Generative AI in Education: A Study of Undergraduate Students' Expectations of ChatGPT

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Abstract: This study investigated undergraduate students' perceptions and expectations regarding using ChatGPT, a generative AI model, in their educational process. Two questionnaires were employed: one based on the Technology Acceptance Model, measuring perceived usefulness and ease of use; and another, with questions suggested by ChatGPT and validated through factor analysis, exploring specific concerns. The findings revealed that while 74% of participants had used ChatGPT, with 77% of users rating it as effective or very effective, they emphasized the importance of maintaining human interaction and diverse information sources in educational settings. Students expressed enthusiasm for ChatGPT's potential to provide personalized support but also concerns about its reliability and ethical implications.

Keywords: generative artificial intelligence, ChatGPT, undergraduate students, student expectations, technology acceptance model (TAM).

Inteligência Artificial Generativa na Educação: Um Estudo sobre as Expectativas dos Estudantes de Graduação em relação ao ChatGPT

Resumo: Este estudo investigou as percepções e expectativas de estudantes de graduação sobre o uso do ChatGPT, um modelo de IA generativa, em seu processo educacional. Foram utilizados dois questionários: um baseado no Modelo de Aceitação de Tecnologia, medindo utilidade percebida e facilidade de uso; e outro, com questões sugeridas pelo ChatGPT e validadas por análise fatorial, explorando preocupações específicas. Os resultados mostraram que, embora 74% dos participantes já tivessem usado o ChatGPT, com 77% dos usuários classificando-o como eficaz ou muito eficaz, eles enfatizaram a importância de manter a interação humana e fontes diversas de informação nos ambientes educacionais. Os estudantes expressaram entusiasmo pelo potencial do ChatGPT em oferecer suporte personalizado, mas também preocupações quanto à confiabilidade e implicações éticas.

Palavras-chave: inteligência artificial generativa, ChatGPT, estudantes de graduação, expectativas dos estudantes, modelo de aceitação de tecnologia (TAM).

1. Introduction

The search for tools to enhance educational processes is continuous and evolving. Recent technological advancements have accelerated the development of Educational Technologies, which are defined as "the study and ethical practice of facilitating learning and improving performance through technological processes and resources" (JANUSZEWSKI; MOLENDA, 2008). These technologies have demonstrated significant benefits in education, including increased student motivation, enhanced memory retention, improved interactivity, and the promotion of collaborative learning and critical thinking (SEGOVIA; DE S. SOUZA, 2018; JIANG, 2023).

Artificial Intelligence (AI), particularly conversational agents like ChatGPT, has emerged as a central technology in education, offering personalized and interactive support for tutoring, assessment, and feedback (ZHOU et al., 2023; SILVESTRE et al., 2023). However, the adoption of AI chatbots in educational settings presents various complexities, as multiple factors influence students' perceptions and patterns of use. This study specifically investigates undergraduate students' expectations and attitudes toward ChatGPT in educational contexts.

This research employs the Technology Acceptance Model (TAM), a framework that explains technology adoption through two primary factors: perceived usefulness and ease of use (DAVIS, 1989). While TAM has been extensively applied across various technological contexts, research specifically examining chatbots in education remains limited. Our study makes three key contributions: it applies TAM to evaluate ChatGPT adoption, validates ChatGPT-generated questions through Confirmatory Factor Analysis (CFA), and provides comprehensive insights into students' expectations, attitudes, and satisfaction with ChatGPT in educational settings.

To achieve these objectives, we employed a mixed-methods approach combining quantitative and qualitative data collection techniques, providing a comprehensive framework for analyzing ChatGPT's role in educational settings.

2.   Related Work

Advancements in natural language processing (NLP) and generative AI, particularly the GPT models developed by OpenAI, have transformed information processing capabilities (TUFFERY, 2023; XIAO; ZHOU, 2020). ChatGPT has demonstrated exceptional performance in linguistic understanding and content generation, becoming particularly influential in NLP applications, especially within conversational contexts (BENGIO; DUCHARME; VINCENT, 2000; SILVESTRE et al., 2023). Current research on ChatGPT encompasses diverse applications, ranging from virtual assistance to sophisticated educational interactions (NAZIR; WANG, 2023).

