



THE IMPACT OF GENERATIVE AI TOOLS ON POSTGRADUATE STUDENTS' LEARNING EXPERIENCES: NEW INSIGHTS INTO USAGE PATTERNS

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ABSTRACT

Aim/Purpose This study aimed to investigate the impact of generative artificial intelligence (GenAI) tools on postgraduate students' learning experiences. It examined how these students utilize GenAI tools, identified the perceived benefits of their use, and uncovered the challenges students face in their learning experiences with these tools.

Background Recent advancements in GenAI, particularly tools like ChatGPT, are transforming how postgraduate students engage with learning, offering new opportunities for academic endeavors. However, understanding how students interact with these tools remains unclear, especially relating to their engagement with activities designed to use GenAI tools as learning assistants.

Methodology This study employed a qualitative case study research design, including 11 female postgraduate students enrolled in an educational technology master's program as the primary data collection method. The researchers only had access to female students because of the gender-segregated education system at most Saudi universities. The participants were interviewed after they engaged in a planned activity called Designing a Training Program with GPT Assistance (DTPGA) and unplanned activities involving other GenAI tools. DTPGA is an activity aimed at integrating innovations in training technologies by designing a training program with ChatGPT assistance. Eleven ChatGPT conversation logs

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and DTPGA activity answers were analyzed based on specific rubrics. The results of the DTPGA activity analysis support the thematic analysis of the interviews.

Contribution	The key contributions of this study include the design and implementation of a planned activity (DTPGA) to understand how students interact with GenAI tools as learning assistants. Evaluating students' work on a DTPGA activity offers educators a clear vision for assessing GenAI-assisted tasks. In terms of data collection and analysis, this study also offers a deep understanding of the participants' perspectives and actual usage. The study identified two distinct usage patterns of GenAI among students, each classified with its characteristics and implications, shedding light on the diverse ways these tools are integrated into students' learning experiences. Furthermore, the findings provide compelling evidence of the risks associated with misunderstandings that can emerge when students misuse GenAI tools.
Findings	Students employ GenAI tools to have intellectual conversations, broaden their perspectives, and prototype and test their solutions. The research identified two distinct GenAI usage patterns – the intellectual partner and the information browser – each characterized by unique traits. The first pattern, intellectual partner, uses ChatGPT as a cognitive partner and interacts with it as if it were a real person. This usage tends to be dialogic, collaborative, selectively researching, persistent, and feedback-oriented. The second pattern, information browser, utilizes ChatGPT primarily as a search engine for ideas with the following usage traits: transactional use and illusory understanding. Regarding the perceived benefits, the students appreciated the importance of GenAI tools in enhancing academic skills development, such as academic writing, translation, and self-directed learning. They also acknowledged GenAI tools' role in boosting productivity in routine tasks by optimizing efforts and enhancing efficiency. In creative tasks, they saved time, offered diverse and innovative ideas, and boosted motivation and confidence. However, the perceived drawbacks included concerns about ethical use, a lack of clear guidelines, limited capabilities, overreliance on GenAI, and potential skills erosion.
Recommendations for Practitioners	These findings will help educators guide students in developing metacognitive awareness and refining their use of GenAI tools while addressing the potential risks. Emphasis should be placed on understanding the distinct patterns of GenAI use, which will enable practitioners to scaffold learners. Integration also requires developing innovative strategies through redesigning lessons and activities and carefully selecting adequate assessment methods that foster critical thinking. Additionally, it is important to enhance learners' skills in effective intellectual communication through GenAI tools, to guide them in evaluating AI-generated content, and to provide ethical frameworks for responsible AI use.
Recommendations for Researchers	Researchers need to explore more innovative strategies to integrate GenAI tools into higher education, in line with the nature of the various disciplines, to use GenAI tools as intellectual partners and not superficially. The field requires further studies to investigate how GenAI tools can be integrated to develop students' intellectual skills, preparing them for future roles that demand advanced abilities and effective use of GenAI for personal and professional growth.
Impact on Society	This study revealed that the use of GenAI tools has many benefits at the level of individuals in society when interacting with AI tools at an intellectual level.

However, the superficial use of GenAI tools may contribute to spreading ignorance and an illusory sense of achievement, which may harm societies. Accordingly, it is necessary to warn users and take necessary measures to avoid superficial and harmful use of GenAI tools by raising individuals' awareness about the effective ways of interacting with GenAI tools and the importance of avoiding overreliance on them without evaluating GenAI outputs.

Future Research	As several drawbacks associated with GenAI tools have emerged, including superficial technology use and the potential erosion of skills, future studies should explore this aspect and its impact on learning in greater depth. Future studies could employ a mixed-methods study design with a larger sample encompassing both males and females to enhance the generalizability of the findings.
Keywords	generative AI, postgraduate students, learning experiences, ChatGPT, innovative learning activity, learning technologies

INTRODUCTION

Learning experiences involve different methods for engaging with educational content and activities to enhance understanding, application, and reflection on knowledge (National Research Council, 2000). They can be structured or unstructured, formal or informal, and they can take place in traditional classrooms, online platforms, or through real-world applications. The key elements that enhance learning experiences include active engagement (Freeman et al., 2014), feedback and reflection (Hattie & Timperley, 2007), real-world relevance (Kolb, 1984), and technology-enhanced learning (Salmon, 2013). Including metacognitive practices within students' learning journeys ensures that students can transfer their knowledge effectively and apply their skills to new contexts (National Research Council, 2000). This focus is particularly important as higher education students prepare to navigate the evolving landscape of modern careers, including the rise of artificial intelligence (AI) and other technological advancements. However, advancements in technology may not simplify future careers; instead, they could increase competition, making it crucial for students to develop strong and adaptable skills for navigating new and unfamiliar challenges (Chan & Hu, 2023; Firat, 2023).

Generative AI (GenAI) has recently emerged as a significant innovation. GenAI not only analyzes and predicts data but also creates new content, such as text, images, audio, and videos, in response to user inputs, commonly referred to as prompts (Stryker & Scapicchio, 2024). This capability is made possible through advanced technologies, such as machine learning and natural language processing (Javaid et al., 2023). GenAI chatbots, such as ChatGPT, have many potential applications in higher education, encompassing seven key capabilities: conversational AI, language translation, text generation, code generation, sentiment analysis, summarization, and communication enhancements (Laato et al., 2023).

Based on the capabilities of ChatGPT and other GenAI chatbots, a new dimension of students' learning experiences has emerged, offering the potential to make these experiences more adaptive and personalized (Jo, 2024; Samala et al., 2024). As Faisal (2024) observes, "the availability of ChatGPT aligns with constructivist pedagogical approaches, emphasizing student-centered learning" (p. 9). This is because ChatGPT's interactive nature encourages learners to engage actively with the learning content, ask questions, and generate new ideas. Thus, integrating Chat GPT could help instructors shift their teaching style from providing only information to fostering critical thinking and facilitating a meaningful learning environment (Faisal, 2024).

The influence of GenAI tools, such as ChatGPT, on learners and their educational experiences is becoming increasingly relevant (Al-Zahrani, 2023; Chan & Hu, 2023; Javaid et al., 2023; Vargas-Murillo et al., 2023). Given the focus on postgraduate students in this study, the potential of GenAI as a perpetual learning assistant is particularly noteworthy because it can meet a student's specific needs, such

as supporting academic writing, saving time in searching for relevant literature, and providing continuous guidance in academic endeavors (Chauke et al., 2024). Educators should recognize the evolving role of GenAI and support students in navigating these technologies effectively (Labadze et al., 2023; Rasul et al., 2023). This includes understanding how students perceive the use, benefits, and challenges of GenAI's capabilities and how these affect their learning experiences. Ngo et al. (2024) found that students were likelier to continue using ChatGPT when they perceived it as beneficial and supportive of their learning objectives.

While considerable research has focused on student uses of GenAI in learning, examining its applications and the various factors influencing these uses (Almulla, 2024; Dahri, Yahaya, Al-Rahmi, Aldraiweesh, et al., 2024; Duong et al., 2023; Xu et al., 2024), a gap in understanding whether students can be differentiated based on their use of GenAI as a learning assistant remains. This study contributes to the literature by enhancing comprehension of the ways in which students integrate ChatGPT into their learning experiences. By utilizing qualitative data collection methods, the study aims to uncover unexpected uses and insights that could reveal students' feelings and fears, ultimately enriching the discourse around GenAI in education.

A major challenge in education arises when evaluating student performance assisted by tools such as ChatGPT (Rasul et al., 2023) because it is difficult to distinguish between the AI tool's contribution and the student's own capabilities, as well as whether the student has employed critical thinking skills. To address this challenge, this study aimed to examine both the outcomes and the direct interactions between students and ChatGPT to provide valuable insights into assessment practices.

This study focused on investigating Saudi postgraduate students' usage, the benefits they gained from GenAI tools during their learning, and the challenges they faced. Additionally, the study aimed to understand how students addressed the course activities that permitted the use of AI, in particular, the Designing Training Program with GPT Assistance (DTPGA) activity.

The study addressed the following research questions:

- RQ1:** How do postgraduate students use GenAI tools during their learning?
- RQ2:** What are the perceived benefits of using GenAI tools in postgraduate students' learning experiences?
- RQ3:** What are the perceived challenges of using GenAI tools in postgraduate students' learning experiences?

LITERATURE REVIEW

GenAI is revolutionizing the educational landscape, offering many opportunities, but it also involves some serious concerns (Firat, 2023). GenAI tools could transform how students learn (Vargas-Murillo et al., 2023), and by connecting the capabilities of technology with educational needs, ChatGPT has significant potential to empower students and improve their educational experiences and resources (Dai et al., 2023).

This literature review focuses on two key dimensions. The first dimension concerns GenAI and learning experiences, how learning can occur using GenAI based on relevant theories, and how students use GenAI as a learning tool. The second dimension concerns students' perceptions of GenAI by outlining pertinent theoretical frameworks and reviewing other studies investigating university students' perceptions of using AI during their learning journey.

GENAI AND LEARNING EXPERIENCES

Regarding the interaction between students and GenAI tools, Lodge et al. (2023) introduced a typology that illustrates the possible human-machine interactions within two dimensions of relationships. The vertical axis represents AI's capacity to manage routine tasks, enabling humans to concentrate on more complex intellectual activities or enhancing their capabilities through augmentation (see Appendix A). The horizontal axis illustrates the nature of the relationship between humans and machines, distinguishing between an individual learning approach and a collaborative setup in which humans and machines work together (see Appendix A). Lodge et al.'s (2023) concept of cognitive offloading describes how people use technology or tools to reduce the cognitive work needed to complete tasks. This frees the mind to devote its energies to other mental tasks or difficult-to-perform sophisticated cognitive tasks, whereas the extended mind means that technology can both augment and become part of the mind (Firat, 2023; Lodge et al., 2023). Researchers have also noted that when humans and GenAI interact, GenAI can prompt humans to learn regulation when humans ask GenAI to provide regulatory support. Examples include asking AI to clarify an idea or using a plug-in or application that enables adaptive prompting (Lodge et al., 2023). Hybrid learning refers to GenAI systems collaborating with learners to support both the cognitive and metacognitive components of learning (Molenaar, 2022).

Several learning theories can explain how learning can occur with the use of GenAI. Kim and Adlof (2024) note that through conversational interactions, ChatGPT can encourage learners to “move beyond traditionally transactional means of passively acquiring information, toward the interpretive process of reflecting on their learning experiences, critically analyzing their progress, and articulating their thoughts” (p. 43). Such reflective dialogue can deepen students' understanding and promote their metacognitive skills. Furthermore, learner's decisions are made independently in dialogue and in writing requests to GenAI tools, aligning with the self-determination theory, which highlights the importance of creating a supportive learning environment in which students feel empowered to take ownership of their learning and enhance their competence through effective feedback (Zhou et al., 2024).

