



RESEARCH PAPER

The Role of ChatGPT in Shifting Cognitive Approaches to Education in Sindh, Pakistan: Explaining a Theoretical TAM Framework

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ABSTRACT

This study aims to investigate the use of ChatGPT from learners' perspectives and its implications for academic practices in the education sector in Sindh, Pakistan. The study focuses on understanding the factors influencing whether the use of ChatGPT in education is meaningful or potentially promotes risk among learners across the educational sector in Sindh, Pakistan. In this context, the TAM model is employed as a research model to determine the learner's intention toward adopting ChatGPT in academia. A quantitative method with 39 respondents provided their initial responses for the reliability test. In our findings, all constructs exceed the reliability coefficient (α) 0.7, ranging from 0.812 to 0.892, respectively. The research recommendations emphasize that the effective adoption of the ChatGPT tool may reduce the deep learning process among learners, underscoring the need for a balanced integration of AI in pedagogical practices across educational sectors.

KEYWORDS GenAI Tools, Education sector, Thinking Process, Sindh Pakistan

Introduction

ChatGPT is a sophisticated language model developed by OpenAI that offers many new frontiers in changing education patterns. All the emerging possibilities concerning its application in teaching and learning are being vigorously explored (Egara & Mosimege, 2024). Students have been engaging with ChatGPT for the generation of ideas regarding essays, projects, and research papers (Zhang et al., 2023; Shah, 2024). ChatGPT can summarize complex topics and suggest different problem-solving strategies. It also helps students outline their research papers. As per those researchers (Elbanna & Armstrong, 2024), ChatGPT can help provide math assistance to the students but would require step-by-step guidance and different modalities for using them while learning about STEM areas. ChatGPT has opened the most brilliant avenues for educational innovations by making learning more accessible, interactive, and personalized (Rasul et al., 2023). Over the years, ChatGPT has propelled and adapted its functions to the needs of an individual learner because this fast-paced era, including Pakistan, encourages active learning, exploration, and critical thinking. Several researchers (Mogavi et al., 2024; Shanto et al., 2024; Klyshbekova & Abbott, 2024; Shah et al., 2024), however, put across that the impact of ChatGPT on the cognitive approaches of the learners may not always tend towards the positive; they may, depending on the way ChatGPT is used, have a negative effect. Excess reliance on ChatGPT might result in the withdrawal of individual learners from content engagement and may eventually affect thinking retention in the learners and the possible depth of learning. Zhang et al.'s (2023) study reveals that the ease with which ChatGPT provides solutions might discourage learners from engaging with problems in their academic activities. When so, it restricts the learners from experimenting with different learning strategies, making mistakes, and learning from them. Another study by the researchers (Shah et al., 2024) stated that one of the revolutionary impacts of ChatGPT is a reduction in face-to-face engagement between teachers and learners. Such an interaction may restrict the ability of the teachers to offer support tailored to the needs essential for effective learning (Gill et al., 2024; Masoomi MHA, 2024). Thus, from the perspective of the impact of ChatGPT on learners, this research examined whether there is a perfect leveraging ChatGPT within

academic learning that promotes critical thinking and intellectual autonomy or encourages risk-taking reliance on ChatGPT-generated solutions in educational settings.

Literature Review

The literature review for this study is organized around two key pillars that constitute the framework for this research. The "TAM model" and the "Previous related studies". Therefore, this section focuses on applying the TAM model with its original predictors to determine the behavioural intention of learners towards adopting the ChatGPT tool in their academic learning and understand how these innovative technologies significantly impact learners' problem-solving skills in educational settings.

Technology Acceptance Model

The Technology Acceptance Model, or TAM, seeks to define how people accept and utilize new-age technologies; it was developed by Davis in 1989 (Davis et al., 1989). That has normally shown important relevance in educational environments (Shaengchart, 2023), which are necessary for predicting and understanding the adoption of technologies. To the researchers (Saif et al., 2024), this claim is more elaborated in TAM as having annotated acclaim to show why some digital tools are being accepted or avoided by people and learners. According to other researchers (Almogren et al., 2024), the TAM model focuses on how learners should regard educational technologies, which can be shaped into design features and interfaces that would synchronize well with their preferences and usability requirements to increase the level of adoption. Researchers (Lai et al., 2023; Shah et al., 2024) stated that TAM provides an actual-usage model by proposing behaviour intention to predict technology use directly. Therefore, they will integrate this tool into their academic routine after seeing it as more of a helpful tool that is also easy to use. Therefore, for this study, the research model adopted is the TAM model, giving the feedback loop to evaluate perception and attitude of behaviour toward educational technologies. Therefore, the feedback considers the productivity or distraction by the ChatGPT tool in cognitive processes in academic learning activities. TAM has three core elements regarding the adoption of ChatGPT. These definitions below will represent the TAM factor:

Perceive Usefulness (PU): is the degree to which users perceive technology will enhance their performance or productivity (Bhaskar et al., 2024). In the learner adoption of ChatGPT, PU could, therefore, refer to how learners perceive the tool's potential to facilitate their educational goals and learning activities, e.g. generating ideas and solving complex problems. Learners might find it a helpful tool to summarize long, complex readings or clarify confusing concepts (Almogren et al., 2024).