Recent studies have extensively examined both the benefits and challenges of ChatGPT implementation. Nyaaba and Zhai (2024) emphasized the necessity of institutional support for ensuring ethical use of generative AI in teaching practices. While Baidoo-Anu and Ansah (2023) developed recommendations for safe implementation practices, Albayati (2024) investigated the factors that influence student acceptance of ChatGPT. Additional research by Niloy and colleagues (2024) highlighted the technology's time-saving capabilities, and Singh and Hiran (2022) provided insights into ChatGPT's potential role in educational administration.

Although previous studies have demonstrated ChatGPT's potential in educational settings, many lack robust empirical evidence and broader generalizability. Our study addresses these limitations by providing comprehensive, empirically-based insights into both ChatGPT's educational impact and patterns of student acceptance.

3.   Research Methods

3.1. Research Model and Procedures

This study investigated undergraduate students' perspectives, expectations, and concerns about using ChatGPT in their academic experiences through a mixed-methods approach. The quantitative component applied to the Technology Acceptance Model (TAM) (DAVIS, 1989) and included questions developed by ChatGPT. The qualitative component provided deeper insights through open-ended questions.

Data collection was conducted via an online self-administered questionnaire in August 2023, using convenience sampling from various courses. Participants were recruited through university departments, student organizations, and academic coordination offices. The invitation to participate was distributed via institutional email lists and academic communication channels, ensuring a diverse representation of undergraduate students.

Participation was voluntary and anonymous, with the questionnaire (in Portuguese) taking around 15 minutes to complete. Participants, aged 18 or older, were given an overview of the study's purpose and provided informed consent.

3.2. Survey Design

Before the first section, participants were informed that the study aimed to assess their perceptions, expectations, and acceptance of ChatGPT. After providing informed consent, they answered four demographic questions: age, gender, course, and place of study.

Academic Profile: The second section focused on identifying the participants' academic profile by asking about their course, learning style, and study preferences. These questions aimed to explore how students view ChatGPT as complementing their learning and their openness to integrating AI-powered resources.

The questions were as follows: How do you prefer to learn new information? (single-select multiple choice: visual, auditory, kinesthetic, mix), How do you study for exams? (multi-select multiple choice: flashcards, reading, practice problems, videos and online classes, annotations, other). Do you prefer to study alone or in a group? (single-select multiple choice: alone, group, depending on the subject, depending on the task, do not have a preference).

Knowledge about ChatGPT: In this section, a brief explanation of ChatGPT was provided, describing it as an AI program developed by OpenAI to interact with people, answer questions, and perform tasks. Four questions were asked to assess participants' familiarity and experience with the tool.

The questions were as follows: Have you heard of ChatGPT before? (single-select multiple choice: yes, no, I do not know), Have you used ChatGPT before? (single-select multiple choice: yes, no, I do not know), If you have used ChatGPT before, how would you rate its effectiveness? (Likert scale from 1 - not effective to 5 - very effective), How did you use ChatGPT? (multi-select multiple choice: revise specific concepts, write academic text, give ideas for projects, give feedback about my writing, practice skills in another language, search general information, translate text, create programming code, others).

Expectations Regarding ChatGPT: This section explored participants' expectations of ChatGPT improving their academic performance, with response options ranging from enhancing understanding of concepts to improving study organization. Participants were then asked how likely they were to use ChatGPT for their studies, rated on a Likert scale from 1 (not likely) to 5 (very likely). Finally, 12 questions from the Technology Acceptance Model (TAM) framework, based on Lewis (2019), were applied.

Technology Acceptance Model (TAM): The TAM framework examines factors influencing user adoption of new technologies (GUPTA; ABBAS; SRIVASTAVA, 2022). It focuses on two main constructs: perceived usefulness (PU) — the belief that the technology will improve performance — and perceived ease of use (PEOU) — the effort required to learn and use the technology (DAVIS, 1989). Higher PU and PEOU lead to a more positive attitude towards technology, increasing the intention to use it (AL-EMRAN; GRANIĆ, 2021). The TAM questions used in this study, with responses on a Likert scale from 1 (Extremely Unlikely) to 7 (Extremely Likely), are available at COMPLEMENTARY MATERIAL (2024).