In practical terms, the use of generative AI as a learning tool in classrooms has been explored in various studies (DaCosta & Kinsell, 2024; Elkhodr et al., 2023; Parsons & Curry, 2024). In a study by Elkhodr et al. (2023) that implemented ChatGPT as a classroom aid, the authors investigated the perceptions of undergraduate and postgraduate ICT students regarding its use and its impact on learning outcomes and experiences. The study used an experimental design of three case studies (two groups were assigned within each research study; one was allowed to use ChatGPT, and the other was prohibited from using ChatGPT). The data were collected through tutorial exercises, reflective exercises, qualitative observations, and a specific rubric for marking. The findings indicated that ChatGPT was perceived positively as a valuable and enjoyable learning tool, and most students expressed a desire to utilize such AI capabilities in the future. Furthermore, the study found that the students who used ChatGPT exhibited enhanced performance in terms of functionality, user flow, and material comprehension compared to the students who relied on conventional search engines (Elkhodr et al., 2023). Another study investigated the influence of intelligent virtual assistant tools such as ChatGPT and Stable Diffusion in writing skills instruction and individualized learning (Hutson & Plate, 2023). The authors proposed an innovative approach to teaching writing skills and content generation. Their research found that integrating GenAI has the potential to revolutionize educational programs by enhancing advanced metacognitive learners' abilities (Hutson & Plate, 2023).

Other studies have focused on ChatGPT's capacity to enhance the instructional design process. Parsons and Curry (2024) examined ChatGPT's capacity to complete assignments on instructional design. Their proposed approach used ChatGPT to outline the needs, tasks, and learners' analysis for a media literacy module and evaluated the responses via a grading rubric. Their findings highlighted the capability of ChatGPT to be utilized as a collaborative tool in instructional design tasks. However,

certain difficulties and frustrations were encountered in ChatGPT's ability to be customized to specific locations and school requirements (Parsons & Curry, 2024). Another study that compared ChatGPT with conventional techniques during an instructional design course highlighted its potential benefits in accelerating analysis, saving time, and providing diverse perspectives by boosting the depth and breadth of instructional design tasks (DaCosta & Kinsell, 2024). However, the authors warned against ChatGPT's lack of human comprehension and expertise in generating nuanced judgments, and they recommended cautious use and evaluation of the results.

Therefore, one should not rely solely on AI tools or take AI results for granted during learning. Educators should address students' awareness of digital literacy and the importance of evaluating AI-generated answers (Firat, 2023). Lodge et al. (2023) argued that "human learners need to self-monitor their learning goals and states, continuously evaluate the AI responses, and adapt their learning strategies or prompts to AI" (p. 121). This is because, in some cases, using ChatGPT could prevent learners from developing critical thinking skills (Vargas-Murillo et al., 2023). Chan and Hu (2023) warn that overreliance on AI "may hinder people's growth, skills, and intellectual development over time" (p. 11). Students need guidance on how to effectively, responsibly, and successfully utilize generative AI in their learning (DaCosta & Kinsell, 2024; Jiayu, 2023; Lodge et al., 2023), for example, through classroom discussions, seminars, or workshops to delve into the effective utilization of AI tools. Such guidance should include determining the aspects that enhance learning, posing intelligent inquiries to optimize AI responses, employing critical thinking when accepting created information, exploring combinations of complementary tools, and promoting or discouraging behaviors while using AI for learning (Jiayu, 2023). Other researchers emphasize the need to restructure curricula to focus on applied learning techniques that highlight the importance of contextual judgment as a key pedagogical principle and the development of advanced metacognitive skills, which will be crucial in future individuals' work environments (Hutson & Plate, 2023). Several studies have redesigned course activities to enhance students' learning and adapt to AI-era requirements (Elkhodr et al., 2023; Hutson & Plate, 2023).

STUDENTS' PERCEPTIONS OF GENAI

Several theoretical frameworks have been used to explain students' perceptions of GenAI technologies (Poenaru et al., 2024). The technology acceptance model (TAM) suggests that users are mainly influenced by perceived usefulness (PU) and perceived ease of use (PEOU). These factors affect learners' attitudes towards technology use and their intention to use it (Silva, 2015). Poenaru et al. (2024) conducted a bibliometric review of AI acceptance in the higher education sector and found that "AI acceptance in higher education in the tertiary sector is multifaceted, with factors belonging to traditional acceptance models having a significant impact on the current research landscape" (p. 333). The TAM framework has been widely used to understand students' acceptance of ChatGPT (e.g., Almulla, 2024; Dahri, Yahaya, Al-Rahmi, Aldraiweesh, et al., 2024; Duong et al., 2023; Xu et al., 2024). It has been used to identify and analyze the factors affecting university students' satisfaction when using ChatGPT during their learning experiences (Almulla, 2024). A mixed-methods study adopted the TAM framework to explore learners' acceptance of ChatGPT as a tool for metacognitive self-regulated learning (Dahri, Yahaya, Al-Rahmi, Aldraiweesh, et al., 2024). A study in China by Xu et al. (2024) aimed to understand undergraduates' and postgraduates' perspectives on ChatGPT, utilizing the TAM to analyze and understand the relevant qualitative data.

Many studies have discussed university students' perceptions of AI, including the opportunities and challenges when integrating AI within their learning journey (Al-Zahrani, 2023; Chan & Hu, 2023; Firat, 2023; Hutson & Plate, 2023; Vargas-Murillo et al., 2023). Chan and Hu (2023) explored Hong Kong university students' perspectives on GenAI technologies, including participants from various disciplines. Their results showed that the students had positive attitudes toward GenAI use in teaching and learning, recognizing the potential for personalized learning support, brainstorming aids, writing, and analytical capabilities. Their study also highlighted many concerns regarding accuracy, privacy, ethical issues, and the impact on one's holistic competencies and social values when engaging

with GenAI during learning. The challenges regarding career risks and job replacement were discussed. Another study investigated the implications of ChatGPT and an AI-powered language model for seven PhD students and seven scholars from four countries (Sweden, Turkey, Australia, and Canada) (Firat, 2023). This study underlined how critical it is to comprehend both the possible benefits and drawbacks of AI in higher education. The results revealed that using ChatGPT can support students' personalized learning by adapting to learners' needs and styles and removing other barriers, such as shyness. Firat's (2023) study also found that one implication of ChatGPT use is changing the educator's role to be more of a facilitator and guide for improving soft skills, critical thinking, and creativity rather than a content provider. A systematic literature review on the impact of ChatGPT usage in higher education and the challenges and opportunities of AI during students' learning journeys revealed that ChatGPT has the potential to enhance students' academic and librarian-related processes; however, the researchers emphasize that one should consider the ethical aspect of using such technology (Vargas-Murillo et al., 2023). This is because this kind of AI technology can also change how people approach different jobs, tasks, and academic processes (Chan & Hu, 2023; Vargas-Murillo et al., 2023). Consequently, an assessment of ChatGPT's appropriate and responsible implementation in the sphere of higher education is required (Vargas-Murillo et al., 2023).

In the Saudi context, many studies have been conducted on students' perceptions of GenAI. A study exploring the role of GenAI in education in 15 Saudi universities found that the students demonstrated a high level of acceptance and awareness of GenAI tools (Aldossary et al., 2024). The researchers found that the students were "highly aware of the role of GenAI tools in improving their understanding of complex concepts, developing skills, improving their self-efficacy, learning outcomes, providing feedback, and making learning meaningful" (Aldossary et al., 2024). Another study that investigated GenAI's uses, benefits, and challenges among postgraduate students at a Saudi university found that the students' main usage of GenAI was for clarifying the meaning of concepts, summarizing the literature, translating, and generating writing ideas (Almassaad et al., 2024). The participants expressed the benefits of saving time, ease of use, and useful feedback. However, they were concerned about plagiarism issues, unreliable information, and the lack of human interaction that could occur if they adopted GenAI tools within their learning (Almassaad et al., 2024). Al-Zahrani (2023) explored the influence of GenAI tools on academics and research in higher education in Saudi Arabia. The research participants reported high awareness and positive attitudes regarding the use of GenAI in research and advantageous experiences with GenAI solutions to broaden the range of their projects and enhance efficiency. Nevertheless, they emphasized the significance of sufficient support, training, and guidance in utilizing GenAI tools. Ethical issues arose as a notable concern, underscoring the students' dedication to ethical research techniques and the necessity of ensuring transparency and actively addressing any biases (Al-Zahrani, 2023).

The current research is unique, as it implemented an innovative strategy to integrate generative AI (GenAI) tools by redesigning a related course activity, specifically a DTPGA activity. This redesign aimed to help researchers investigate the actual use of AI tools during students' learning experiences. The study employed the TAM framework to understand students' usage of AI tools in their learning. The TAM provides insights into the perceived benefits of AI tools through the PU lens and explores the perceived challenges encountered during students' learning process through the PEOU lens. This approach aimed to identify which aspects of GenAI usage students find useful and what factors may hinder their engagement with these tools.

METHODOLOGY

This section presents the study's design and context, including the participants and the activities implemented. It also describes the data collection and analysis methods and procedures.

STUDY DESIGN

This study aimed to investigate the impact of GenAI tools on postgraduate students' learning experiences by focusing on (1) how these students utilize GenAI tools, (2) the perceived benefits of their use, and (3) the challenges they face in their learning experiences with these tools. A qualitative research approach using a case study was employed to collect in-depth data about the research problem. Creswell and Poth (2017) pointed out that qualitative research is suitable for understanding what happens in a given situation. Cohen et al. (2017) explained that a case study design focuses on providing rich and detailed descriptions of events. It centers on individual or group participants and aims to understand their perceptions of those events (Cohen et al., 2017). A case study design was appropriate for this study because it employed an innovative strategy to integrate ChatGPT. This approach allowed for an in-depth exploration of the impact of GenAI on learning experiences by utilizing various data sources, including students' actual usage and perceptions obtained from course evaluations and interviews. Several studies have used a qualitative case study design to examine the impact of educational technologies on learning from student perspectives during university courses (Gozali et al., 2024; Johnson, 2022; Lugo, 2022; Meşe & Sevilen, 2021).

PARTICIPANTS AND DTPGA ACTIVITY

To conduct a case study design, it is essential to establish well-defined boundaries surrounding the case (Cohen et al., 2017). This study focused on second-year female postgraduate students enrolled in a course titled Innovations in Education and Training Technologies (IETT) within the Educational Technology Master's program at a Saudi university during the fall semester of 2023. In Saudi Arabia, female students are instructed by female professors, while male students are taught by male professors. Students in the same program follow an identical academic plan.

In the IETT course, 14 students were enrolled: 12 females and 2 males. The female researchers only had access to the 12 female students, which made them the selected convenience sample. Of these, 11 students volunteered to participate in the study (referred to as S1 to S11 in this study). The two male students were not included due to the gender-segregated educational system in Saudi Arabia.

The small number of participants may have affected the generalizability of the research findings. However, as Creswell and Poth (2017) noted, qualitative research focuses on understanding the specific context from which the findings emerge rather than making broad generalizations. Additionally, Cohen et al. (2017) suggested that the number of participants in qualitative research should be determined by the sufficiency of the data they provide to explain the phenomenon under investigation.

