



# An investigation of pre-service teachers' perceptions of generative artificial intelligence using an instrument based on expectancy-value theory and an evaluation of their learning anxiety

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## ABSTRACT

This study aimed to determine the extent and effects of pre-service teachers' (PSTs) knowledge of generative artificial intelligence (GenAI) techniques, and to identify their perceptions of the benefits and potential challenges of GenAI. It also sought to determine PSTs' anxiety over GenAI learning and the risk of job replacement. Students' perceptions of artificial intelligence were therefore gathered to help ascertain the changes necessary for integrating GenAI into their courses. To achieve these aims, a mixed methods approach was adopted. Thus, a survey (quantitative method) was conducted to discover the relationship between PSTs' knowledge of GenAI and the following variables: (1) willingness to use GenAI, (2) concerns regarding the use of GenAI, (3) anxiety about learning, and (4) anxiety about job replacement. A sample of 170 PSTs participated in this survey, with results indicating moderate knowledge of GenAI. Moreover, positive correlations were found between the participants' knowledge of GenAI and their willingness to use it, concern over its uses, and anxiety about learning and job replacement. Interviews (a qualitative method) were subsequently carried out with 10 survey participants to explore the potential benefits and challenges associated with using GenAI in learning, and to validate the survey results. GenAI technologies can provide users with instantly accessible feedback and suggestions for assignments. However, the interviewees mentioned a number of challenges, like a lack of training courses, presence of bias and discrimination in the data, and ignorance of the University's rules for GenAI use.

**Keywords:** generative artificial intelligence, expectancy-value theory, anxiety, pre-service teachers

## INTRODUCTION

Artificial intelligence (AI) is a technology that involves training machines to imitate human intelligence, in order to accomplish various tasks (McKinsey Consultant, 2023). Meanwhile, machine learning involves the development of intelligent systems that can 'learn' from data patterns without explicit human instructions or guidance (McKinsey Consultant, 2023). Generative artificial intelligence (GenAI) is a subset of machine learning algorithms that generate diverse new content (for example, essays, poems, images, presentations, and videos), in response to users' questions and prompts. Examples of these tools include ChatGPT and Bard (Chan & Hu, 2023). Therefore, these tools can perform any intellectual task that the human brain is capable of, such as creative writing and content generation (Chan, 2023).

This revolutionary new technology has already been used in many disciplines such as healthcare, where it has diagnosed diseases and produced treatment plans (Park et al., 2020). In finance, AI is used to analyze data and power chatbots for customer service provision (Pallathadka et al., 2023). In education, AI was first used as a teaching assistant. Thus, AI has been integrated into embedded computer systems, humanoid robots, and Web-based chatbots to provide individual support, reduce teachers' reviewing load, grade students' assignments and check for plagiarism (Chen et al., 2020; Crompton & Burke, 2023; Zhang et al., 2023). The application of AI in education includes personalized intelligent teaching, smart school face and speech recognition, and virtual labs (Chen et al., 2020). These uses have improved the quality of courses, according to Chen et al. (2020), as relevant content is delivered according to the curriculum and in response to learners' needs and abilities. The efficiency of courses has likewise been enhanced (Chen et al., 2020) since students' retention and achievement are consequently improved.

In this study, the relationship between pre-service teachers' (PSTs) knowledge and their anxiety over GenAI use (with regard to learning and job replacement) was explored to determine the relationship between the use of AI and the accompanying anxiety, motivation, and satisfaction. In the extant literature, increased use of AI tools is correlated with low anxiety, while uneasiness about using AI tools appears to increase AI anxiety (Almaiah et al., 2022). Nevertheless, little is currently known about PSTs (students at a college of education) in terms of their actual use of GenAI, willingness to use it in future, concerns about its use, learning anxiety, or anxiety about job replacement, specifically in the school of education at Imam Abdulrahman bin Faisal University. This is confirmed by Gamlem et al. (2025), who reported that few studies have examined the perceptions, experiences, and usage of GenAI by PSTs. Thus, it is crucial to examine PSTs' perceptions, due to their dual role (Nyaaba et al., 2024) as college students who are also practicing teachers on their program. Therefore, they use GenAI in their learning as well as in preparing their lesson plans and teaching practice. Consequently, investigating PSTs' perceptions of AI was expected to identify the changes required to integrate GenAI into courses, so that it could be used by both teachers and learners (Almaraz-López et al., 2023; Chan & Zhou, 2023).

As educational institutions begin to adopt GenAI technology, it is important to understand PSTs' current knowledge of it, its application, its potential benefits and challenges, their willingness to use it in future, and the factors affecting their decision to use it (Chan & Zhou, 2023). This is confirmed in findings by Akanzire et al. (2025), indicating how those who acknowledge that GenAI has supported their academic achievement and increased their engagement with teachers and peers are more likely to perceive it positively. Moreover, it is vital to examine and understand PSTs' perceptions of AI and identify the factors that bear upon its use (Zhang et al., 2023). This is so that PSTs can be prepared for AI use in education. Moreover, most of the research on perceptions of AI in teacher education has focused on in-service teachers, with only a few studies conducted on PSTs, as highlighted by Zhang et al. (2023). Ascertaining PSTs' existing knowledge of GenAI is important for determining their willingness to use it in their learning and to facilitate the incorporation of AI technologies into teachers' current courses (Almaraz-López et al., 2023; Zhang et al., 2023).

The results of this study are anticipated to be valuable for teachers and policymakers, particularly with regard to pre-service teaching programs (the current research context), helping those responsible to make informed decisions about the integration of GenAI technologies into higher education (Chan & Zhou, 2023; Zhang et al., 2023). This would encourage policymakers to provide sufficient training on using AI apps and increase prospective users' knowledge of the potential benefits, so that these apps can be employed confidently and responsibly (Almaraz-López et al., 2023; Zhang et al., 2023). This would equip PSTs to make informed decisions about the use of AI apps in their academic studies and future careers.