The average score for each TAM construct (Perceived Usefulness and Perceived Ease of Use) was calculated for each participant. The TAM score reflects the overall attitude and intention of the participants towards using ChatGPT in their learning process.

It's worth noting that while both free (ChatGPT-3.5) and paid (ChatGPT-4.0) versions were available during the study period, the survey did not distinguish between these versions in participants' responses.

3.3. Generative AI in this Work

We utilized various generative AI technologies to improve the quality of our document:
- Text Enhancement: ChatGPT and Grammarly helped refine sentence structure, grammar, and overall clarity.
- Language Correction: Both tools were used to correct English language errors.
- Framework Recommendations: ChatGPT provided insights on suitable frameworks, such as TAM.
- Question Suggestions: ChatGPT assisted in formulating participant questions.

The generative AI tools used in this study demonstrated the potential of AI in academic research and opened new possibilities for educational applications. The questionnaire employed is available at COMPLEMENTARY MATERIAL (2022).

3.4. Statistical Analysis

For the statistical analysis, we used IBM SPSS packages and Microsoft Excel. We performed descriptive statistics to summarize and present key features of the dataset. We computed the following measures:
- Mean: The average response or expectation level.
- Median: The middle value in the dataset, mitigating the impact of outliers.
- Mode: The most frequently occurring responses.
- Standard Deviation: The degree of variation in responses.
- Range: The spread between the minimum and maximum values.

We also applied the confirmatory factor analysis (CFA) to validate the suggested questions by ChatGPT, following the same statistical procedure described in Paradeda and Santos (2022). We tested the reliability and validity of the data provided by the ChatGPT questions using Cronbach's alpha, composite reliability (CR), and average variance extracted (AVE). We considered the data to have satisfactory reliability if the value of Cronbach's alpha was higher than 0.45, as mentioned in Taber (2018). We accepted the value of CR as higher than 0.7 and AVE as higher than 0.5, following Taber (2018) and Bacon, Sauer, and Young (1995).

We measured the strength and direction of association between the questions suggested by ChatGPT using Goodman and Kruskal's gamma and Spearman rank-order correlation coefficient. We applied these tests because the data did not deviate from a normal distribution according to the Shapiro-Wilk normality test ($p = 0.000$). We referred to the values suggested by Cohen (2013) and Dancey and Reidy (2007) to identify the acceptable strength of association, i.e., r-value ranging from 0.10 to 0.39 is a weak association, from 0.4 to 0.69 is a moderate association, from 0.7 to 0.99 is a strong association, and r equal to 1 is a perfect association.

We also investigated the linear association among the questions posed by ChatGPT using Spearman's rho correlation coefficient. We extended this correlation analysis to include

other variables, such as participants' preferred learning methods, their inclination towards individual or group study, their assessment of ChatGPT's effectiveness, the likelihood of incorporating this tool into their studies, and their perceptions of its usefulness and ease of use.

A significance level of p = 0.05 was chosen for all statistical tests, indicating a 95% confidence level. This threshold was applied to determine the statistical significance of the results.

3.5. Ethical Considerations

We followed ethical guidelines for human research, obtaining informed consent from all participants and protecting their anonymity, data privacy, and confidentiality. Participation was voluntary, and participants could withdraw from the study without consequences.

4. Results

4.1. Demographic Data

Our sample consisted of 100 volunteers with an average age of approximately 24 years (*Median = 22, Mode = 21, SD = 6.64, Range = 35*). Most participants were female (*55, 55%, Median = 21, Mode = 21, AVG = 23.935, SD = 6.44, Range = 25*), with 45 males (*45%, AVG=24.53, Median=22, Mode=20, SD=6.93, Range = 34*).

4.2. Validity test of questions suggested by ChatGPT

We conducted the CFA to validate the questions created by ChatGPT. The factor loadings ranged from *0.478* to *0.883*. All the factor loading values exceeded the suggested minimum threshold of *0.4* for individual loadings (TABACHNICK; FIDELL, 2021). The overall reliability measured by Cronbach's alpha was *0.811*, indicating good reliability. Moreover, the CR value of *0.943* and the AVE value of *0.704* indicated excellent reliability and validity, respectively.