The participants had prior educational qualifications obtained before studying for the master's degree. Four were currently employed as K–12 teachers in disciplines such as computer science, Arabic, and science. Five were employed in higher education institutions or training organizations as administrators or instructional designers. The remaining three participants were not employed. The participants' backgrounds ranged from recent bachelor's degree graduates to those with up to 13 years of professional experience. All participants had their first experience of using ChatGPT as an integrated teaching method. Most had previous exposure to ChatGPT for personal, professional, and educational purposes. They had acquired knowledge of GenAI tools and prompt engineering as part of the IETT course, and they could access the free version of ChatGPT.

The IETT course includes an end-of-semester activity designed to integrate innovations in training technologies by designing a training program. The course instructors, who are also researchers, developed the activity to integrate ChatGPT as an assistant for students. This activity is called the *Designing Training Program with GPT Assistance* (DTPGA). The activity focuses on training students to use AI tools and apply instructional design principles to diverse training solutions while developing AI-compatible evaluation methods. The students selected one scenario from three scenarios as problem cases (hospital, university, or company). They undertook the following tasks: identify the problem,

analyze the setting, define a target audience, set objectives for the training program, design three related training activities, choose appropriate training strategies, and identify outcome measurement methods (for DTPGA activity, click here: [Link](#)). The activity was conducted in the classroom and was allocated a duration of two hours.

DATA COLLECTION AND ANALYSIS

In-depth interviews with the postgraduate student participants were the primary method for data collection, complemented by the researchers' diaries. Denscombe (2003) categorizes qualitative data collection into two approaches: the first focuses on understanding meaning and how individuals perceive things, while the second examines behavior patterns and how these behaviors are expressed. In this study, the interviews represented the first approach, capturing the participants' usage preferences and perceptions of GenAI. One-to-one interviews allow participants to express their personal thoughts, feelings, beliefs, and experiences in depth (Cohen et al., 2017; Seidman, 2013). The study used the second approach to understand the pattern of behaviors regarding the students' usage of one GenAI tool (i.e., ChatGPT) in the DTPGA activity, including (1) the student-ChatGPT conversation logs and (2) the final DTPGA activity answers.

The students' learning experiences with GenAI in this course are explained in Figure 1. It outlines two types of learning experiences: (1) planned activities, such as the DTPGA, and (2) unplanned, self-directed learning experiences. These experiences shaped the students' perceptions, which they expressed during the interviews. Figure 1 also demonstrates how the outcomes of the planned activity and interview analysis complemented each other and enriched the final analysis of the interview results, facilitating triangulation from different sources. This strategy not only established the credibility of the data but also unlocked valuable insights from each source. The researchers held many meetings to understand the data and link the meanings with each other by comparing the participants' verbal interviews with their actual practical actions and how the participants addressed the DTPGA activities, all of which were discussed and reported in the researchers' diaries.

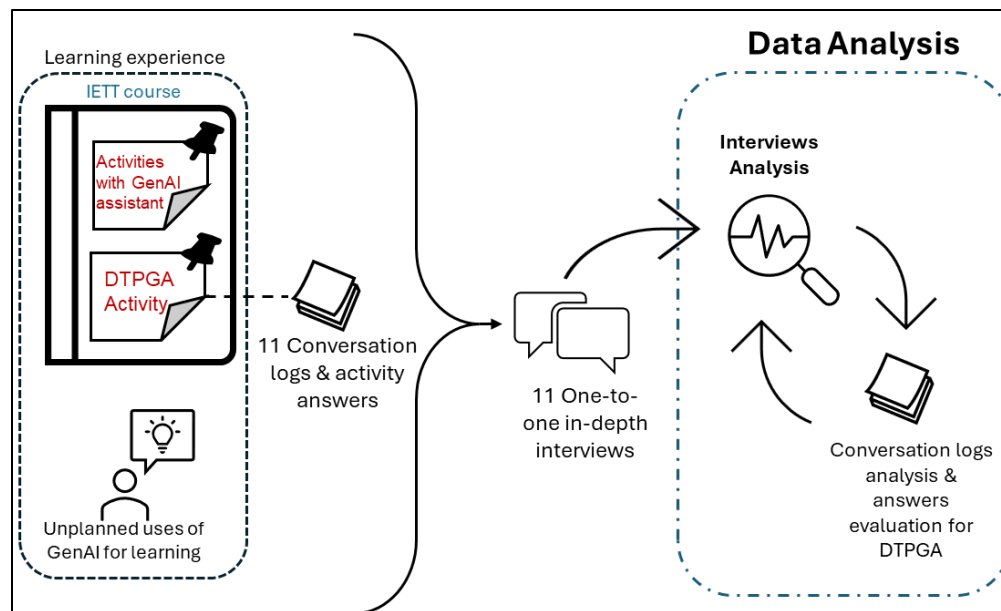


Figure 1. Data collection and analysis process

Informed consent was obtained before collecting data from all participants to ensure their participation was voluntary and to confirm the confidentiality of their personal information. The researchers acknowledged the challenges of their dual roles as instructors and researchers and took steps to address this issue. By conducting interviews after the course was completed, they created a comfortable

environment for students to express themselves. To put the students at ease, they engaged with the participants as peers and started conversations on informal topics to foster a friendly atmosphere. The participants were assured that their involvement would not affect their grades and that they could withdraw from the study or omit specific responses at any time.

To increase the validity of this qualitative research, member checking was adopted. This involves sharing preliminary findings with the participants and seeking their feedback and confirmation. This process allows participants to validate the accuracy and interpretation of their experiences, contributing to the overall credibility and trustworthiness of the study (Birt et al., 2016; Creswell & Poth, 2017).

Interviews

Semi-structured interview questions were used, allowing for the emergence of unexpected answers (Robson, 2011). The interview structure was designed by first including suitable opening questions, followed by questions based on the three main research questions, and then providing cool-off questions (for the interview guide, click here: [Link](#)).

The researchers conducted 11 interviews with students in Arabic, each lasting between 45 and 60 minutes. Before the interviews, the participants were informed that they could decline to answer any question without consequences and request the removal of any part of the interview afterward. They were also asked for their permission for the interviews to be audio recorded, and they were assured that the recordings would be transcribed and then deleted. All the participants agreed to these terms.

For the interview analysis, the researchers applied thematic analysis, which is the process of identifying and categorizing text segments according to thematic ideas (see Appendix B). This process facilitates both data organization and deeper analytic insights, allowing researchers to move beyond mere description to uncover patterns and theoretical connections within the data (Gibbs, 2012). This study followed Gibbs's (2012) procedure for analyzing the interviews, which includes three key steps for converting text to "thick descriptive" data: (1) providing a detailed description, (2) categorizing the information, and (3) analyzing the resulting codes.

DTPGA activity analysis

The students interacted with ChatGPT to accomplish the DTPGA activity. The data collection included 11 conversation logs from the students' interactions with ChatGPT and 11 completed answers from the activity (Figure 2). The researchers obtained the students' consent to share their conversation logs and answers for research purposes and assured them that their names and identities would be anonymized. The logs created with ChatGPT used in the activity were collected as PDF files and stored confidentially. The DTPGA activity was analyzed based on two aspects: *process* and *outcome* (Figure 2).

The DTPGA activity *process* involved understanding how the students engaged in conversations with ChatGPT. After the initial analysis of the interviews (see Figure 1), the researchers examined the conversation logs using the themes and findings that emerged from the interviews. This analysis led to the identification of four key themes: (1) use prompt engineering rules, (2) intellectual communication, (3) selectivity, and (4) creativity in prompts.

For instance, during the interviews, one student shared her experience using innovative questioning techniques with ChatGPT. This insight prompted the researchers to introduce a creativity theme into the rubric for analyzing student-ChatGPT interactions, allowing us to explore whether similar strategies appeared in other participants' conversation logs.

The conversation logs were then analyzed according to the four identified themes. A theme was considered present if it appeared at least once in the conversation texts. For instance, under the intellectual communication criterion, behaviors such as providing clarification or asking follow-up questions indicated that the student met this criterion.

The second stage of analyzing the DTPGA activity was the *outcome* of the DTPGA activity. The students' answers in the activity were assessed on a scale from zero to two based on goal accuracy, solution coherence, objective achievement, and activity clarity.

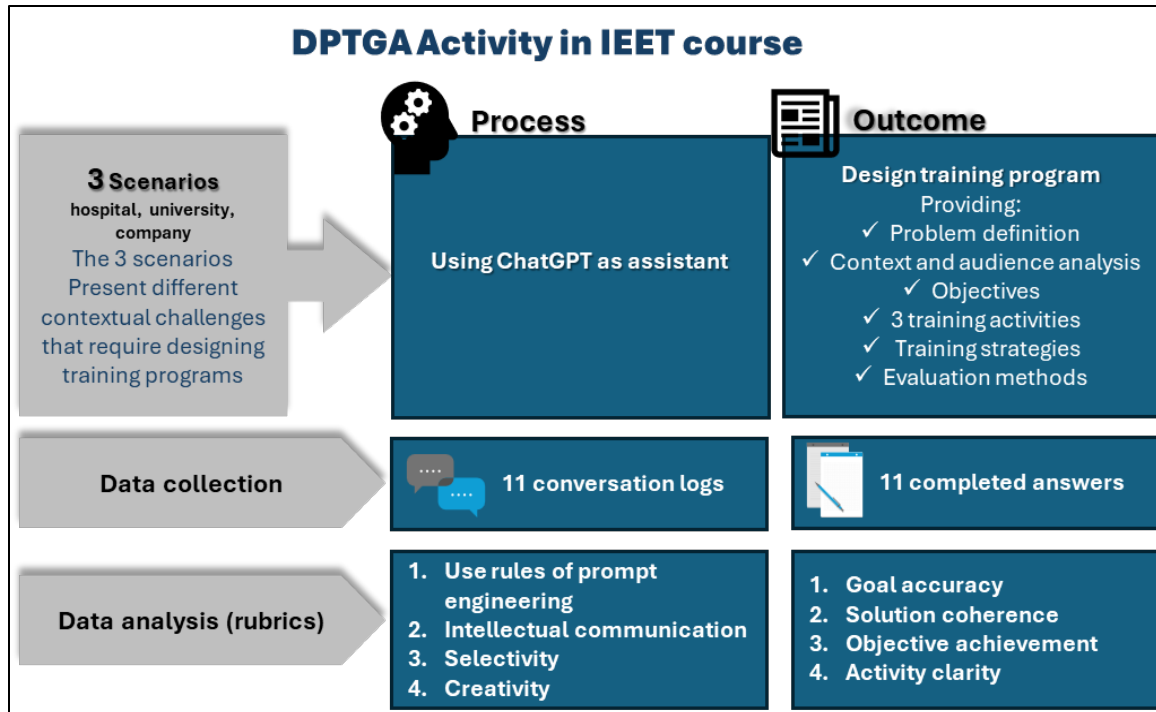


Figure 2. DTPGA activity

RESULTS

This section presents the study's findings structured around the three main research aims regarding GenAI usage and its perceived benefits and challenges. To interpret the data, the TAM framework was used. The analysis of the data from the interviews and the ChatGPT logs revealed several themes and subthemes (see Figure 3).

USAGE OF GENAI TOOLS

To understand how the students utilized GenAI tools during their learning, data were collected and analyzed from the student-ChatGPT conversation logs for the DTPGA, evaluation of the DTPGA answers, and interviews with the students. The findings from the DTPGA activity include the students' interactions with ChatGPT, presented in Table 1, and the evaluation of the final solutions produced with ChatGPT, presented in Table 2. All these were analyzed alongside the findings from the interviews.