In this study, knowledge of GenAI technologies refers to PSTs' preconceptions that these technologies could limit their ability to handle complex tasks, as well as generating inaccurate or inappropriate output (Chan & Hu, 2023). Meanwhile, the willingness to use GenAI refers to PSTs' belief that they must learn how to use GenAI for their careers, as it would improve their digital competence, help save time and provide immediate and personalized feedback (Chan & Hu, 2023). In this study, 'willingness' is equivalent to the intention to use GenAI in future; 'concerns about GenAI technologies' refer to students' fears that using GenAI will undermine the value of their education, limit their opportunities to interact with others, and hinder the development of their teamwork, problem-solving, and leadership skills (Chan & Hu, 2023); 'learning anxiety' signifies the anxiety experienced by PSTs when learning AI techniques, understanding how they work, and

trying to keep pace with the updates (Wang & Wang, 2022), and 'anxiety about job replacement' refers to PSTs' fears that GenAI will make them dependent and lazy, cause them to lose some of their reasoning skills, and could even replace humans in their jobs (Wang & Wang, 2022). In the following sections, the relevant literature is reviewed, after which distinct parts of this paper are devoted to the methodology, data analysis, results, and discussion of this study.

## LITERATURE REVIEW

Numerous studies have found that GenAI apps can enhance students' learning experience (Chan & Hu, 2023; Wang et al., 2024). GenAI facilitates students' learning because they receive individual support, and it helps prepare them for real-life situations. In this section, studies that have investigated PSTs' perceptions of GenAI are reviewed, along with their concerns and the models used to examine the phenomenon.

### Generative Artificial Intelligence

AI has been defined by COMEST (2019) as the function of intelligent machines that can imitate and sometimes surpass human cognitive abilities, which would include sensing, verbal interaction, evaluating, decision-making, and even creativity. An advanced version of OpenAI's generative pretrained transformer (GPT) series has further developed the concept of AI to gain a better understanding of the user's context and generate innovative output (Korzynski et al., 2023). Meanwhile, GenAI represents a technology that relies on massive datasets, collected and analyzed to produce new content such as text, images, videos, or other media in response to user input (Lecocq et al., 2024). Likewise, Ofem and Chukwujama (2024) define GenAI as a type of machine-learning model, using algorithms that can generate new data like text, images, audio-, or video content based on patterns and models learned from training data. These models adopt deep learning approaches, like variational autoencoders, generative adversarial networks, and large language models, in order to create output that is realistic and novel (Zhang & Aslan, 2021). ChatGPT is one of the most significant of these tools, transforming the way in which organizations operate, communicate, and innovate (Korzynski et al., 2023).

### Pre-Service Teachers' Perceptions of Generative Artificial Intelligence

Few studies have examined students' perceptions, especially PSTs' perceptions, of GenAI, as confirmed by Bonsu and Baffour-Koduah (2023), Wang et al. (2023), and Gamlem et al. (2025). In particular, Gamlem et al. (2025) examined PSTs' perceptions, experiences, and usage of GenAI, using a mixed methods approach involving a survey and interviews. They found that the sampled PSTs were aware of GenAI and had used AI tools but none of them considered themselves experts. They especially appreciated GenAI's practical benefits for planning lessons and exploring resources, but they were concerned about its trustworthiness and implications for human-centered education. In the interviews conducted in Gamlem et al.'s (2025) study, clearer insights were gained into the differences between experienced and novice users of GenAI. The experienced users were able to give a clear explanation of how and why they perceived GenAI as a valuable learning tool. In contrast, the novice users had a more unclear and generalized view of it, acknowledging its promising future but not specifying its future applications.

In the same vein, Nyaaba et al. (2024) explored PSTs' perceptions of GenAI as a 'learning buddy' and teaching assistant, determining their attitudes to it through a survey. The research sample consisted of 167 PSTs, who responded to the survey online. The mean (M) score of the attitude factors (teaching, learning, ethics, and advocacy) revealed a positive attitude to GenAI. This is justified as GenAI enhancing PSTs' knowledge, access to learning and teaching resources, the assessment strategies developed, and lesson planning. In particular, GenAI played a crucial role in providing the PSTs with practical examples to explain theoretical concepts, while enhancing their reflective practices, consequently promoting their professional development. Thus, the PSTs had less need for assistance from colleagues in their learning and teaching practices. Conversely, the PSTs expressed various concerns over GenAI in relation to its accuracy and trustworthiness.

Similarly, Wang et al. (2024) explored the factors and mechanisms influencing PSTs' intentions to integrate GenAI into their teaching practices. Based on the unified theory of acceptance and use of technology (UTAUT)

Model, an online survey was developed and completed by 606 PSTs, finding that GenAI anxiety, social influence, and performance expectancy significantly predicted the PSTs' behavioral intention to use GenAI as a teaching aid. However, effort expectancy and facilitating conditions did not show a statistically significant relationship with this behavioral intention.

Moreover, Söğüt (2024) examined the rationale for English Language PSTs using GenAI to develop their writing skills. A sample of 28 PSTs participated in the above-mentioned qualitative study, which aimed to gain detailed data from the participants. The sample reported many benefits of using GenAI, like support for overcoming their writing blocks and receiving immediate personalized feedback on their writing. It was mentioned that GenAI helped them organize their writing and generated different resources to gather information. However, various concerns were expressed by the sampled PSTs, mainly relating to the hindrance of critical thinking and creativity by GenAI. It was also highlighted that the technology could generate misleading information and falsified references. Moreover, there was the risk of students using GenAI as a shortcut to producing answers, instead of conducting extensive research. It emerged that many of the PSTs were frustrated with plagiarism, cheating, and misuse of GenAI by their students. Consequently, it was feared that GenAI could suppress students' opportunities to practice their writing.

More recently, Zhuang and Zhang (2025) investigated the long-term impact of integrating AI into pre-service Mathematics teachers. The teachers' perceptions of using GenAI tools, namely ChatGPT, was examined when developing their questioning strategies. The study examined the changes over a semester in four key areas: perceived usefulness, perceived ease of use, self-efficacy, and behavioral intention. The research tools consisted of written reflections, two surveys, and an interview. The study found increased familiarity and improved prompt-writing proficiency, together with more positive views of using GenAI. The results highlighted the importance of sustained engagement with GenAI tools, which would offer structured guidance and formative feedback. Conversely, Putri and Nafihima (2025) carried out a survey to investigate PSTs' dependency on GenAI and their perceptions of its effects. The study found that although most PSTs were uncertain about their dependency on GenAI, a large number admitted its benefits in terms of saving time and providing them with personalized feedback. However, concerns were raised over its impact on social interaction, teamwork, critical thinking, and leadership skills.