We also calculated Goodman and Kruskal's gamma and Spearman rank-order correlation coefficient to measure the strength and direction of association between the questions suggested by ChatGPT. We found three comparisons had moderate associations (*0.301* to *0.699*), and four had strong associations (*0.7* to *1*). All associations were statistically significant (*p = .000*). See Complementary Material (COMPLEMENTARY MATERIAL, 2022) for more details.

4.3. Participants' Academic Profile

Most participants preferred learning in a mixed style, combining visual, auditory, and kinesthetic resources (72 participants). The second most popular learning style was visual (15), followed by kinesthetic (7) and auditory (6). When studying for exams, most participants preferred reading (93), followed by annotations (69), video/online classes (64), practice problems (51), and flashcards (23). Regarding study preferences, 43 participants preferred studying alone, while others depended on the subject (24), the task (15), or had no preference (8). Only 9 participants preferred group study, and 1 alternated between group and individual study.

4.4. Participants' Knowledge regarding ChatGPT

Out of 100 participants, 94 had heard of ChatGPT before, five had not, and one was unsure. Among those who had heard of ChatGPT, 74 had used it before, 25 had not, and one was unsure. We also asked the participants who had used ChatGPT before to rate its effectiveness on a scale of 1 (not at all effective) to 5 (very effective). The results were as follows: 20 participants rated ChatGPT as very effective (5); 37 participants rated ChatGPT as effective (4); 10 participants rated ChatGPT as neither effective nor ineffective (3); 5 participants rated ChatGPT as not very effective (2); 2 participants rated ChatGPT as not at all effective (1).

From the options given to the participants who used ChatGPT, it is possible to observe in Figure 1 that most of them pointed out that ChatGPT was used to search for general information (55), followed by revising specific concepts (40) and giving ideas for projects (39).
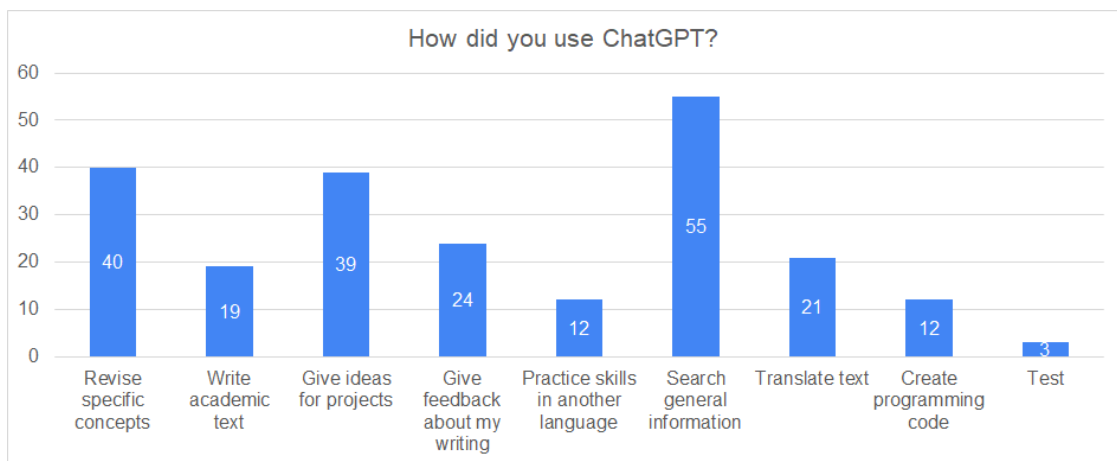

Figure 1. Participants' answers of how they used ChatGPT.

