechanisms should assess satisfaction and inform improvements. Involving educators in selecting GAI tools can enhance engagement, while supporting students in building confidence with GAI is vital. Adoption must consider diverse student needs, and investment in research is needed to understand GAI's impact. Establishing ethical use guidelines focusing on equity and data privacy is also crucial for improved learning outcomes.

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