In the same vein, Zhang et al. (2023) performed a study to explore the factors determining PSTs' intentions to utilize AI applications, wherein a sample of 452 participants (325 female, 127 male) participated in an online survey based on the technology acceptance model (TAM). It was found in the above study that perceived usefulness' and perceived ease of use were the most significant factors affecting the PSTs' intentions to use AI technology. This could relate to individuals' belief in the ease and convenience of this technology, which they considered to have developed their performance and helped them achieve their goals. Nevertheless, numerous concerns were also expressed, like the anxiety experienced by PSTs over using GenAI, which could directly affect their intention to use these apps (Zhang et al., 2023).

In contrast, Bonsu and Baffour-Koduah (2023) conducted mixed methods research to explore university students' perceptions and intentions to use GenAI in higher education. The sample was drawn from different departments, such as education, humanities, legal studies, and agriculture. Thus, a sample of 107 students participated in an online survey based on TAM. However, no statistical relationship was found between the students' perceptions and their intention to use ChatGPT. In contrast, interviews with 10 of the participants revealed that they had positive perceptions of ChatGPT because it was convenient, accurate, and generated good results. Thus, the contradiction in the quantitative results was justified by the interview findings.

Overall, the studies reviewed indicate that PSTs tend to have positive perceptions of using AI apps in learning, as they improved their skills and academic performance. Conversely, they lacked knowledge of the definition, benefits, limitations, and practical application of GenAI.

### **Examining Students' Perceptions of Generative Artificial Intelligence Using Different Models**

In the literature, various frameworks such as TAM and UTAUT have been used to explore PSTs' perceptions of AI. For example, Bonsu and Baffour-Koduah (2023) and Zhang et al. (2023) used TAM, as reviewed earlier. Conversely, UTAUT has been applied by other researchers to explore students' perceptions, such as Wang et

al. (2024), whose study was also reviewed in the previous sub-section. Other studies have examined this topic from the angle of expectancy-value theory (EVT), which is introduced in the next sub-section.

### *The expectancy-value theory*

EVT is a cognitive motivational theory that links an individual's motivation to pursue a particular goal with their expectation of achieving it, and the value they assign to the goal (Vansteenkiste et al., 2005). This theory is a framework for understanding and predicting important outcomes such as achievement-related choices and behavior (Ranellucci et al., 2020). It suggests that expectations of success and subjective task values can predict these important outcomes (Ranellucci et al., 2020). Expectancy of success refers to an individual's beliefs about how well they will perform a forthcoming task. Meanwhile, task value is comprised of four main parts:

- (1) attainment value, referring to the extent to which an individual can perform well in a task,
- (2) intrinsic value, referring to how much an individual enjoys engaging with a particular task,
- (3) utility value, referring to an individual's perception of a task's usefulness for their future plans, and
- (4) cost, referring to the perceived negatives of engaging with a task (Ranellucci et al., 2020).

More recently, Chan and Zhou (2023) based students' perceptions of GenAI (gathered in a survey) on the EVT to examine the correlation between the intention to use GenAI, and knowledge, perceived value, and cost of GenAI. The above authors justified the use of EVT on the basis of an individual's choice to participate in an activity or task being affected by his or her expectations of success (expectancy) and the perceived value of the activity (value). Expectancy refers to a person's confidence in their ability to achieve success in a task, while value includes factors such as attainment value, intrinsic value, utility value, and cost.

The early version of EVT incorporated,

- (1) students' belief in their ability,
- (2) students' expectancy of success in a particular task, and
- (3) four task values (i.e., intrinsic, utility, attainment, and cost) (Eccles et al., 1983).

A more recent version of EVT indicates expectancy of success as more predictive of performance, and value beliefs as more predictive of achievement-related choice and effort (Trautwein et al., 2012). However, in the Trautwein et al. (2012) model, expectancy and value positively predicted performance and their interaction had a stronger impact on performance.

Meanwhile, Chan and Zhou (2023) confirmed that EVT focuses on the factors that affect students' motivation and decision-making processes in relation to their choices, aims, and performance. Part of the current research aim was to confirm this finding. Students' decisions to achieve their learning goals are determined by their expectancy of success, and their values by the outcomes of that success (Howley & Rosé, 2018). Meanwhile, other models, like UTAUT and TAM, are concerned with technology acceptance and adoption. Moreover, it has been proven that raising perceived expectancy and value for a tool will significantly predict a student's intention to use it (Howley & Rosé, 2018). Conversely, it has been found that anxiety over using an AI tool predicts low intention to use it (Howley & Rosé, 2018). Therefore, anxiety is explored in this present study to predict students' intentions to use GenAI in future. Conversely, TAM was not used in this study to examine students' perceptions and acceptance of AI, since Zhang et al. (2023) reported that TAM does not measure students' anxiety accurately.

Multiple factors appear to affect students' acceptance and perceptions of GenAI, including the good and accurate results achieved by AI, the ease of use and convenience of the technology, and the development in users' performance. Moreover, students' expectations of success and the perceived value of using GenAI were also found to be crucial factors.

In the present study, expectancy of success refers to an individual's knowledge of GenAI in terms of how well they will perform forthcoming tasks. However, in the present study, the focus on task value is limited to measuring utility value, as evaluated from PSTs' willingness to use GenAI, together with cost, which is measured according to the constructs of PSTs' concerns about GenAI, anxiety about learning, and anxiety about job replacement.