4.5. Participants' Expectations

In the first question to measure the participant's expectations regarding the ChatGPT, as can be seen in Figure 2, most of the participants pointed out that they expect the tool to increase their understanding of concepts (55), followed by helping to write better academic papers (41) and to learn faster and more efficiently (35).
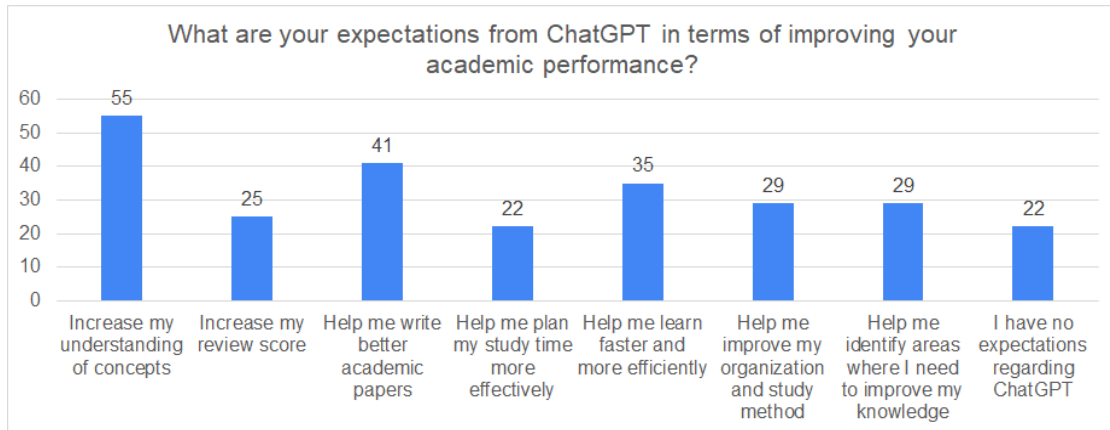
Figure 2. Expectations of ChatGPT to improve participant academic performance.

In an open question about other expectations of ChatGPT improving their academic performance, some participants mentioned the following: "I will not use this tool", "From conversations with other people, I realize that it is very useful for studying, but it depends on each person's use, just like any internet tool. After my only experience, I was sure it is effective, but it will depend on how it is used.", "I THINK it doesn't help much at all but rather hinders in some aspects", and finally, "Allow me to get feedback on reports before handing them over to professors."

Regarding the question of how likely the participants are to use ChatGPT for their studies (Behavioral Intention), 39 indicated they probably will use it, 24 indicated they are very likely to use it, 18 were neutral, ten unlikely, and nine very unlikely.

4.6. TAM Questions

Participants were asked to rate their perceptions of the technology's usefulness (PU) and ease of use (PEOU) on a 7-point Likert scale. The average score for PU was 4.74, with a median of 4.83, a mode of 7, a standard deviation of 1.54, and a range of 6. The average score for PEOU was 5.10, with a median of 5.33, a mode of 4, a standard deviation of 1.39, and a range of 6.

4.7. ChatGPT Question Suggestions

The generative AI suggested seven questions to measure participants' perceptions of ChatGPT. The statistical analysis of these questions, including the average, standard deviation, median, mode, and range, can be found in the COMPLEMENTARY MATERIAL (2024).

We also calculated Spearman's rho correlation coefficient for each pair of questions suggested by ChatGPT to measure the strength and direction of the association between the participants' responses. The results, along with the correlation coefficients, are also available in the COMPLEMENTARY MATERIAL (2024).

Using Spearman's rho correlation, no significant correlation was found between "How do you prefer to learn new information?" and "Do you prefer to study alone or in a group?" with other variables. However, "How do you rate ChatGPT effectiveness?" showed significant positive correlations with "How likely are you to use ChatGPT for your studies?" (*.522*), PU (*.550*), PEU (*.546*), and ChatGPT questions (*.614*). Additionally, "How likely are you to use ChatGPT?" correlated significantly with PU (*.728*), PEU (*.606*), and ChatGPT questions (*.582*).

PU correlated with PEU (*.721*) and ChatGPT questions (*.758*), while PEU showed a positive correlation with ChatGPT questions (.*562*). All correlations were significant at *p < .01*.

4.8. Open Question

In the survey's final question, 28 participants shared their views on ChatGPT, revealing both advantages and disadvantages. On the positive side, ChatGPT was praised for facilitating repetitive tasks, aiding in finding specific information, and supporting brainstorming and research. It was also seen as an inevitable technological advancement that could provide valuable context for subjects under study, highlighting its potential benefits in educational settings.

However, participants also pointed out several concerns. They noted that ChatGPT tended to provide superficial and sometimes unfounded responses, making it unreliable for academic work, especially due to its production of invented references. Some feared that using ChatGPT could hinder learning, promote plagiarism, and even encourage laziness, potentially leading to a generation of less reflective students with weaker research and reading skills.