The findings in Tables 1 and 2 provide critical insights into the relationship between the quality of the student's final solution for the DTPGA activity and their performance in conversations with ChatGPT. The data revealed a general trend suggesting that a lower level of ChatGPT usage was associated with a lower-quality final solution for the DTPGA activity. For example, the analysis of the student-ChatGPT conversation logs in Table 1 shows that participants S3 and S8 had limited depth in their interactions with ChatGPT and produced a final solution that did not meet the minimum requirements for some criteria, particularly criteria 3 and 4, as shown in Table 2.

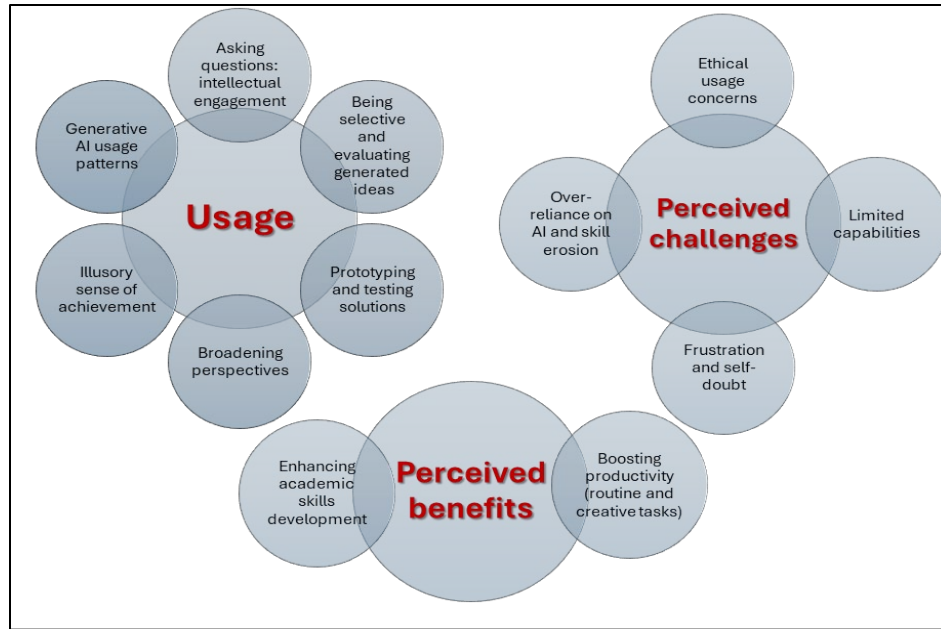


Figure 3. Extracted main themes and sub-themes from the analysis

Furthermore, the students who showed a high-performance conversation level with ChatGPT produced higher-quality solutions for the DTPGA activity. For example, S9 and S11, who fulfilled all the interaction criteria and presented a greater depth of interaction with ChatGPT, designed solutions that met all four outcome evaluation criteria (see Table 2). However, the data also imply that achieving an average level of interaction with ChatGPT – such as meeting at least two of the criteria shown in Table 1 – did not necessarily indicate low-quality final answers. Some participants, such as S1 and S4, utilized their skills independently, achieving high-quality outcomes without relying on interactions with ChatGPT.

Table 1. Analysis of student–ChatGPT conversation logs for DTPGA activity

Criteria	Description	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	Examples
Use prompt engineering rules	Students utilize structured prompts to guide their ChatGPT responses effectively.	-	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Provide a description of the role played by ChatGPT - “As an instructional designer, you can ... - S4 - “As an expert in scenario design and narrative plotting” - S7 - “As a specialist in educational technology, what does information literacy mean?” - S10
Intellectual communication	Students interact with ChatGPT, including their ability to clarify, rephrase, or ask follow-up questions to refine the conversation.	✓	-	-	-	✓	-	-	-	✓	✓	✓	Implementing a two-way dialogue - “... if we agree on that, rewrite ...” - S11 - “Why did you name it that?” - S11 - A question on an idea proposed by ChatGPT: “What is the role of critical thinking in information literacy?” - S10”

Criteria	Description	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	Examples
Selectivity	Students' ability to selectively use the information provided by ChatGPT most relevant to their task.	✓	✓	-	✓	✓	✓	✓	-	✓	✓	✓	Guiding responses or requests for refining choices and alternative - "I liked the virtual reality examples you mentioned, but I want practical steps for implementing them. Please specify exactly how I can do that by listing actionable steps." - S11 - "Give me other names." - S1 - "Write teaching strategies that must be consistent with the selected activities, which are ..." - S2 - Combine the goals you mentioned with a primary goal." - S4
Creativity in prompts	Use of non-traditional or innovative approaches by students in engaging with ChatGPT.	-	-	-	✓	-	-	-	-	✓	-	✓	Situational test: "Can I ask ChatGPT to play the role of a patient in a scenario that requires the trainee to apply empathy skills? Is this possible, and how can I effectively implement this?" S11 Idea proposal: "What if gamification was used in the training activity for this scenario?" - S4
<p>(✓) indicates that the conversation clearly meets the criterion;(-) signifies that there is no evidence to support that the criterion has been met.</p>													

Table 2. Evaluation of the DTPGA activity.

Criteria	Description	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11
1. Goal accuracy	Are the objectives specific and solution-oriented?	✓✓	✓	✓	✓✓	✓	✓	✓	✓✓	✓✓	✓	✓✓
2. Solution coherence	Are the objectives and strategies aligned?	✓✓	✓✓	x	✓✓	✓	✓	x	✓✓	✓✓	✓✓	✓✓
3. Objective achievement	Do the activities meet the objectives?	✓✓	✓✓	x	✓✓	✓	✓	✓	x	✓✓	✓	✓✓
4. Activity clarity	Are the activities clearly presented?	✓✓	✓✓	x	✓✓	✓✓	✓	✓	x	✓✓	✓✓	✓✓
Grading scale: (x) for non-achievement, (✓) for partial fulfillment, and two (✓✓) for complete fulfillment.												

The interviews' results revealed six themes concerning the student's usage of GenAI (Table 3).

Table 3. Summary of students' use of GenAI tools

Subtheme	Key finding
Asking questions that require intellectual engagement	Interacting with ChatGPT using precise prompts and detailed queries enhanced the participants' understanding and produced meaningful results.
	Participants asked ChatGPT to explain and simplify ideas.
	Participants asked ChatGPT follow-up questions if they had issues with the explanations.
	Participants discussed uploaded materials with ChatGPT.
	Some participants suggested that curiosity, openness to learning, persistence, and determination are essential for effective AI interaction.
Being selective and evaluating generated ideas	Using ChatGPT requires an awareness of unnecessary details. Although most participants avoided including irrelevant ideas, some struggled.
	Participants believed that having prior knowledge is essential to guiding idea selection and to correct information.
	Participants evaluated the suitability and applicability of ideas to the chosen context.
Prototyping and testing solutions	Participants used ChatGPT to conceptualize how solutions would work in real-life scenarios. They then asked for clarification and modification. Finally, they evaluated the solution and decided whether to select it.
Broadening perspectives	Participants used ChatGPT to clarify tasks by broadening their understanding of the requirements for a particular assignment.
	Participants compared their answers with ChatGPT's response to explore ideas they had not considered.
	Participants found that ChatGPT allowed them, as students and researchers, to explore diverse perspectives on a topic efficiently.
Illusory sense of achievement	Rapid access to information from ChatGPT can create a false sense of understanding, as genuine learning requires time and progression, according to some students.
	Comparison of the interview responses with the activity outcomes showed that some participants developed an illusory sense of achievement.
GenAI usage patterns	Two patterns found from participants' usage traits were intellectual partners and information browsers.

Asking questions that require intellectual engagement

The results revealed that the students discovered certain ways of interacting with ChatGPT that led to deeper cognitive engagement and more relevant outcomes. For example, after S1 used ChatGPT for a translation, she realized that it had incorrectly translated "gamification" to "games" in Arabic. She corrected this and asked ChatGPT to use the correct term in future translations. One student noted, "We can guide it [ChatGPT] effectively by clearly defining what we want through precise prompts." S11 differentiated between searching for information on Google and learning through ChatGPT:

When I used ChatGPT, I didn't just ask it questions in general, like I would with Google. Instead, I literally sat down and had a conversation with it!! For example, my sister was struggling to understand some physics lectures. When she couldn't grasp the content, I suggested she ask ChatGPT to explain and simplify it. Even when she thought that ChatGPT had made a mistake, I encouraged her to challenge it by saying, "Go back to that slide where the teacher mentioned this and that. Okay, why did you say this?"

Thus, S11 emphasized the importance of detailed prompts as a communication channel.

In the analysis of the student-ChatGPT conversation logs for the DTPGA activity, several instances of commands expressing intellectual communication were identified. This type of communication

involves a back-and-forth exchange. For example, S11 used the command “If we agree on this, re-write the steps of the design stage ...” and asked, “Why did you name it that?” Similarly, S10 engaged in dialogue by asking, “What is the role of ...” after ChatGPT provided certain information. However, the analysis also showed that many students issued direct commands, such as “State” or “Give me,” without any follow-up interaction (see Table 1).

The researchers observed that some participants were not familiar with iterative communication, as they did not consider using ChatGPT as a real dialogue between two parties. Although they asked the right question and used prompt engineering rules (see Tables 1 and 2) to obtain an answer, they often neglected to react to ChatGPT’s responses and continued the dialogue. This step is essential to leverage the full benefits of generative intelligence.

Some participants identified key traits essential for maximizing effective AI interaction. For instance, S11 said that IT requires a mindset of curiosity and openness to learning: “You need to be willing to explore what it will say.” S8 and S11 opined that users must have persistence and determination. In S11’s words, “If I don’t like the result, I don’t stop. I keep going back and forth with it until I get the result I want.”

Being selective and evaluating generated ideas

All the participants agreed that the primary use of GenAI tools is to generate ideas. The results showed that interacting with GenAI can lead to the discussion of diverse topics and present new and unexpected ideas. Navigating new ideas requires students to select what is relevant and discard what is irrelevant, an ability that is closely linked to metacognitive thinking skills. This interaction also requires prior knowledge of the topic under discussion and the ability to evaluate the suitability of new ideas.

Evaluation of the DTPGA activity highlighted that some students struggled to recognize unnecessary details. In the activity, they were asked to design a training program with objectives and activities. Some students set numerous innovative objectives but struggled to achieve them all through the designed activities. This was evident in the objective achievement criteria in the DTPGA evaluation rubric (see Table 2).

Regarding the evaluation of ideas, S11 highlighted the importance of having prior knowledge to guide idea selection, saying that one must “... know when ChatGPT goes off track.” Similarly, S2 emphasized the necessity of background knowledge for evaluating and correcting the information generated by AI. Prior knowledge was essential for three main aspects: (1) formulating the question, (2) making judgments, and (3) properly connecting with the topic. S1 mentioned that she evaluated the suitability and applicability of ideas to her context. Similarly, S.10 stated, “It helps me get a starting point for ideas, and then I can tailor them to my situation.” She emphasized this point further, expressing her reservations about people who adopt ideas without altering them, saying, “No matter what, I know my context best; I know the problems, the people, and the employees better.”