## Significance of the Study

From the above review of the literature, it is clear that few researchers have measured PSTs' perceptions of using GenAI in their studies or their intention to use it in future, as indicated previously. Unlike the majority of studies in the literature, the students' perceptions of using GenAI were measured in this study using a scale based on EVT rather than TAM (Bonsu & Baffour-Koduah, 2023; Zhang et al., 2023). Moreover, EVT has not hitherto been used to explore PSTs' perceptions of GenAI. EVT focuses on the factors affecting students' motivation and decision-making processes in relation to their choices, aims, and performance (Chan & Zhou, 2023; Trautwein et al., 2012), which are included in the present study aims. EVT was applied in this study to determine students' intention to use GenAI in their future careers. This was based on their decision to engage in activities influenced by their expectation of success and perceptions of task value. In the current study, expectancy of success was measured by examining individuals' knowledge of GenAI in terms of how well they will perform forthcoming tasks. Meanwhile, utility value was measured according to PSTs' willingness to use GenAI, and cost was measured through the constructs of PSTs' concerns about GenAI, anxiety about learning, and anxiety about job replacement. As indicated previously, there is a dearth of studies that have examined PSTs' perceptions of using GenAI, their willingness to use it, and their anxiety about this technology, especially in the school of education at Imam Abdulrahman bin Faisal University. Consequently, this study aimed to answer the following research questions:

1. How familiar are PSTs with GenAI technologies?
2. What are the potential benefits and challenges associated with using GenAI in learning, as perceived by PSTs?
3. Is there a correlation between PSTs' knowledge of GenAI and their willingness to use it?
4. Is there a correlation between PSTs' knowledge of GenAI and their concerns about using it?
5. Is there a correlation between PSTs' knowledge of GenAI and their anxiety about learning?
6. Is there a correlation between PSTs' knowledge of GenAI and their anxiety about job replacement?

## METHODOLOGY

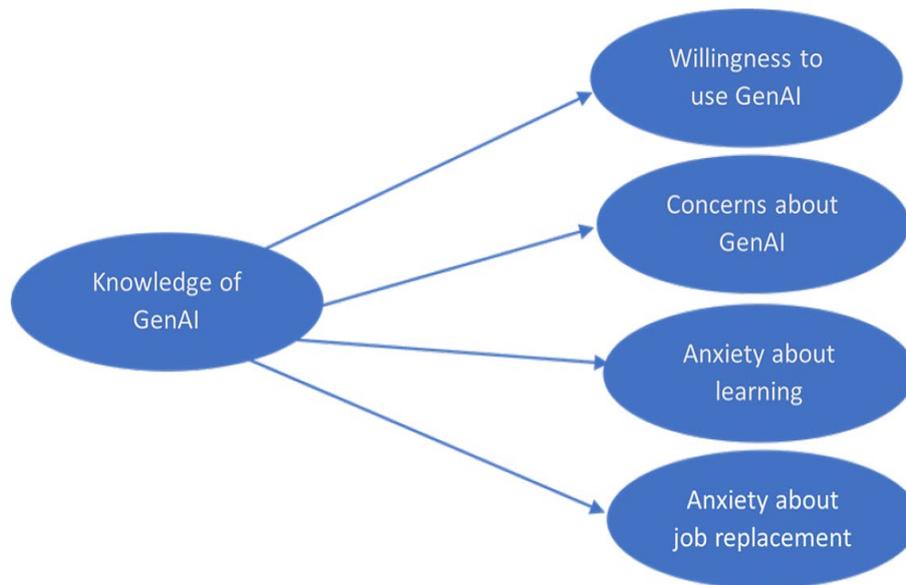
### Research Design

A mixed methods approach was adopted in this study, within a sequential explanatory design. To recruit the participants, a convenience sampling approach was applied, resulting in a sample of 170 PSTs, all registered as pre-teachers in the college of education at Imam Abdulrahman bin Faisal University. The research design first involved collecting quantitative data, followed by qualitative data to obtain in-depth information. The analysis as a whole was subsequently interpreted (Creswell et al., 2003). This study sought to ascertain whether there was a correlation between PSTs' knowledge of GenAI and their concerns, willingness to use GenAI, and anxiety about learning (see [Figure 1](#)). Thus, quantitative non-experimental correlational research was conducted.

A survey method was used to collect the quantitative data, with the PSTs completing the self-reported survey anonymously. The first part of the survey consisted of a consent form, which introduced the study aims to the participants and assured them of the confidentiality of their data, and their right to withdraw from the study at any time. The second section related to the research constructs, measured using a five-point Likert scale. The constructs covered in the survey comprised: the PSTs' knowledge of GenAI technologies, their willingness to use GenAI technologies, their concerns about GenAI technologies, their anxiety about learning, and their anxiety about job replacement.

In contrast, to collect the qualitative data, individual semi-structured interviews were conducted with 10 volunteers from the survey sample. These interviews were carried out to explore the benefits and challenges of using GenAI, as well as to validate the questionnaire results and gather more details about the PSTs' use and perceptions of GenAI in learning. The responses were analyzed and then coded to capture the main themes. The participants were requested to express their perspectives in response to the following questions:

1. Why do you think GenAI technologies are beneficial for you?



**Figure 1.** Correlations between constructs in the current study (Prepared by the authors)

2. Have you faced any challenges while using GenAI technologies? Please elaborate.
3. What is your opinion of the survey results?

### The Participants

The participants were all Saudi female PSTs studying in the college of education at Imam Abdulrahman bin Faisal University, specifically on its kindergarten program. At the time of conducting this research, the participants were in their second year of the program.

### The Research Instrument

The survey instrument used in this study was adapted from two scales (Chan & Hu, 2023; Wang & Wang, 2022). Chan and Hu's (2023) scale was employed to explore the PSTs' perceptions of GenAI technologies, with an emphasis on their willingness to engage, potential benefits and concerns, and their understanding of this technology. The instrument comprised three main constructs: knowledge of GenAI technologies (item 3-item 8), willingness to use GenAI technologies (item 9-item 16), and concerns about GenAI technologies (item 17-item 20). Conversely, Wang and Wang's (2022) scale measured the participants' fears and unease about using the technology. It contained four constructs: learning, job replacement, sociotechnical blindness, and AI configuration. The first two constructs were included in this study: anxiety about learning (item 21-item 26), and anxiety about job replacement (item 27-item 31), due to their connection to the current research topic. These constructs were deployed to measure the PSTs' levels of self-perceived anxiety about learning and job replacement. A statement was also added about dishonest behavior (Amani et al., 2023).

The whole scale was translated into Arabic, in a procedure that consisted of translating and adapting the meaning of the original scales, in order to make them easier for the target group to understand. The validity of the scale was verified using content validity and discriminating validity procedures, which determined whether the instruments' items were properly formulated and related to the associated constructs. This was accomplished by submitting the instrument in its preliminary form to six experts in the field of teaching methods and educational technology, so that the items' clarity and appropriateness for the related constructs could be assessed. The experts reported an agreement rate of between 80% and 100%.