In terms of usage patterns, ChatGPT was frequently employed to organize ideas and complete repetitive tasks, with occasional use for creating study bases or understanding context. Trust levels varied, with participants expressing low confidence in its academic reliability but higher trust when it was used for simpler tasks, such as answering specific questions or providing a starting point for research. The general takeaway was that users should verify information from other sources, and while teachers could incorporate it as a learning tool, they should be aware of its limitations.

5. Discussion

Our sample of young adults reflects the target population of ChatGPT users in academic contexts, who are likely to adopt new technologies (GRANIĆ, 2022). Our study validates the questions generated by ChatGPT to measure users' expectations and attitudes toward ChatGPT in education using CFA and other metrics, demonstrating their potential for research applications. The internal consistency and convergent validity metrics further confirmed the reliability of the questions. However, more research with larger and more diverse samples is needed for generalizability.

Participants prefer a mixed-mode learning approach, using visual, auditory, and practical resources, as well as text-based and digital tools. These preferences are consistent with findings by Çeken and Taşkin (2022) and Timotheou et al. (2023). They also favor individual study environments, consistent with self-directed learning principles. These findings suggest that ChatGPT needs to adapt to different learning styles and preferences and complement rather than replace existing learning methods.

The responses show that participants are familiar with ChatGPT and perceive it as effective for various purposes, such as finding information, revising concepts, and generating ideas. They report benefits such as improved efficiency, enhanced writing skills, and increased motivation. However, they also express concerns about coherence, consistency, and ethical issues, including bias, misinformation, and plagiarism (AMARO et al., 2023).

Most participants have high expectations for ChatGPT's ability to improve understanding, writing, and learning, reflecting growing interest in language models for education (SABZALIEVA; VALENTINI, 2023). They also emphasized the importance of ethical usage in academic settings. Future research should focus on actual usage patterns and their effects on learning outcomes.

Participants scored highly on perceived usefulness and ease of use, consistent with the Technology Acceptance Model (TAM), though variations suggest that personal characteristics and external factors warrant further exploration. These insights can inform strategies to enhance ChatGPT's adoption in educational settings.

While participants recognized ChatGPT's role in supporting learning, they were skeptical of its ability to replace teachers or serve as a sole information source. Correlations showed positive perceptions of ChatGPT's educational potential, but concerns about academic value and reliability suggest the need for further research on ethical issues and effective use guidelines.

6.   Conclusion

This study explored undergraduate students' expectations of using ChatGPT in their learning, making several important contributions to the field. First, we successfully applied the Technology Acceptance Model to evaluate ChatGPT adoption in education, providing a framework for understanding student attitudes towards this new technology. Second, our study validated questions generated by AI for research purposes, demonstrating the potential of AI-assisted research design. Third, we provided comprehensive insights into students' expectations, attitudes, and satisfaction with ChatGPT in educational settings, filling a gap in the literature on AI in education.

Our findings, based on a questionnaire combining the Technology Acceptance Model and AI-generated questions validated by CFA, revealed both enthusiasm and concerns about AI in education. Students recognized the potential of ChatGPT for personalized assistance but expressed skepticism about its reliability and ethical implications. Notably, we found a high level of engagement with ChatGPT among participants, with the majority of users rating it as effective for their educational needs. This indicates a significant perceived utility of ChatGPT in academic contexts.

Several limitations should be considered when interpreting our findings. The small sample size and convenience sampling may limit the generalizability of results. Additionally, the reliance on self-reported data might introduce bias. Furthermore, our analysis did not distinguish between participants' experiences with the free (ChatGPT-3.5) and paid (ChatGPT-4.0) versions, which could affect their perceptions and expectations. This distinction warrants further exploration to better understand user experiences.

The timing of this research coincided with ChatGPT's increasing popularity and emergence as a novel tool in society, with ChatGPT-4.0 being released in March 2023. This context is relevant, as it shaped the perceptions and expectations of students toward AI in education.

As generative AI technologies evolve, future research should explore factors influencing students' intentions and behavior towards ChatGPT, its actual effects on learning performance, and AI's ethical and pedagogical implications in education. It would also be interesting to compare the various GPT-based tools currently available, providing a broader perspective on how these technologies influence education. Addressing this study's limitations through larger samples, objective usage measures, and longitudinal studies will further refine our understanding of ChatGPT's role and that of similar AI tools in education, ensuring their responsible and effective implementation.

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