Prototyping and testing solutions

The use of ChatGPT to test a solution emerged in S11’s interview and S11’s and S4’s ChatGPT conversation logs. These students requested that ChatGPT simulate solutions to understand all the details and make informed decisions. For instance, S11 asked ChatGPT to illustrate the solutions in real-life scenarios when she was faced with multiple design solutions. She then asked for the necessary resources and requirements to implement one such solution. Through this process, she evaluated the solution and decided that it was unsuitable, stating in the interview. She said:

For example, the last assignment I was working on was the design for the hospital. Initially, I thought about using augmented or virtual reality to create a simulation experience. So, I asked it [ChatGPT], ‘How could I implement or use this technology in this context?’ It gave me some ideas on how we might use it. But I noticed that it mentioned I’d need to design characters and

require specialized software. That made me realize that if I were really going to apply this, I'd honestly steer clear of augmented reality because it's a long and complicated topic. (S11)

This usage was also evident in the conversation logs for the DTPGA activity: S11 asked questions such as, "Would it be beneficial for trainees to use this tool ..." to allow ChatGPT to convince her of an idea's feasibility. Similarly, S4 wanted to visualize a scenario by applying a specific strategy and asked ChatGPT, "What if gamification was used in the training activity for this scenario?" (see Creativity in prompts in Table 1). This suggests that these two participants actively explored possibilities and applied critical thinking while assessing potential outcomes.

Broadening perspectives

The students leveraged ChatGPT to provide explanations and simplify assignments, which helped them view the given problems from different angles. For example, S4 realized that ChatGPT helped her by broadening her understanding of the requirements for a particular assignment. She noted, "I might miss certain things, so I feel like I can overcome this problem because it explains the assignment more thoroughly." S7 used ChatGPT to compare her first draft responses for the tasks with ChatGPT's answers. This approach provided the students with a broader, more comprehensive perspective, whether by asking clarifying questions or refining their answers through comparison.

Enhancing the understanding of information from various perspectives was another notable usage of ChatGPT. S11 and S4 considered ChatGPT to be most effective at grasping different aspects of information: "It can explore ideas I hadn't considered. I approach it from one angle, and it reveals a different perspective" (S4).

Illusory sense of achievement

ChatGPT use can lead to a false sense of understanding. One participant mentioned that genuine learning requires time and progression through stages, which contrasts with the rapid access to information provided by ChatGPT. S11 explained, "Accessing information quickly can be ineffective and does not lead to real learning because the student hasn't taken the time to engage with the material fully."

Some students, including S3 and S6, developed an illusory sense of achievement by completing the DTPGA activity using ChatGPT. They were impressed and satisfied with their work, although the quality was found to be poor when it was evaluated (see Table 2).

GenAI usage patterns

After analyzing the data (i.e., the interviews, the evaluation of the DTPGA activity, and the student-GPT conversation logs for the DTPGA analysis), two distinct usage patterns of interaction with GenAI tools (e.g., ChatGPT) were found (see Table 4).

Table 4 ChatGPT usage patterns

Pattern	Intellectual partner		Information browser	
Pattern description	Using ChatGPT as cognitive partners and interacting with them as if they were a real person.		Utilizing ChatGPT primarily as a search engine for ideas.	
Usage traits	Dialogic	Involved interactive communication, akin to a two-way interaction with a real person. Practically, users might request explanations of responses or ask for re-explanations, examples, and the reasons behind answers.	Transactional use	Direct commands were issued to retrieve specific ideas or information, with interactions lacking conversational depth (e.g., question followed

Pattern	Intellectual partner		Information browser	
	Collaborative	Ideas and solutions emerged from combining human capabilities with ChatGPT and developing and refining ideas iteratively.		by an answer and then another question).
	Selective researcher	Users critically evaluated and selected ideas that best fit their context from a wide array of ideas generated with ChatGPT.	Illusory understanding	Although students may believe that they have mastered tasks, the evaluations often revealed superficial and inaccurate ideas. This pattern tended to copy and paste responses, overly trusting ChatGPT's outputs.
	Persistent	Users persisted in dialogue, focusing on objectives despite inconsistent responses from ChatGPT, obtaining suitable answers through effective prompts.		
	Feedback-oriented	Instead of merely extracting ideas, users refined their own ideas through the tool, seeking evaluation and critiques to enhance and expand their conceptual understanding.		
Examples	Intellectual partnership usage traits were frequently identified in the interviews and observed in the DTPGA activity of participants S4, S5, S10, and S11.			
Notes	<p>Students identified as intellectual partners exhibited variations in their engagement and were categorized into open partners and reserved partners. Reserved partners, such as S10, demonstrated clear concerns about potential impacts on personal creativity and analytical skills, loss of personal spirit in research, and fears of equity imbalance.</p> <p>Conversely, students engaging as open partners expressed confidence and a proactive approach toward AI governance, such as S9.</p>			

The traits of both usage types appeared both in the interviews and the DTPGA activity analysis, highlighting a spectrum of engagement with AI tools. However, the lack of sufficient data made it challenging to determine whether the remaining participants belonged to the first or second pattern.

PERCEIVED BENEFITS OF USING GENAI TOOLS

In the interviews, the participants expressed their intentions to use GenAI tools, highlighting the benefits of these tools. The aspects that most benefit students can be categorized into the following themes (see Table 5).

Table 5. Summary of perceived benefits of using GenAI tools in learning

Subthemes	Key finding
Enhancing academic skills development	GenAI is valuable for structuring paragraphs, enhancing language, selecting titles, and correcting grammar in academic writing.
	GenAI indirectly enhances academic writing skills by improving the clear expression of ideas and identifying writing weaknesses.
	GenAI is preferred to traditional translation tools because it focuses on meaning, allows for discussion and clarification, provides a comprehensive understanding of content, and it can effectively summarize articles in Arabic.
	GenAI facilitates self-learning by explaining differences between concepts, providing examples, and offering background information.
Boosting productivity	<p>A distinction emerged between the benefits of using GenAI for routine tasks, which are repetitive and time-consuming, and creative tasks, which involve generating new work and typically do not require citations:</p> <p>Routine tasks: GenAI is valuable for activities such as proofreading, rewriting, and managing references, optimizing efforts and enhancing task efficiency.</p> <p>Creative tasks: GenAI is valuable for activities such as project planning and scriptwriting, as it saves time, offers diverse and innovative ideas, provides a clear starting point, simplifies tasks, and boosts motivation and confidence to achieve more.</p>

Enhancing academic skills development

The participants suggested that GenAI might influence the development of academic skills used in graduate studies, such as advanced cognitive skills, self-directed learning, and research capabilities. They reported the benefits of using ChatGPT and similar tools in their academic writing processes. S7 and S1 noted that ChatGPT helped structure paragraphs by developing introductions and conclusions, diversifying phrases in academic writing, and choosing engaging terms and meaningful titles: “I would turn to GPT for help with refining my sentences. I would write down the original sentence and then ask, ‘Can you rephrase this or give it to me with different terms?’ This approach really helped me craft my own academic statements more effectively” (S1); “I rely on artificial intelligence to help me write proper texts and grammatically accurate sentences” (S7).

The researchers noted that GenAI indirectly affected academic writing skills. S4 mentioned that her initial questions lacked clarity, prompting her to refine them multiple times: “Sometimes, even if I have an idea of a topic, the question I write to ChatGPT doesn’t fully reflect what’s in my mind, and I find myself adjusting the question to precisely match the level I’m aiming for.” Interaction with ChatGPT requires users to formulate precise requests and predict responses. Consequently, engaging with GenAI tools could improve the clear expression of ideas and help to identify writing weaknesses. This interaction could enhance students’ self-awareness and self-evaluation skills.

The researchers also observed that the participants overcame language barriers in translation tasks. Due to the limited number of Arabic sources and the students’ weak English skills, ChatGPT proved valuable as a translation assistant, helping students verify, review, and select the most appropriate translated text. Several students noted that ChatGPT differs from traditional translation tools in three ways. First, traditional tools often translate phrases literally, while ChatGPT focuses on their meaning. As S5 noted, “At the beginning of my translation task, I decided to test out translating a paragraph with GPT, and I really liked the phrasing. Then I started comparing GPT’s translations to those from Google Translate, and honestly, it was quite a shock—haha—GPT’s translations turned out to be far more professional.” Second, users can interact with ChatGPT to understand why it chooses specific terms and guide it in using preferred terms. Third, the participants found that these tools provided a comprehensive understanding of the translated text content. S1 found that ChatGPT helped her understand articles more deeply than other translation tools, which she worried might create misunderstandings due to her weak English skills: “I tried different translation tools, but

then I switched to ChatGPT. It didn't just translate for me – it helped me ask questions like, 'What does this mean? Can you explain?' It would clarify the translation, allowing me to pose questions and receive answers that helped me understand and delve deeper into the research" (S1). S10 noted that ChatGPT's ability to summarize articles in Arabic gave her a clear understanding of the articles' contents and saved time, enabling her to read and comprehend more articles efficiently. Despite these benefits, S2 emphasized the importance of reviewing translations, as errors could occur. She stated, "Even though ChatGPT is a machine, it sometimes misses the exact meaning I'm after. Like with 'gamification' – it first translated as 'educational games.' But once I clarified what I needed, it got it right. So, it's helpful, but remember, it's not perfect. You shouldn't rely on it completely; it might give the wrong answers" (S2).

Regarding the facilitation of self-learning, some students viewed ChatGPT as a self-teacher for understanding complex information, such as explaining differences between concepts and providing examples. S2 mentioned that ChatGPT helped her understand the distinctions between big data and traditional data. Other students described ChatGPT as an assistant when seeking background information on a specific topic. For example, S8 noted, "Even for quick questions – I consider it a life-saver."

Boosting productivity

A distinction emerged between the benefits of using GenAI tools in (1) routine tasks and (2) creative tasks (see Table 5). Routine tasks require significant time and effort, yet not much creative thinking or decision-making. These tasks are essential for maintaining the quality and organization of academic work. The students acknowledged the value of GenAI in routine activities, such as proofreading, rewriting (S9 and S3), and managing references (S10 and S5).

The students identified creative tasks as activities that contribute directly to creating new work and do not usually require citations (see Table 5). The interviews revealed that the students benefited from GenAI in two examples of creative tasks completed during their studies. These included project planning (i.e., the DTPGA activity) and script writing. Many students reported that using ChatGPT significantly reduced the time spent on these tasks. Regarding ChatGPT's benefits for the DTPGA activity, S5 said, "The last activity [DTPGA activity] was completed in record time; a similar project would take us six weeks, and we finished it in about two hours." In terms of idea generation, S7 stated, "It gives me innovative and creative ideas for the activities [DTPGA activity]." Others considered ChatGPT a starting point, requiring the user to refine and adapt its ideas. The second creative task for which GenAI proved beneficial was script writing for video or story design. S11 shared, "For this simple task [script writing], I really felt the difference; it made things much easier for me." As described by S7, a notable perceived benefit of using GenAI for creative tasks is the sense of empowerment and motivation to do more.

PERCEIVED CHALLENGES OF USING GENAI TOOLS

The student interviews identified the challenges of using GenAI and related concerns that could affect their use of GenAI during learning. Table 6 presents a summary and categorization of these challenges.

Table 6 Summary of perceived challenges of using GenAI tools

Subthemes	Key finding
Ethical usage concerns	Unclear guidelines on proper usage of GenAI, leading to negative emotions such as stress and guilt. Some participants noted that such tools could compromise the fairness of student evaluations.
	Participants expected teachers to explain the reasons for not being allowed to use GenAI tools in assignments.
Limited capabilities	ChatGPT's limitations include its lack of innovation, outdated information, inaccurate references, and potential bias.

Subthemes	Key finding
Frustration and self-doubt	Some participants felt self-doubt and a lack of confidence when they failed to convey their ideas to ChatGPT or when they compared their ideas to its ideas.
Overreliance on AI and skill erosion	Continuous ChatGPT use could lead to decreased critical thinking and writing skills, loss of originality, and overreliance on technology.