To calculate the discriminant validity, a pilot study was conducted by distributing the survey to a group of 41 PSTs with the same characteristics as the sample. Discriminant validity was calculated by taking the total score for each dimension of the perceptions in the GenAI questionnaire (Appendix A) as a criterion for judging its validity, whereby the highest and lowest 27% of the scores were taken, and a t-test performed to compare the averages. The results are presented in Table 1. It is clear from Table 1 that there are statistically significant differences at the level of 0.01 between the averages of the upper quartile group and the averages of the

**Table 1.** Results of the t-test to study the differences between the means of the peripheral groups for the constructs

| Sub-dimensions                        | Highest 27% |      | Lowest 27% |      | t     | p-value |
|---------------------------------------|-------------|------|------------|------|-------|---------|
|                                       | M           | SD   | M          | SD   |       |         |
| Knowledge of GenAI technologies       | 28.27       | 1.95 | 16.18      | 1.25 | 17.29 | 0.000   |
| Willingness to use GenAI technologies | 39.09       | 0.94 | 28.36      | 2.80 | 12.03 | 0.000   |
| Concerns about GenAI technologies     | 17.18       | 1.94 | 7.00       | 1.61 | 13.39 | 0.000   |
| Anxiety about learning                | 23.36       | 4.57 | 11.18      | 2.04 | 8.08  | 0.000   |
| Anxiety about job replacement         | 28.55       | 1.37 | 14.00      | 3.69 | 12.26 | 0.000   |

**Table 2.** Correlation between each Item and the total score of its sub-questionnaire

| Knowledge of GenAI technologies |        | Willingness to use GenAI technologies |        | Concerns about GenAI technologies |        | Anxiety about learning |        | Anxiety about job replacement |        |
|---------------------------------|--------|---------------------------------------|--------|-----------------------------------|--------|------------------------|--------|-------------------------------|--------|
| Item                            | R      | Item                                  | R      | Item                              | R      | Item                   | R      | Item                          | R      |
| 3                               | .720** | 9                                     | .628** | 17                                | .734** | 21                     | .844** | 27                            | .860** |
| 4                               | .822** | 10                                    | .724** | 18                                | .846** | 22                     | .875** | 28                            | .834** |
| 5                               | .701** | 11                                    | .688** | 19                                | .838** | 23                     | .841** | 29                            | .733** |
| 6                               | .751** | 12                                    | .737** | 20                                | .688** | 24                     | .846** | 30                            | .863** |
| 7                               | .744** | 13                                    | .736** |                                   |        | 25                     | .878** | 31                            | .784** |
| 8                               | .750** | 14                                    | .627** |                                   |        | 26                     | .655** | 32                            | .668** |
|                                 |        | 15                                    | .662** |                                   |        |                        |        |                               |        |
|                                 |        | 16                                    | .520** |                                   |        |                        |        |                               |        |

Note. \*\*0.01 level

**Table 3.** Reliability of the perceptions gathered in the GenAI questionnaire

| Sub-scales                            | Cronbach's alpha | Split-half |
|---------------------------------------|------------------|------------|
| Knowledge of GenAI technologies       | .832             | .841       |
| Willingness to use GenAI technologies | .812             | .825       |
| Concerns about GenAI technologies     | .776             | .808       |
| Anxiety about learning                | .898             | .895       |
| Anxiety about job replacement         | .880             | .845       |

lower quartile group in all dimensions of the perceptions explored in the GenAI questionnaire, thereby indicating the questionnaire's discriminatory validity.

Furthermore, the reliability of the instrument constructs was evaluated. First, the instrument was found to have a high degree of internal consistency, as confirmed by calculating the correlation coefficients between the score for each item and the total score of the dimension to which it belonged (see [Table 2](#)).

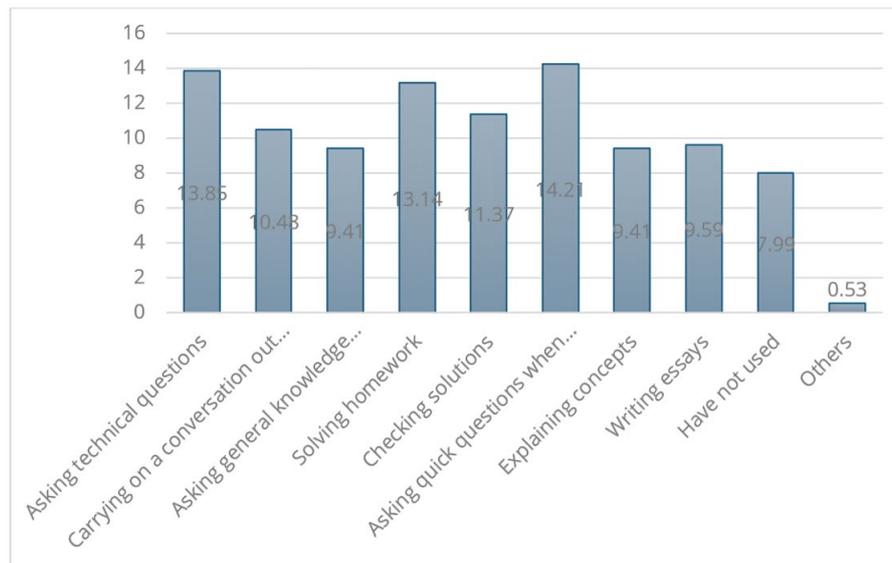
[Table 2](#) shows that all the correlation coefficients were significant at the level 0.01, indicating the questionnaire's high internal consistency.

Secondly, Cronbach's alpha and split-half correlation were applied to compute the reliability of the questionnaire. Split-half reliability was calculated after the scale was divided into two equivalent parts. The Cronbach's alpha and split-half values may be seen in [Table 3](#). The Cronbach's alpha values ranged between 0.889 and 0.776, and the split-half values ranged between 0.895 and 0.808, indicating acceptable values (Lewis-Beck et al., 2003).

