Upskilling teachers to use generative artificial intelligence: The TPTP approach for sustainable teacher support and development

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There is a growing need to upskill higher education (HE) teachers for the effective and responsible integration of generative artificial intelligence (GenAI) in their classrooms. This case study sought to address this growing need by designing and delivering a training course for educators, focusing on the use of ChatGPT as it was the most commonly used tool at the time. The professional development opportunity lasted 5 weeks and covered critical aspects of GenAI use for teaching and learning. Data collected from participants included discussion board entries, written tasks and focus groups. Findings highlight some of the common practices and concerns HE practitioners had regarding the use of GenAI in their practice. The findings also emphasise the importance of providing teachers with customised GenAI training to facilitate its effective integration in HE contexts. Finally, based on the findings of this study, we propose the TPTP Support System for Teachers, built upon four key areas: teacher training, pedagogical support, testing revamp and practice networks. This system aims to guide institutional efforts to facilitate and support educators as they integrate GenAI in HE.

Implications for practice or policy:

- Teacher training is necessary for the effective integration of GenAI in HE contexts.
- Institutions should provide support in four key areas to facilitate educators' effective and responsible use of GenAI in HE. The TPTP Support System for Teachers can be leveraged for these planning and support initiatives.

Keywords: generative artificial intelligence (GenAI), artificial intelligence in education (AIED), artificial intelligence, teacher training, professional development

Introduction

Recent reports indicate that many industries are becoming more dependent on generative artificial intelligence (GenAI) tools, and the job market will expect employees (i.e., our current students) to be fully equipped to use these tools effectively, critically and creatively (Chui et al., 2023; Frey & Osborne, 2023; Maslej et al., 2023; Pelletier et al., 2024; Waring, 2024). Therefore, integrating these tools into our classrooms is bound to become a reality that teachers cannot avoid, and this new reality requires preparing and training teachers to understand and integrate GenAI into their practice while still maintaining effective learning environments. The growing need for teacher GenAI training has been highlighted by many researchers (Al-Ali et al., 2024; Lodge et al., 2023; Mathew & Stefaniak, 2024; Ng et al., 2023). Multiple factors underpin their calls for teacher training. Firstly, the way GenAI tools operate is unique. That is, to effectively utilise GenAI, a user must develop some kind of familiarity with the way these tools operate and, more importantly, with their limitations. The UNESCO Assistant Director-General for Education elaborated, "Future learning and training systems must equip all people with core AI competencies, including understanding of how AI collects and can manipulate data, and skills to ensure safety and protection of personal data" (Giannini, 2023, p. 1). Acquiring this basic level of understanding of the way GenAI tools are built is necessary as it will drastically shape teachers' ability to incorporate these tools into their practice.

Another critical factor driving the need for teacher training is the unprecedented speed at which these tools are being introduced and developed (Lodge et al., 2023). For example, ChatGPT launched in November 2022 with text-only capabilities, before introducing drastic changes that allow for audio and video features in May 2024 (OpenAI, 2024a, 2024b). This development introduces new implications for educators to consider. Thompson et al. (2023) anticipated such a need as they encouraged institutions to "continually update their knowledge and skills in relation to generative AI" (p. 3). That said, this frequent need for staying abreast of changes and developments is challenging given teachers' extensively documented heavy workload (Easthope & Easthope, 2000; Kim, 2019; Selwood & Pilkington, 2005; Watermeyer et al., 2023). A well-designed training course would bridge these knowledge gaps in ways that do not overload teachers.

Finally, GenAI teacher training is needed because the effective integration of GenAI tools in education is not inherently guaranteed. When computers were first introduced into the classroom, Mehan (1989) noted, "A microcomputer in a classroom is a social practice and not a technology. The crucial ingredient is people's experience with the machine, not its 'inherent' features. It is what people do with the machine, not the machine itself, that makes a difference" (p. 19). Modern technology still upholds Mehan's observation, an observation that underscores the importance of focusing on the experience teachers can create with GenAI tools in educational settings and the training needed to foster this experience. GenAI training for teachers is not merely about the tools, but rather about how educators and learners interact with these tools to foster a conducive learning environment.