Ethical usage concerns

Several students expressed concerns about unclear guidelines for the proper usage and attribution of GenAI tools. S11 said, "There is a need for clear guidelines from the instructor about the boundaries of usage, what is and what isn't allowed, and the reasons behind these rules." She also emphasized that instructors should clarify the purpose of assignments to determine whether using ChatGPT is appropriate: "The objectives need to be clear. The instructor should explain the aim of the assignment so that students understand why using ChatGPT might not be suitable for completing it."

The students requested clarification of usage boundaries and an explanation of why certain assignments must be completed without using ChatGPT. This indicates that students view the use of ChatGPT and similar tools as their right and expect instructors to explain why it should not be used.

Due to unclear guidelines, some students experienced negative emotions. S9 said, "I still feel guilty when I use it. I feel like I'm cheating. We're not used to using it, so I'm still embarrassed to use it in assignments. I don't understand the limits of its use, which I'm supposed not to exceed." A lack of clear guidelines may perpetuate these negative feelings. Furthermore, GenAI might compromise the fairness of student evaluations. S11 highlighted this issue, stating, "I'm worried that teachers might unfairly compare students who rely on their own efforts with those who use AI technology."

Author 2 observed that many students expressed relief when they were asked to use ChatGPT for their assignments as if permission to use the tool lifted a heavy burden. It seems that they had used the tool with hesitation and fear of repercussions due to unclear usage guidelines and a lack of discussion with other instructors in their program.

Limited capabilities

Many students perceived ChatGPT to have limitations. Some common criticisms included the following: "It doesn't provide innovative ideas" (S6), "The information is outdated" (S9), "The references are inaccurate and fake" (S6), and "The ideas can be incorrect and biased" (S11). Additionally, when asked to complete the DTPGA, some students reported issues such as interruptions and lack of coherence in the generated questions (e.g., S5), which created confusion. At times, the students found ChatGPT's answers confusing, particularly when it gave different responses to the same question (e.g., S1). This could be attributed to a lack of proficiency in prompt engineering and the failure to provide ChatGPT with sufficient details.

Frustration and self-doubt

Some students experienced frustration and self-doubt when they failed to convey their requirements clearly. One student mentioned, "I feel bad when I fail to convey what I need and have to make repeated attempts to get a specific result using prompt engineering" (S4). She added, "I don't know if it's because I didn't explain the topic properly, but I tried several times" (S4). Although S7 admired ChatGPT's ability to generate innovative and useful ideas, she felt disappointed by her own perceived lack of creativity. She said, "Although I was happy with the answers it gave me, I felt disappointed in myself for not being able to come up with those ideas on my own." This highlights the complex impact of technology on self-confidence and self-assessment.

Overreliance on AI and skill erosion

Some students expressed concerns that continuous use of ChatGPT might worsen certain skills, such as critical thinking and writing. S5 stated, “There is a fear that people may lose their deductive and critical thinking skills.” S6 added, “It [GenAI] could affect writing skills if reliance on it continues.” S9 went further, saying that it “might affect IQ levels,” lead to “dependence and a lack of self-reliance,” and result in a “loss of originality and an absence of the researcher’s voice.” S10 shared similar concerns, referring to originality as the “researcher’s spirit.” S4 also expressed her fear that AI would make people’s ideas repetitive and uniform, saying, “If we all use it for research, our perspectives will become similar,” adding, “It will be on the same level and rhythm, but each of us has something unique.” S9 elaborated on this idea, stating, “In the past, we relied on our memory to remember numbers and places, for example. Now, we depend entirely on technology for that. I fear we might start relying on ChatGPT for thinking, which could diminish higher-order thinking skills when we rush to it for every little thing.”

DISCUSSION

The findings showed that GenAI usage varied among the participants. Some students engaged actively with GenAI by asking the GenAI tools questions that required intellectual engagement when addressing the DTPGA activity, which also involved being selective and critically evaluating generated ideas. Furthermore, some participants used ChatGPT for prototyping and testing solutions (see Table 3). These types of usage concur with what Lodge et al. (2023) call co-regulating and hybrid learning. During interactions between students and GenAI, students can commence co-regulation by seeking regulatory assistance from GenAI, such as by requesting that GenAI clarify a concept or by using a plug-in that provides adaptive prompting (Lodge et al., 2023). Hybrid learning, on the other hand, refers to collaboration between GenAI systems and human learners, providing support for both the cognitive and metacognitive aspects of learning (Molenaar, 2022). AI can improve learners’ metacognitive abilities by offering immediate feedback, adaptive inquiries, and suggestions for self-assessment prompts (Lodge et al., 2023). These features assist learners in monitoring, evaluating, and adjusting their learning methods. Dahri, Yahaya, Al-Rahmi, Aldraiweesh, et al. (2024a) found a positive impact on students’ metacognitive self-regulated learning when using ChatGPT during their learning journey. Therefore, using GenAI technology could empower students to be at the center of their learning and to develop critical thinking (Faisal, 2024; Samala et al., 2024; Taranikanti & Davidson, 2023). Furthermore, some researchers consider this technology to be “a student-driven innovation with the rich potential to empower students and enhance their educational experiences and resources” (Dai et al., 2023, p. 84). Thus, adopting GenAI during students’ learning could support the development of some important skills (e.g., metacognitive skills), which are considered vital for students’ future professional success (Hutson & Plate, 2023).

Broadening perspectives emerged as a main theme for explaining participants’ usage of GenAI during this study (see Table 3). Using GenAI tools helped enhance the students’ understanding of information from various perspectives, provided them with explanations, and simplified assignments. This finding is consistent with DaCosta and Kinsell’s (2024) study results, which found that ChatGPT may provide a variety of insights, thus improving students’ learning experience when using GenAI to aid an instructional design process.

On the other hand, other students used GenAI as a search engine to get direct answers without critically assessing the answers. The two instructors observed that the most prominent challenge was the superficial use of AI tools, which led to an illusory sense of achievement, as some participants believed that they had completed the exercise excellently. However, when the instructors evaluated these students’ answers, they were at a very low level (see Table 2). In this regard, Vargas-Murillo et al. (2023) reported that when students relied on AI to generate easy answers to accomplish their work, this could result in a “lack of creative thinking and research integrity, not to mention the inaccuracies yielded by this technology when not given exact prompts” (p. 130). Many researchers warn

about the shallow use of GenAI tools, as this could prevent students from developing critical thinking (Chan & Hu, 2023; Vargas-Murillo et al., 2023).

This study's analysis distinguished between two patterns of participants' use of ChatGPT (i.e., intellectual partner and information browser). Each pattern had certain usage traits that were noticed among the participants (see Table 4). Having different user patterns is similar to what Stojanov et al. (2024) found. They identified five unique profiles, including versatile low reliers, who exhibited minimal self-reported dependence throughout the university tasks, whereas all-rounders had high self-reported dependence when using ChatGPT; knowledge seekers scored high on activities such as material information, retrieval, acquisition, and summarizing of texts, while proactive learners focused more on collecting feedback, planning, and quizzing; and assignment delegators tended to depend on ChatGPT to compose assignments, complete homework, or even generate their assignments. The information browser pattern identified in this research represents behavior similar to that of knowledge seekers, who focus on knowledge acquisition, while the intellectual partner pattern represents behavior similar to that of proactive learners, who engage in intellectual communication with AI tools. However, the usage pattern identified in the current research is based on analyzing the participants' interviews and how they addressed the DTPGA activities, whereas Stojanov et al.'s (2024) study was based on the participants' self-reported degree of reliance on using ChatGPT to address various tasks.

Concerning the perceived benefits of using GenAI tools, the findings of this research indicate that the participants benefited from using GenAI at different levels (see Table 5). The basic level related to academic routine work, including proofreading, clarifying concepts, and improving writing standards. These findings are consistent with Almassaad et al.'s (2024) study, which found that learners use GenAI tools to define and clarify concepts, summarize the literature, and generate ideas. This kind of adoption to handle routine tasks is referred to as cognitive offloading by some researchers, meaning that it helps reduce the cognitive work required to finish a task and ultimately helps liberate the mind to engage with more sophisticated tasks (Lodge et al., 2023).

Meanwhile, the deeper level related to creative work, as the participants interacted intellectually with ChatGPT, which helped broaden their perspectives to understand and accomplish the tasks in more depth. Similar findings were reported by Elkhodr et al. (2023), who articulated that students who used ChatGPT exhibited enhanced performance in terms of functionality, user flow, and material comprehension compared to students who relied on search engines (Elkhodr et al., 2023). Chan and Hu (2023) reported that their study participants benefited from brainstorming assistance, research, and recognizing the potential for personalized learning. GenAI tools have also been found to provide diverse perspectives that boost the depth and breadth of instructional design tasks (DaCosta & Kinsell, 2024). Some researchers believe that the use of GenAI can be considered an extension of the human brain (Firat, 2023; Lodge et al., 2023), which could affect the future of students' learning and how they interact with information (Firat, 2023).

The current research also indicated that when the students interacted intellectually with ChatGPT, this could help boost their ability and productivity and save time. A similar result was reported by Al-Zahrani (2023), who found that when their participants engaged with GenAI, it broadened the scope of their projects and enhanced their efficiency. Dahri, Yahaya, Al-Rahmi, Aldraiweesh, et al. (2024) found that using ChatGPT helped students improve the clarity and quality of content and its consistency with learning objectives in addition to setting goals, organizing content, and formulating strategies when engaging in lesson design activities. Furthermore, the use of GenAI has been found to help accelerate learners' work, improve their experience (DaCosta & Kinsell, 2024), and save their time (Almassaad et al., 2024).

On the other hand, the study participants expressed many concerns (see Table 6) about the ethical use of AI, particularly the lack of guidelines on the proper usage of GenAI tools within universities.

This result is consistent with many studies' findings (e.g., Al-Zahrani, 2023; Chan & Hu, 2023; Husain, 2024; Jo, 2024; Samala et al., 2024) in which ethical concerns were a notable concern. Therefore, it is crucial to guarantee that the use of AI tools in education does not unintentionally cause harm to students or reinforce existing inequalities within educational environments (Yan et al., 2024). Moreover, it is important to issue a guide for university students explaining acceptable and unacceptable uses of AI tools. However, the researchers noticed from the participants' interviews that some students considered the use of AI tools to be the norm, and they believed that educators must explain why AI tools cannot be used. Therefore, educators within universities must establish proper usage rules for GenAI tools and raise students' awareness (Aldossary et al., 2024; Vargas-Murillo et al., 2023), as well as rethink appropriate assessment methods for the AI era (Vargas-Murillo et al., 2023). In addition, many studies have indicated that career risks and job replacements will emerge as the demand for some jobs will change (Chan & Hu, 2023; Dempere et al., 2023). Consequently, students must be prepared to engage with AI tools in a productive and beneficial manner to support their learning and increase their productivity.

Some participants in the current study found the limited capabilities of ChatGPT to be a concern, noting its lack of innovation, outdated information, inaccurate references, and potential bias. Similarly, unreliable information was expressed as a concern among Saudi students in Almassaad et al.'s (2024) study. GenAI's information accuracy has been found to be an important factor in predicting the acceptance and use of AI tools (Almulla, 2024; Dahri, Yahaya, Al-Rahmi, Vighio, et al., 2024). This was also confirmed by a study that found that the feedback and assessment quality of ChatGPT could affect learners' intention to adopt these tools (Almogren et al., 2024).