## ANALYSIS

In order to analyze the quantitative data and answer the research questions, the M, standard deviation (SD), and Pearson's correlation coefficient were calculated. Meanwhile, to analyze the interview data, the data was coded and thematic analysis performed. Thematic analysis was carried out following Braun and Clarke's (2006) six phases:

- (1) reading the data to familiarize oneself with it and noting down initial thoughts,
- (2) coding interesting thoughts and generating initial codes for all the data,
- (3) collating the codes to search for themes describing these codes,
- (4) reviewing the themes to ensure their relevance to the coded extracts,



**Figure 2.** PSTs' uses of GenAI (Prepared by the authors)

- (5) defining and naming the themes, and
- (6) producing a report and selecting vivid extracts as examples in the report.

The responses were therefore analyzed by the researchers and coded by capturing the main themes. The interviews were subsequently coded by an independent researcher. To estimate the degree of agreement between the raters, inter-rater reliability was assessed using Cohen's kappa statistics. The Kappa value was 0.75, indicating a substantial level of agreement (Landis & Koch, 1977).

## RESULTS

### Quantitative Results

To answer the first research question, which was aimed at assessing the PSTs' level of knowledge of GenAI technologies, the M and SD were calculated. The level of PSTs' knowledge of GenAI technologies was found to be moderate ( $M = 3.13$ ,  $SD = 1.06$ ). Around 40% of the participants self-assessed as 'moderately familiar' with GenAI technologies, whereas 22% of the participants assessed themselves as 'very familiar', and 12% of the participants assessed themselves as 'absolutely familiar' in this regard. However, 20% of the participants self-assessed as 'slightly familiar', and 6% evaluated themselves as 'not familiar' with GenAI technologies.

To gather more details on the participants' knowledge of GenAI, they were asked about the ways in which they had used it. The highest ranked response to the questionnaire item about the most common use of GenAI was 'asking quick questions when stuck on a problem', which was selected by 14% of the participants. The second most common use of GenAI was indicated as 'asking technical questions', selected by 13.8% of the participants, and the third most common use of GenAI was indicated as 'solving homework', according to 13.1% of the participants. **Figure 2** shows the percentages for responses to the item: 'what ways have you used ChatGPT?'

In response to item 3, which attempted to assess the relationship between the PSTs' knowledge of GenAI and their willingness to use it, Pearson's correlation coefficient was calculated. The resulting value suggested a significant positive low relationship at the level of 0.05 between the two variables:  $r(168) = .163$ ,  $p = 0.03$ .

In response to item 4, which assessed the relationship between PSTs' knowledge of GenAI and their accompanying concerns, Pearson's correlation coefficient was likewise calculated. The relationship between these two variables was found to be a significant positive low relationship at the level of 0.05:  $r(168) = .220$ ,  $p = 0.004$ .

In addition, for item 5 and item 6, which were aimed at evaluating the relationship between PSTs' knowledge of GenAI and their anxiety about learning and job replacement, Pearson's correlation coefficient

**Table 4.** Correlation coefficient between knowledge of GenAI and PSTs' anxiety about learning

|                               |                         | Knowledge of GenAI |
|-------------------------------|-------------------------|--------------------|
| Anxiety about learning        | Pearson's correlation   | .252**             |
|                               | Significance (2-tailed) | 0.001              |
|                               | N                       | 170                |
| Anxiety about job replacement | Pearson's correlation   | .190*              |
|                               | Significance (2-tailed) | 0.013              |
|                               | N                       | 170                |

Note. \*\*Correlation is significant at the 0.05 level

values were calculated (see [Table 4](#)). [Table 4](#) illustrates a statistically significant positive relationship between PSTs' knowledge of GenAI and their anxiety about learning. Moreover, there is a statistically significant positive relationship between PSTs' knowledge of GenAI and their anxiety about job replacement.

### Qualitative Results

Interviews were carried out with 10 PSTs who participated in the survey. The aim of these interviews was to explore the potential benefits and challenges associated with learning to use GenAI, as perceived by the PSTs, and to gain in-depth information about their views of the survey results. An analysis of the interviewees' responses revealed three dominant themes: the benefits of GenAI technologies for PSTs, the challenges posed to PSTs by these technologies, and the PSTs' concerns. The participants were requested to express their perspectives of the benefits that GenAI technologies held for them, as well as the related challenges and concerns. The interviewees responded to the first interview question, regarding the benefits of GenAI technologies, by highlighting that GenAI can provide them with instantly accessible feedback and suggestions for their assignments. One PST stated:

GenAI can help me, save my time, and give me new insights and perspectives while I do the assignments.

Another interviewee mentioned that this technology could help improve the quality of her assignments and make her writing more appealing to the reader. Additionally, one interviewee described GenAI technologies as assisting her in her everyday life, as well as in her professional tasks.

In contrast, while responding to the second interview question about the challenges faced when using GenAI, most of the PSTs declared that they had not received any training in its use. Therefore, they had not been introduced to suitable technologies that could help them in their learning. Moreover, four of the participants reported that in the University, there were even warnings disseminated about the consequences of learning technologies being used incorrectly. One interviewee stated:

We get warnings without anything having previously raised our awareness, whether in the college manuals or on social media accounts.

Three of the interviewees also mentioned challenges related to the accuracy, relevance, and adequacy of information generated by GenAI technologies, with one specifying:

When I am using a GenAI application, I am sometimes concerned if the data I get is incorrect or outdated.

A further challenge was highlighted by two of the interviewees, namely, that there was sometimes bias and discrimination in the data provided by GenAI technologies. This was a matter of concern for them, with one stating:

If I am seeking information about something in GenAI, I always have a concern that the AI will give me information that might be 100% biased.

Moreover, six of the interviewees were unsure about the benefits of using such technology, as they feared it might hinder their interpersonal skills and their ability to perform complex tasks involving teamwork development, problem-solving, and leadership. Furthermore, seven interviewees indicated that their

awareness of the limitations of this technology caused them anxiety when learning how to use AI products to enhance their skills. Meanwhile, all the interviewees expressed worries over the possibility of GenAI technologies replacing humans.