Perceived Ease of Use (PEOU): is the extent to which an individual believes that using a technology is free of effort (Lai et al., 2023). In the case of learners' adoption of ChatGPT, PEOU influences how they view the tool as user-friendly and easily navigable (that is, clear responses and intuitive interface), making these learners more likely to develop a positive intention toward regular usage (Kumar & Anu, 2024).

Behaviour Intention (BI): serves as the link between learners' perceptions of ChatGPT (its usefulness and ease of use) and their actual usage (Shaengchart, 2023). By addressing the factors that influence BI, a study can establish whether learners see ChatGPT as a helpful tool or if its use disturbs their cognitive capacity in the education sector (Saif et al., 2024).

Use of ChatGPT: In TAM, behavioural intention to actual use (BI) is a powerful predictor of actual usage. This means that if users want to use ChatGPT, they are more likely to do so.

The following considers the TAM model suggested in the hypothesis's relationship, and Figure 1 represents the research model.

H₁: Perceive Usefulness significantly impacts behaviour intention.

H₂: Perceive Ease of Use significantly impacts behaviour intention.

H₃: Behaviour Intention significantly impacts the use of ChatGPT.

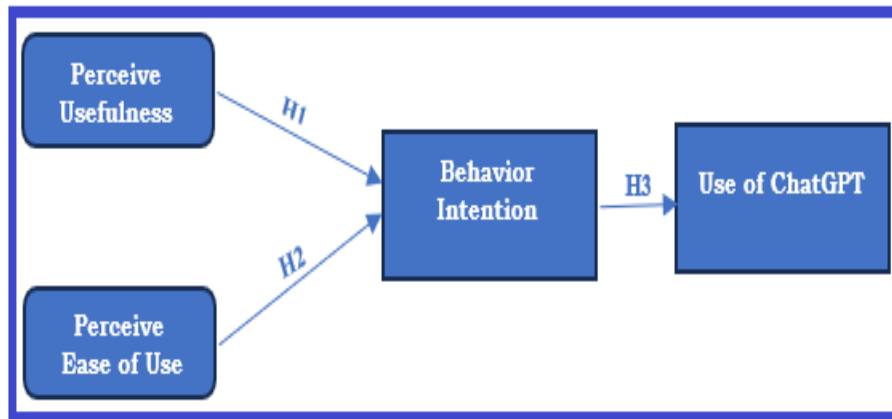


Figure 1. Research Model, Source (Davis et al., 1989)

Previous Related Studies

In a study by García et al. (2022), research in the USA emphasized that ChatGPT provides opportunities for improving critical thinking and creativity. However, certain aspects of ChatGPT use can disrupt cognitive development. As a result, overreliance on ChatGPT to generate ideas, solutions, or answers may reduce learners' efforts in critical thinking and problem-solving. Another researcher from India (Hassan et al., 2023), stated that when learners depend heavily on ChatGPT, this reliance might create a passive learning environment where learners become the consumers of knowledge rather than actively participate in its creation. UAE researchers, as Al-kfairy mentions, indicate that learners could read ChatGPT-generated writings and end up using them in their learning without understanding and reflecting on them. This can kill the opportunities for authentic learning and disrupt the development of original thoughts. Another researcher from Spain, Romero-Rodriguez et al. (2023), argued that while ChatGPT produces imaginative content, students' over-dependence on it might bar them from developing creative skills. Moreover, research in China (Sohn & Kwon, 2020) shows that metacognition is thinking about one's thinking processes. Because answers are available ready-made by ChatGPT, learners are likely to be less inclined toward self-reflection or evaluation of their knowledge.

By addressing these challenges, this study needs to investigate the intersection of ChatGPT in academic learning activities in the education sector of Sindh, Pakistan.

Material and Methods

The data-gathering team comprises learners from the education sector across Sindh, Pakistan. This study employed a quantitative method; a survey questionnaire was developed from previous research studies. A survey instrument consists of 23 items divided into two sections. The first part related to demographic information such as gender, age, department, and university of the respondent. Similarly, the second part associated the construct items (questions) aiming to evaluate the research model and suggested hypotheses to serve the research purpose. In this context, the significant predictors such as (PU, with five items), (PEOU, with five items); and the dependent variable (BI, with four

items) influence the use of ChatGPT (UG, with three items) is also a dependent variable to determine the intention of actual usage. A Web-based questionnaire was designed and distributed a link to education sectors across Sindh for collecting insights from targeted participants. The participants involved active learners who studied academic disciplines from well-reputed colleges and institutions in Metropolitan cities such as Karachi, Hyderabad, and Sukkur in Sindh, Pakistan. After collecting the data, IBM SPSS was used for statistical analysis due to its robust capabilities for analysing survey data and testing hypotheses (Huang et al., 2024). According to the researchers (Field, 2024), the IBMSPPSS is a foundational tool for statistical methods. It provides various features with formulations to split data from group to subgroup for descriptive statistics and reliability test analysis.