Another concern reported by some participants in the current research was negative feelings of frustration and self-doubt when they failed to convey their ideas to ChatGPT or when they compared its ideas to their own ideas. This could be attributed to a lack of proficiency in prompt engineering and the failure to provide ChatGPT with sufficient details. Likewise, technophobia or fear of using new technology was mentioned in Jo's (2024) study, which emphasized that technophobia could negatively impact behavioral intentions. Therefore, it is vital to raise students' awareness of the idea behind GenAI tools and how students can interact actively with these tools to support their learning (Jo, 2024).

Furthermore, the research results of this study indicated that some participants were concerned about the impact of AI overreliance on skill erosion, especially in relation to critical thinking and writing skills. This finding is consistent with Chan and Hu's (2023) study, in which the participants reported concerns regarding the impact of using AI tools on one's "holistic competencies" (Chan & Hu, 2023, p. 13) and an "illusory sense of achievement" was also reported in the current research. Thus, students must understand that working with GenAI demands a higher level of self-regulation skills since the accuracy and dependability of the information generated by GenAI are not guaranteed, and successful co-regulation requires the ability to enact human agency and manage learning processes (Lodge et al., 2023). This requires learners to self-report their learning objectives, assess AI replies regularly, and modify their learning prompts or techniques accordingly to utilize GenAI to support their learning without being overly reliant on AI to solve learning tasks or being influenced by AI responses (Lodge et al., 2023). Hutson and Plate (2023) highlighted the necessity of reorganizing educational programs to prioritize practical learning methods that emphasize the significance of contextual judgment as a fundamental pedagogical principle when using GenAI tools. Additionally, they emphasized the cultivation of sophisticated metacognitive skills, which will be important in future professional settings. Vargas-Murillo et al. (2023, p. 132) emphasized that:

New technologies are key to progressing innovation, and despite the critical views that many educators and institutions may have, the overall impact of AI-assisted learning can benefit the educational field, although only if students and teachers alike truly understand the possibilities that this technology can bring in the future.

In short, the current research found that the perceived benefits shaped through the actual use of GenAI boosted the study participants' productivity both in routine work and in creative work that requires intellectual interaction. However, despite the ease of using GenAI tools, many concerns can affect students' use of these tools, including ethical usage concerns, fears of overreliance on AI and skill erosion, and technophobia or fear of using new technology. All these factors influence students' adoption of the technology and their intention to use it in their future learning journeys. Thus, "increasing students' awareness and access to AI tools and addressing their concerns can facilitate the widespread adoption and effective integration of AI technologies, improving academic experiences and outcomes" (Sova et al., 2024, p. 1).

CONCLUSION

This study investigated the impact of using GenAI tools on Saudi postgraduate students' learning experiences by examining their usage, how they benefited from this technology and the challenges they encountered. The participants' GenAI usage included their practice in a planned activity (DTPGA activity) and their usage of GenAI tools in general during their studies. The researchers evaluated the 11 participants' DTPGA completed activities' answers and 11 logs of conversations that occurred with ChatGPT via specific rubrics and combined these with the participants' perspectives gathered from interviews to understand what they believed about GenAI usage and their actual use of GenAI tools for the DTPGA activity.

This study found that the nature of GenAI usage varied among the participants, resulting in two distinct usage patterns of interaction with GenAI tools (i.e., intellectual partner and information browser). The participants with the first pattern tended to communicate intellectually with ChatGPT (or other GenAI), selecting and evaluating the generated AI ideas, and some engaged with prototyping and testing the generated solutions. However, the participants with the second pattern mostly used ChatGPT as a search engine, getting direct answers and not assessing them critically, which could sometimes result in an illusory understanding when the participants were under the impression that they had performed exceptionally well in the DTPGA activity. However, upon evaluation by the instructors, it was determined that their answers were of a significantly poor standard.

The study participants highlighted many perceived benefits of using GenAI tools to enhance their academic skills development, such as improving academic writing, translation, and boosting their productivity, thus broadening their perspectives to understand and accomplish the tasks in more depth, as it could be considered an extension of the human brain. However, the participants also encountered many challenges, such as concerns about ethical usage, the limited capacity of ChatGPT, negative feelings of frustration and self-doubt, and concerns about an overreliance on GenAI, leading to the loss of some vital skills.

The widespread use of GenAI tools among students has become a reality that cannot be ignored, so there is a need for a paradigm shift in traditional teaching and learning to adapt to the capabilities of GenAI tools like ChatGPT that have the potential to develop students' learning experiences (Hutson & Plate, 2023). By understanding different GenAI usage patterns, teachers can better guide their students toward more effective use of these tools. Recognizing whether a student approaches GenAI as an intellectual partner or an information browser can help with tailoring educational strategies to promote deeper engagement. Educators can then design activities and evaluations that both assess and demonstrate effective interaction with GenAI, ensuring students maximize their learning potential. Additionally, reviewing GenAI interactions as part of student assessments can provide valuable insights into their learning progress. Furthermore, there is a need to raise learners' awareness about effective intellectual communication with GenAI tools, enlighten them about digital literacy and the importance of evaluating GenAI-generated answers, and provide them with ethical guidance on these tools. Moreover, the arrangement of workshops or seminars could enable students to explore the

combinations of GenAI tools and promote or discourage some behaviors while using GenAI tools for learning (Jiayu, 2023).

In summary, integrating GenAI tools efficiently and raising students' awareness to engage with these tools productively and beneficially can support students in co-regulating their learning. This could help students take an active role in their learning, which would empower and improve their learning experiences. This could ultimately help prepare students for future careers that require more intellectual skills in the AI era.

REFERENCES

- Aldossary, A. S., Aljindi, A. A., & Alamri, J. M. (2024). The role of generative AI in education: Perceptions of Saudi students. *Contemporary Educational Technology*, 16(4), ep536. <https://doi.org/10.30935/cedtech/15496>
- Almassaad, A., Alajlan, H., & Alebaikan, R. (2024). Student perceptions of generative artificial intelligence: Investigating utilization, benefits, and challenges in higher education. *Systems*, 12(10), 385. <https://doi.org/10.3390/systems12100385>
- Almogren, A. S., Al-Rahmi, W. M., & Dahri, N. A. (2024). Exploring factors influencing the acceptance of ChatGPT in higher education: A smart education perspective. *Heliyon*, 10(11), e31887 <https://doi.org/10.1016/j.heliyon.2024.e31887>
- Almulla, M. A. (2024). Investigating influencing factors of learning satisfaction in AI ChatGPT for research: University students perspective. *Heliyon*, 10(11), e32220. <https://doi.org/10.1016/j.heliyon.2024.e32220>
- Al-Zahrani, A. M. (2023). The impact of generative AI tools on researchers and research: Implications for academia in higher education. *Innovations in Education and Teaching International*, 61(5), 1029-1043. <https://doi.org/10.1080/14703297.2023.2271445>
- Birt, L., Scott, S., Cavers, D., Campbell, C., & Walter, F. (2016). Member checking: A tool to enhance trustworthiness or merely a nod to validation? *Qualitative Health Research*, 26(13), 1802-1811. <https://doi.org/10.1177/1049732316654870>
- Chan, C., & Hu, W. (2023). Students' voices on generative AI: Perceptions, benefits, and challenges in higher education. *International Journal of Educational Technology in Higher Education*, 20(1), 43. <https://doi.org/10.1186/s41239-023-00411-8>
- Chauke, T., Mkhize, T., Methi, L., & Dlamini, N. (2024). Postgraduate students' perceptions on the benefits associated with artificial intelligence tools for academic success: The use of the ChatGPT AI tool. *Journal of Curriculum Studies Research*, 6(1), 44-59. <https://doi.org/10.46303/jcsr.2024.4>
- Cohen, L., Manion, L., & Morrison, K. (2017). *Research methods in education* (8th ed.). Routledge. <https://doi.org/10.4324/9781315456539>
- Creswell, J. W., & Poth, C. N. (2017). *Qualitative inquiry and research design: Choosing among five approaches* (4th ed.). Sage.
- DaCosta, B., & Kinsell, C. (2024). Investigating media selection through ChatGPT: An exploratory study on generative artificial intelligence in the aid of instructional design. *Open Journal of Social Sciences*, 12(4), 187-227. <https://doi.org/10.4236/jss.2024.124014>
- Dahri, N. A., Yahaya, N., Al-Rahmi, W. M., Aldraiweesh, A., Alturki, U., Almutairy, S., Shutaleva, A., & Soomro, R. B. (2024). Extended TAM based acceptance of AI-Powered ChatGPT for supporting meta-cognitive self-regulated learning in education: A mixed-methods study. *Heliyon*, 10(8), e29317. <https://doi.org/10.1016/j.heliyon.2024.e29317>
- Dahri, N. A., Yahaya, N., Al-Rahmi, W. M., Vighio, M. S., Alblehai, F., Soomro, R. B., & Shutaleva, A. (2024). Investigating AI-based academic support acceptance and its impact on students' performance in Malaysian and Pakistani higher education institutions. *Education and Information Technologies*, 29, 18695-18744. <https://doi.org/10.1007/s10639-024-12599-x>
- Dai, Y., Liu, A., & Lim, C. P. (2023). Reconceptualizing ChatGPT and generative AI as a student-driven innovation in higher education. *Procedia CIRP*, 119, 84-90. <https://doi.org/10.1016/j.procir.2023.05.002>