The third interview question was designed to gain more details about the survey findings. First, half of the interviewees mentioned that they were unfamiliar with GenAI technologies, and they had not been introduced to them either at school or in university. These PSTs emphasized that their teachers had never explained the use of these technologies to them or asked them to explore GenAI for themselves. Moreover, these technologies have not been introduced into the curriculum. However, the remaining interviewees indicated that they were familiar with AI applications, having used them to generate ideas or complete presentations. After asking this question, the interviewer went on to explain the underlying concept of GenAI technologies to all the interviewees, whereupon they affirmed that they would be willing to use these technologies in future, irrespective of their concerns about GenAI possibly affecting their thinking and problem-solving skills or limiting their interaction with teachers and peers. However, most of the interviewees were anxious about learning how to use the new GenAI technologies, as there are no training courses available, even on YouTube. Thus, it is not easy to find simple explanations of how to use GenAI in learning. Lastly, five of the interviewees declared that their limited knowledge of GenAI made them anxious that GenAI could replace humans in the workplace.

## DISCUSSION

The results of this study answer the first research question, which sought to identify PSTs' familiarity with GenAI technologies. The PSTs' familiarity with GenAI technologies was found to be moderate in this study, as confirmed by the results of survey item 2, wherein around 60% of the participants self-assessed as 'Moderately familiar' with GenAI technologies. To better understand this quantitative result, more details were gathered from the interview participants, with five of the 10 interviewees declaring that they had limited familiarity with GenAI technologies. They justified this as not having been introduced to these technologies on their university courses or even in secondary school. Their teachers had not explained these technologies to them or asked them to explore GenAI. Besides, these technologies were not even part of their curriculum. The students' familiarity with and knowledge of GenAI were essential to their perceptions of its use, as EVT assumes a correlation between the intention to use GenAI and knowledge, perceived value, and cost of GenAI (Chan & Zhou, 2023). This finding echoes Gamlem et al.'s (2025) finding that novice users were unclear about the benefits of AI, expressing a generalized view that AI held future promise, although they failed to specify any of its potential applications.

To answer the second research question, which was aimed at identifying the potential benefits and challenges associated with GenAI use in learning, as perceived by the PSTs, the interview results revealed many benefits of its use. For example, the PSTs stated that they gained insights into how to complete their assignments and received immediate feedback at any time and on any day of the week, with suggestions for assignments or for improving their learning outcomes. These results are supported by Chan and Zhou (2023), Bonsu and Baffour-Koduah (2023), Gamlem et al. (2025), Putri and Nafihima (2025), and Zhuang and Zhang (2025). Therefore, GenAI can enhance PSTs' learning outcomes and academic performance by giving them immediate personalized feedback and accurate responses to their questions. Conversely, the PSTs sometimes faced challenges with the accuracy, relevance, and adequacy of information generated by GenAI technologies, as found by Bonsu and Baffour-Koduah (2023) and Putri and Nafihima (2025). These challenges can be explained as the PSTs having limited training opportunities on how to specify the questions that they put to GenAI.

Overall, this present study found a significant positive low relationship between PSTs' knowledge of GenAI and their willingness to use it, which answered the third research question. Hence, the participants' knowledge of GenAI technologies related to their willingness to use GenAI in their teaching, learning practices, and future careers, but only to a limited extent. This can be justified as the PSTs having limited knowledge, due to GenAI use not being part of any of their courses. Instead, their willingness to use GenAI may have stemmed from their personal practice, trials, or discussion with peers and family members. Nevertheless, the participants tended to be unaware that GenAI can likewise exhibit biases and unfairness in its output. This

was confirmed by Zhang et al. (2023), who found that PSTs were aware of AI's impact, and willing to use it more in their learning, but their knowledge of it was limited by a lack of training opportunities. Conversely, Chan and Zhou (2023) found a strong positive correlation between the perceived value of AI and the intention to use it, because their research sample noted many advantages of using GenAI. Similarly, Gamlem et al. (2025) found that experienced users were able to offer a clear explanation of how and why they perceived GenAI to be a valuable learning tool, while novice users were less clear and more generalized in their views of AI's potential, without specifying its possible uses. This is also in contrast with Bonsu and Baffour-Koduah (2023), who found no statistical relationship between PSTs' perceptions and their intention to use ChatGPT.

The results of this study answered the fourth research question, indicating a significant positive relationship between the PSTs' knowledge of GenAI and their concerns about its use. This reveals that their knowledge related to their concerns about GenAI, albeit to a limited extent. The PSTs were aware that GenAI could help develop their ability to handle complex tasks, but they were also aware that it could generate inaccurate, inappropriate, and insensitive output that might contain bias (Haensch et al., 2023; Nyaaba et al., 2024). Thus, the participants identified that the quality of their work might be negatively affected. Such concerns were especially expressed by the interviewees, who feared that using GenAI to complete their assignments would rob them of opportunities to interact with others while doing their coursework. Moreover, they were worried that it would hinder them from developing teamwork, problem-solving, and leadership skills. This is in line with Söğüt's (2024) findings that students' concerns and frustration ruled out their use of GenAI. Additionally, some of the interviewees were concerned that using GenAI would have a negative effect on their thinking skills (Söğüt, 2024).

Furthermore, this study found a positive relationship between PSTs' knowledge of GenAI and their anxiety over learning, which corresponded to the fifth research question. The PSTs' knowledge that GenAI could generate output that is factually inaccurate and inappropriate, exhibit biases and unfairness, and limit their ability to handle complex tasks, was associated with their anxiety about learning how to use AI products and keep up to date with the rapid advancement of AI. This result was confirmed by seven of the interviewees, who said that their awareness of the limitations of GenAI made them anxious about learning how to use AI products. Moreover, it echoed Zhang et al. (2023) and Almaiah et al. (2022), who found that such anxiety is caused by uneasiness over using AI tools. Thus, PSTs are more capable of using AI tools when their anxiety is low (Almaiah et al., 2022). Moreover, it is aligned with EVT, which explains that an individual's choice to participate in an activity or task will be affected by their expectations of success (expectancy) in future.

Lastly, the results answered the sixth research question, finding a statistically significant positive relationship between the PSTs' knowledge of GenAI and their anxiety about job replacement. The PSTs' knowledge of GenAI was associated with their anxiety over GenAI possibly making them dependent, lazier, less able to reason, and vulnerable to being replaced by a machine. All the interviewees demonstrated anxiety over the prospect of GenAI perhaps replacing humans. This was confirmed by the fact that personal beliefs are an essential precondition for behavioral intentions, with AI anxiety being median to behavioral intention (Wang & Wang, 2022).