Result and Discussion

Descriptive Statistics

39 responses were received from learners who are actively engaged in their academic journey in the education sector across Sindh, Pakistan. The obtained replies were used to provide early findings about the validity of the data instruments using reliability test analysis.

In demographic analysis, most of the participants were male—30 (77.8%) and female—9 (21.6%). The age distribution indicated that 15 participants (38.8%) were between 19 and 22 years old, an equal number (38.8%) fell within the 23-26 age bracket, and 9 participants (24.4%) were aged between 14 and 18. Participants outside these age groups were not represented in the study.

Geographically, most of the learners recorded their initial responses in Karachi 20 (49.8%), followed by Hyderabad 26.8 (26.8%) and Sukkur 09 (24.4%). In terms of academic levels, the majority of learners were from O/A levels 35 (90.8%), whereas a smaller proportion, 4 (9.2%), were from Higher Secondary Schools (HSC); the rest of the academic levels did not participate. The detailed demographic distribution is summarized in Table 1, where (N) denotes the number of participants.

Table 1
Demographic Analysis (N=39)

Demographic Information	Frequency	Percentage (%)
Gender		
Male	30	77.8
Female	09	21.6
Age		
14-18	09	24.4
19-22	15	38.8
23-26	15	38.8
27+	--	--
Public/Private institutions in Sindh, Pakistan		
Karachi	20	49.8
Hyderabad	10	26.8
Sukkur	09	24.4
Academic Levels		
O/A Levels	35	90.8
HSC (Higher Secondary School)	04	9.2
Bachelor	--	--
Master	--	--

Reliability Analysis

In this research, which seeks to investigate a new area or phenomenon, the reliability measure ensures that data collection instruments yield consistent results over repeated tests or scenarios. In a study by researchers (George & Mallery, 2018; Shah et al.,

202), a reliability test could assess whether survey items are consistently measured across different participants or groups. Other researchers (Hair et al., 2013) asserted that without reliable instruments, any observed differences might be due to inconsistencies in measurement rather than actual variations in attributes. In this context, the researchers applied Cronbach's α test using the SPSS statistical tool to assess the consistency of items within each construct. Cronbach's α is considered reliable when its coefficient is higher or equal to 0.7 (Hair et al., 2013). The significance of the reliability of each construct exceeds 0.7, with alpha coefficients. Table 3 represents the reliability test results of each construct.

Table 2
Reliability Test Results (N=39)

Constructs	No. of Items	Cronbach's $\alpha \geq 0.7$
Perceived Usefulness (PU)	05	0.812
Perceive Ease of Use (PEOU)	05	0.875
Behaviour Intention (BI)	04	0.892
Use of ChatGPT (UG)	03	0.881

The 0.7 threshold of Cronbach's Alpha indicates that the items under the constructs measure the same underlying concept reliability. This is the standard most often adopted in behavioural intention research. The reliability coefficients obtained per construct were as follows: PU ($\alpha=0.812$), PEOU ($\alpha=0.875$), BI ($\alpha=0.892$), and UG ($\alpha=0.881$), with a range from 0.812 to 892 respectively. This shows that all the constructs are above the reliability coefficient alpha (α) of 0.7. Hence, the researchers would confidently say that their instruments are pretty reliable, further supporting the findings' credibility and replicability.

Conclusion

The recent introduction of ChatGPT for education shows a shift in transition to technological integration in learning, primarily involving the students in using such new innovative tools supplementing conventional learning approaches and raising concerns regarding the implications of AI technologies on their academic development. Hence, the study investigated the effects of emerging technology on higher-order thinking skills, such as critical analysis and idea synthesis, in first-stage learners in the Sindh education sector. In this regard, the Technology Acceptance Model (TAM) was utilized in designing the research model since it contains the key determinants with which learners' intentions to adopt and use ChatGPT can be studied in education sectors across Sindh, Pakistan. The reliability coefficients obtained for each construct were as follows: PU ($\alpha = 0.812$), PEOU ($\alpha = 0.875$), BI ($\alpha = 0.892$), and UG ($\alpha = 0.881$), ranging from 0.812 to 892, respectively. Hence, all of the constructs in this study exceeded a reliability coefficient alpha (α) of 0.7, and the authors confidently declare their measurement instruments as reliable and valid for further analysis. Thus, addressing these pivotal issues sets the ground for future research regarding the effective integration of ChatGPT into education while balancing the potential or pros benefit-generating risks. The research recommendations emphasize that the effective adoption of the ChatGPT tool may reduce the deep learning process among learners, underscoring the need for a balanced integration of AI in pedagogical practices across educational sectors in Pakistan.

Recommendations

The recommendation aims to ensure that while the ChatGPT can support education, it does not become a substitute for critical thinking and deep learning. The ongoing research to evaluate the long-term effects of ChatGPT and similar tools utilizing the learners to accomplish academic tasks in the education sector in Sindh, Pakistan. Consequently, this will help educational institutions adapt strategies to mitigate negative impacts.

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