The Impact of Generative AI Tools on Postgraduate Students' Learning Experiences

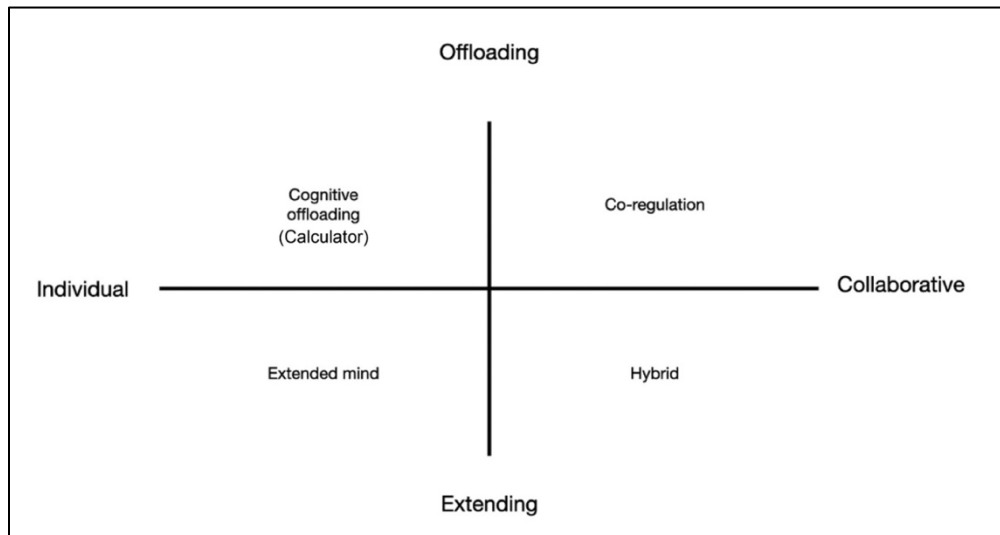
- Dempere, J., Modugu, K., Hesham, A., & Ramasamy, L. K. (2023). The impact of ChatGPT on higher education. *Frontiers in Education*, 8, 1206936. <https://doi.org/10.3389/feduc.2023.1206936>
- Denscombe, M. (2003). *The good research guide: For small-scale social research projects* (2nd ed.). Open University Press.
- Duong, C. D., Vu, T. N., & Ngo, T. V. N. (2023). Applying a modified technology acceptance model to explain higher education students' usage of ChatGPT: A serial multiple mediation model with knowledge sharing as a moderator. *The International Journal of Management Education*, 21(3), 100883. <https://doi.org/10.1016/j.ijme.2023.100883>
- Elkhodr, M., Gide, E., Wu, R., & Darwish, O. (2023). ICT students' perceptions towards ChatGPT: An experimental reflective lab analysis. *STEM Education*, 3(2), 70-88. <https://doi.org/10.3934/steme.2023006>
- Faisal, E. (2024). Unlock the potential for Saudi Arabian higher education: A systematic review of the benefits of ChatGPT. *Frontiers in Education*, 9, 1325601. <https://doi.org/10.3389/feduc.2024.1325601>
- Firat, M. (2023). What ChatGPT means for universities: Perceptions of scholars and students. *Journal of Applied Learning and Teaching*, 6(1), 57-63. <https://doi.org/10.37074/jalt.2023.6.1.22>
- Freeman, S., Eddy, S. L., McDonough, M., Smith, M. K., Okoroafor, N., Jordt, H., & Wenderoth, M. P. (2014). Active learning increases student performance in science, engineering, and mathematics. *Proceedings of the National Academy of Sciences*, 111(23), 8410-8415. <https://doi.org/10.1073/pnas.1319030111>
- Gibbs, G. R. (2012). *Analyzing qualitative data*. Sage.
- Gozali, I., Wijaya, A. R. T., Lie, A., Cahyono, B. Y., & Suryati, N. (2024). Leveraging the potential of ChatGPT as an automated writing evaluation (AWE) tool: Students' feedback literacy development and AWE tools integration framework. *The JAL T CALL Journal*, 20(1), 1–22. <https://doi.org/10.29140/jalt-call.v20n1.1200>
- Hattie, J., & Timperley, H. (2007). The power of feedback. *Review of Educational Research*, 77(1), 81-112. <https://doi.org/10.3102/003465430298487>
- Husain, A. (2024). Potentials of ChatGPT in computer programming: Insights from programming instructors. *Journal of Information Technology Education: Research*, 23, Article 2. <https://doi.org/10.28945/5240>
- Hutson, J., & Plate, D. (2023). Human-AI collaboration for smart education: Reframing applied learning to support metacognition. In A. Soofastaei (Ed.), *Advanced virtual assistants - A window to the virtual future* (pp. 194-203). IntechOpen. <https://doi.org/10.5772/intechopen.1001832>
- Javaid, M., Haleem, A., Singh, R. P., Khan, S., & Khan, I. H. (2023). Unlocking the opportunities through ChatGPT tool towards ameliorating the education system. *BenchCouncil Transactions on Benchmarks, Standards and Evaluations*, 3(2), 100115. <https://doi.org/10.1016/j.tbench.2023.100115>
- Jiayu, Y. (2023). Challenges and opportunities of generative artificial intelligence in higher education student educational management. *Advances in Educational Technology and Psychology*, 7(9), 92-96. <https://doi.org/10.23977/aetp.2023.070914>
- Jo, H. (2024). From concerns to benefits: A comprehensive study of ChatGPT usage in education. *International Journal of Educational Technology in Higher Education*, 2, Article 35. <https://doi.org/10.1186/s41239-024-00471-4>
- Johnson, P. S. (2022). *Gamified vocabulary learning for international students in the university EAP context* [Doctoral dissertation, University of Kansas].
- Kim, M., & Adlof, L. (2024). Adapting to the future: ChatGPT as a means for supporting constructivist learning environments. *TechTrends*, 68, 37-46. <https://doi.org/10.1007/s11528-023-00899-x>
- Kolb, D. A. (1984). *Experiential learning: Experience as the source of learning and development*. Prentice-Hall.
- Laato, S., Morschheuser, B., Hamari, J., & Björne, J. (2023, July). AI-assisted learning with ChatGPT and large language models: Implications for higher education. *Proceedings of the IEEE International Conference on Advanced Learning Technologies*, Orem, UT, USA, 226-230. <https://doi.org/10.1109/ICALT58122.2023.00072>

- Labadze, L., Grigolia, M., & Machaidze, L. (2023). Role of AI chatbots in education: Systematic literature review. *International Journal of Educational Technology in Higher Education*, 20, Article 56. <https://doi.org/10.1186/s41239-023-00426-1>
- Lodge, J. M., Yang, S., Furze, L., & Dawson, P. (2023). It's not like a calculator, so what is the relationship between learners and generative artificial intelligence? *Learning: Research and Practice*, 9(2), 117-124. <https://doi.org/10.1080/23735082.2023.2261106>
- Lugo, L. G. (2022). *A qualitative case study of students' perceptions of their experiences in undergraduate online courses* [Doctoral dissertation, St. John's University]. https://scholar.stjohns.edu/theses_dissertations/411
- Meşe, E., & Sevilen, Ç. (2021). Factors influencing EFL students' motivation in online learning: A qualitative case study. *Journal of Educational Technology & Online Learning*, 4(1), 11-22.
- Molenaar, I. (2022). The concept of hybrid human-AI regulation: Exemplifying how to support young learners' self-regulated learning. *Computers and Education: Artificial Intelligence*, 3, 100070. <https://doi.org/10.1016/j.caeai.2022.100070>
- National Research Council. (2000). *How people learn: Brain, mind, experience, and school: Expanded ed.* National Academy Press.
- Ngo, T. T. A., An, G. K., Nguyen, P. T., & Tran, T. T. (2024). Unlocking educational potential: Exploring students' satisfaction and sustainable engagement with ChatGPT using the ECM model. *Journal of Information Technology Education: Research*, 23, Article 21. <https://doi.org/10.28945/5344>
- Parsons, B., & Curry, J. H. (2024). Can ChatGPT pass graduate-level instructional design assignments? Potential implications of artificial intelligence in education and a call to action. *TechTrends*, 68, 67-78. <https://doi.org/10.1007/s11528-023-00912-3>
- Poenaru, L. F., Popescu, D., Hornoiu, R. I., & Lanfranchi, G. (2024). Professors versus students: An introductory bibliometric review of AI acceptance in higher education's specialisations of tertiary sector. *Proceedings of the International Conference on Economics and Social Sciences*, 6(1), 326-335.
- Rasul, T., Nair, S., Kalendra, D., Robin, M., Santini, F. de O., Ladeira, W. J., Sun, M., Day, I., Rather, R. A., & Heathcote, L. (2023). The role of ChatGPT in higher education: Benefits, challenges, and future research directions. *Journal of Applied Learning & Teaching*, 6(1), 41-56. <https://doi.org/10.37074/jalt.2023.6.1.29>
- Robson, C. (2011). *Real world research* (3rd ed.). Wiley.
- Salmon, G. (2013). *E-tivities: The key to active online learning*. Routledge. <https://doi.org/10.4324/9780203074640>
- Samala, A. D., Sokolova, E. V., Grassini, S., & Rawas, S. (2024). ChatGPT: A bibliometric analysis and visualization of emerging educational trends, challenges, and applications. *International Journal of Evaluation and Research in Education*, 13(4), 2374-2387. <http://doi.org/10.11591/ijere.v13i4.28119>
- Seidman, I. (2013). *Interviewing as qualitative research: A guide for researchers in education and the social sciences* (4th ed.). Teachers College Press.
- Silva, P. (2015). Davis' Technology Acceptance Model (TAM) (1989). In M. Al-Suqri, & A. Al-Aufi (Eds.), *Information seeking behavior and technology adoption: Theories and trends* (pp. 205-219). IGI Global. <https://doi.org/10.4018/978-1-4666-8156-9.ch013>
- Sova, R., Tudor, C., Tartavulea, C. V., & Dieaconescu, R. I. (2024). Artificial intelligence tool adoption in higher education: A structural equation modeling approach to understanding impact factors among economics students. *Electronics*, 13(18), 3632. <https://doi.org/10.3390/electronics13183632>
- Stojanov, A., Liu, Q., & Koh, J. H. L. (2024). University students' self-reported reliance on ChatGPT for learning: A latent profile analysis. *Computers and Education: Artificial Intelligence*, 6, 100243. <https://doi.org/10.1016/j.caeai.2024.100243>
- Stryker, C., & Scapicchio, M. (2024). *What is generative AI?* IBM. <https://www.ibm.com/topics/generative-ai>
- Taranikanti, V., & Davidson, C. J. (2023). Metacognition through an iterative anatomy AI chatbot: An innovative playing field for educating the future generation of medical students. *Anatomia*, 2(3), 271-281. <https://doi.org/10.3390/anatomia2030025>

- Vargas-Murillo, A. R., de la Asuncion, I. N. M., & de Jesús Guevara-Soto, F. (2023). Challenges and opportunities of AI-assisted learning: A systematic literature review on the impact of ChatGPT usage in higher education. *International Journal of Learning, Teaching and Educational Research*, 22(7), 122-135. <https://doi.org/10.26803/ijlter.22.7.7>
- Xu, X., Su, Y., Zhang, Y., Wu, Y., & Xu, X. (2024). Understanding learners' perceptions of ChatGPT: A thematic analysis of peer interviews among undergraduates and postgraduates in China. *Heliyon*, 10(4). <https://doi.org/10.1016/j.heliyon.2024.e26239>.
- Yan, L., Sha, L., Zhao, L., Li, Y., Martinez-Maldonado, R., Chen, G., Li, X., Jin, Y., & Gašević, D. (2024). Practical and ethical challenges of large language models in education: A systematic scoping review. *British Journal of Educational Technology*, 55(1), 90-112. <https://doi.org/10.1111/bjet.13370>
- Zhou, J., Shen, L., & Chen, W. (2024). How ChatGPT transformed teachers: The role of basic psychological needs in enhancing digital competence. *Frontiers in Psychology*, 15, 1458551. <https://doi.org/10.3389/fpsyg.2024.1458551>

APPENDIX A

Quadrant typology of human and machine interactions for education (Lodge et al., 2023, p. 119) used with permission:



APPENDIX B

Example of an interview transcript and analysis of thematic categories:

	SPK_2 00:10:40 امم، يسهل عليّ مثلا أشياء يعني مثلا في فيديو كنت بأسويه، أوكيه أنا أعرف أسوي أعرف أمنتج أعرف اا أسوي ال هذا ستوري بورد، وهذا الأشياء، بس حسيت ما عندي وقت، كفاية إلى أجل، من البداية أنا
تحاول تأكد انها تعرف عندها قدرة	تفكر وما ادري وشو. فطلبت منه اني اكتب لي سيناريو يعني، وكتب لي اسهل علي هذي المهمة اللي هي بالنسبة لي يعني.
الاستخدامات	شيء روتيني معتاد وسهل، أوكيه، أنا أعرف اسويها لي. بس امم ما ابغى يعني اب الجهد حاليا في ذلك الفترة يعني.
الفرق	في هذا الشيء البسيط، فهو رتيه لي وحسيت. يعني مره فرق معي يعني ارتحت مره يعني مثلا. في اني أكمل أنا الخطوات ويس، يعني مجرد اني أعدل وأبدأ أنفذ الأشياء العملية اللي ما تحتاج امم يعني ما تحتاج جهد عقلي يعني؟ وكلها تحتاج جهد عقلي بس يعني؟ فمثل هذا الشيء يسهل علي يختصر علي اا الأشياء البسيطة الروتينية.
الحالات التي أكدت تستخدمها فيه	SPK_2 00:11:39 ال زي كذا، هذا صراحة أغلب شيء يعني أنا استخدمته فيه.
	SPK_1 00:11:44 حلو، يعني كان، كان عندك فيديو وسويتني فيه؟

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