In an analysis of these research findings based on EVT, it was deduced that the PSTs' willingness to use GenAI in their future careers was limited, since their expectation of success and perceived value of the activity were low. This was due to their poor knowledge of GenAI and lack of familiarity with the technology, which also justified their anxiety about job replacement.

## **CONCLUSION, LIMITATIONS, AND IMPLICATIONS**

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New technologies, such as those fueled by GenAI, offer a new learning experience for PSTs. These GenAI technologies can facilitate PSTs' academic development, but PSTs also need to be aware of the associated benefits and challenges. This study investigated PSTs' familiarity with GenAI technologies and assessed the correlation between their knowledge of these technologies and the following variables:

- (1) willingness to use GenAI,
- (2) concerns about GenAI,
- (3) anxiety about learning, and

(4) anxiety about job replacement.

The main findings of this study may be summarized as follows:

- (1) the PSTs' possessed a moderate level of knowledge of GenAI technologies,
- (2) there was a positive correlation between the PSTs' knowledge of GenAI technologies and their willingness to use them in their learning,
- (3) there was a positive correlation between the PSTs' knowledge of GenAI technologies and their concerns about using them in their learning, and
- (4) there was a positive correlation between the PSTs' knowledge of GenAI technologies, and their anxiety about learning how to use them and the possibility of job replacement.

Nevertheless, there are a number of limitations in this study. First, the participants were all recruited from a single department at just one college. Therefore, they were likely to have a similar background in using AI apps. Second, the research sample was relatively small, making it difficult to generalize the findings. Therefore, it is recommended to conduct further studies with a larger sample, including PSTs from different disciplines and colleges. Third, the focus in this study was to understand the perceptions of PSTs who are still at university. Fourth, there is potential bias since the data in the questionnaire results was self-reported by the sample. Thus, the perceptions of other individuals such as schoolteachers and college professors could be included in future studies.

In summary, this study presents a number of implications for various stakeholders. For example, in education, strategies should be established to control the use of GenAI, while at the same time enabling PSTs to develop their creativity and critical thinking skills, as confirmed by Putri and Naf'ihima (2025). Moreover, higher education institutions need to collaborate with AI companies to develop detective tools that will enable teachers to identify texts and assignments that are generated by AI tools. Finally, new policies and regulations must be drafted by all universities to regulate PSTs' usage of GenAI technologies, and to frame the ways in which PSTs' cheating behavior is brought to light through these technologies.

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**Ethics declaration:** This study was approved by the Institutional Review Board at Imam Abdulrahman bin Faisal University on 6 December 2023 with approval code IRB-2023-15-547. Informed consent was obtained from all participants prior to data collection. Participants were clearly informed about the purpose of the study, the voluntary nature of their participation, their right to withdraw at any time without penalty, and how their data would be used. To protect personal, all identifiable data were coded immediately after collection. Data were stored securely on password-protected, encrypted systems accessible only to the research team. No personal identifiers were included in the dataset used for analysis or reporting.

**Declaration of interest:** The authors declared no competing interest.

**Data availability:** Data generated or analyzed during this study are available from the authors on request.

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## APPENDIX A

**Table A1.** Students' perceptions of GenAI questionnaire

| The construct                                     | The statement  |
|---|--|
| Knowledge of GenAI technologies                   | 1. I understand GenAI technologies have limitations in their ability to handle complex tasks.  |
|   | 2. I understand GenAI technologies can generate output that is factually inaccurate.   |
|   | 3. I understand GenAI technologies can generate output that is out of context or inappropriate.  |
|   | 4. I understand GenAI technologies can exhibit biases and unfairness in their output.  |
|   | 5. I understand GenAI technologies may rely too heavily on statistics, which can limit their usefulness in certain contexts.                       |
|   | 6. I understand GenAI technologies have limited emotional intelligence and empathy, which can lead to output that is insensitive or inappropriate. |
| Willingness to use GenAI technologies             | 7. I envision integrating GenAI technologies into my teaching and learning practices in the future.  |
|   | 8. Students must learn how to use GenAI technologies well for their careers.   |
|   | 9. I believe GenAI technologies can improve my digital competence.   |
|   | 10. I believe GenAI technologies can help me save time.  |
|   | 11. I believe AI technologies (GenAI) can provide me with unique insights and perspectives that I may not have thought of myself.                  |
|   | 12. I think AI technologies (GenAI) can provide me with personalized and immediate feedback and suggestions for my assignments.                    |
| Concerns about GenAI technologies                 | 13. I think AI technologies (GenAI) are great tools as they are available 24/7.  |
|   | 14. I think AI technologies (GenAI) are great tools for student support services due to their anonymity.   |
|   | 15. Using GenAI technologies to complete assignments undermines the value of university education.   |
|   | 16. GenAI technologies will limit my opportunities to interact with others and socialize while completing coursework.                              |
|   | 17. GenAI technologies will hinder my development of generic or transferable skills such as teamwork, problem-solving, and leadership skills.      |
|   | 18. I can become over-reliant on generative AI technologies (GenAI).   |
| Anxiety about learning                            | 19. Learning to understand all of the special functions associated with an AI technique/product makes me anxious.                                  |
|   | 20. Learning to use AI techniques/products makes me anxious.   |
|   | 21. Learning how an AI technique/product works makes me anxious.   |
|   | 22. Learning to interact with an AI technique/product makes me anxious.  |
|   | 23. Reading an AI technique/product manual makes me anxious.   |
|   | 24. Being unable to keep up with the advances associated with AI techniques/products makes me anxious.   |
| Anxiety about job replacement (Wang & Wang, 2022) | 25. I am afraid that an AI technique/product may make us dependent.  |
|   | 26. I am afraid that an AI technique/product may make us even lazier.  |
|   | 27. I am afraid that an AI technique/product may replace humans.   |
|   | 28. I am afraid that if I begin to use AI techniques/products I will become dependent upon them and lose some of my reasoning skills.              |
|   | 29. I am afraid that AI techniques/products will replace someone's job.  |
|   | 30. GenAI technologies will enable dishonest academic behaviors.   |