Ultimately, these critical factors not only showcase the need for more research into GenAI teacher training in higher education (HE) contexts, but they also highlight the need to develop a research-based approach to supporting educators' efforts as they integrate GenAI into their practice. This study aims to address both needs, and it proposes the TPTP Support System for Teachers. As suggested by our findings, four critical areas of support are required to support teachers' GenAI integration efforts: technical training, pedagogical support, testing revamp, and practice networks. Although the first two aspects can be covered by a well-designed training course, the last two require institutional engagement and support. A more detailed discussion of the model and its four dimensions is offered in the discussion.

The remainder of this paper is structured as follows: The next section addresses the research gap in GenAI teacher training and outlines the study objectives. The Methodology section details the mixed-methods design, analysing data from surveys, focus groups and written tasks. Following this, key findings address the two main guiding research questions. The discussion then examines implications for teacher practice, training and policy, proposing the TPTP Support System for Teachers. The paper concludes by addressing limitations and future research directions.

Research gap and study objectives

With growing calls to provide teachers with GenAI training, empirical studies thus far have rarely focused on GenAI training courses for teachers in the context of HE. For example, Moorhouse et al. (2024) shared the results of their 11-week intervention programme for pre-service language teachers as part of their master's degree programme. Although their study addressed the need for research into GenAI training, their participants were graduate students whose teaching experience did not involve HE contexts. As well, their programme was offered to participants who were active graduate students enrolled in an English language teaching master's programme – not full-time teachers. The dynamics of a graduate programme are different from those of one-off training courses that full-time teachers volunteer to join. Similarly, Ding et al. (2024) reported the results of a "case-based learning approach" (p. 4) to develop science teachers' AI literacy. Their study targeted the need for teacher training; only it focused primarily on K-12 teachers. In fact, in their conclusions, Ding et al. recommended more research into teacher training for "diverse educational settings, including a broader range of subject areas and grade levels" (p. 11). Another study, by Nyaaba and Zhai (2024), targeted a wider range of educators; however, their training was limited to a single webinar that aimed to "sensitize teacher educators about GAI and to collect their insights, particularly in areas where they may seek assistance" (p. 2). One of their main findings called for efforts

to inform educators about the relevant technical aspects of GenAI to encourage adoption of the technology for teaching and learning. It must be noted, as well, that the pace of change and development in GenAI technologies presents significant challenges to those creating meaningful training. It is likely that publication timelines mean many current training initiatives are yet to be reported. Some significant examples of training courses include Harnessing Artificial Intelligence for Teaching (University of Maryland, n.d.), edX: Introduction to ChatGPT (Amigot, n.d.) and Google AI for Anyone (Moroney, 2024).

Therefore, there is a growing need for empirical research into effective ways to provide HE educators with GenAI training specifically designed for teachers. More specifically, more research-based guidance is needed to inform the design and delivery of professional development and training opportunities for educators. This study aimed to address this need. It reports the results of a training course designed for HE teachers. Findings from the study highlight the need for four critical areas to fully support teachers' GenAI integration efforts; these four areas will be elaborated on in the Discussion section as the study outlines the TPTP Support System for Teachers.

Methodology

Study design

This study addressed the growing need to provide HE teachers with GenAI training. It aimed to answer two main research questions (RQs):

- RQ1: What are teachers' perceptions and concerns about the use of GenAI?
- RQ2: What training strategies are most effective for preparing teachers to use GenAI?

To answer these questions, a training course was developed to discuss ChatGPT and its educational use and implications. It should also be noted that our research was conducted in early 2023 in the initial stages of the GenAI wave, when participants' focus and interest were primarily geared towards ChatGPT. Therefore, although the research and course initially centred on ChatGPT, the course covered GenAI in general using ChatGPT as a prime example, and other GenAI tools were highlighted in the final weeks.

As summarised in Figure 1, this project encompassed two iterations of the training course, targeting HE educators. The initial implementation served as a pilot study, involving 21 educators from a United Arab Emirates-based HE institution. The second involved 15 educators from diverse academic backgrounds – including language studies, computer science and quality assurance – and from HE institutions around the world.

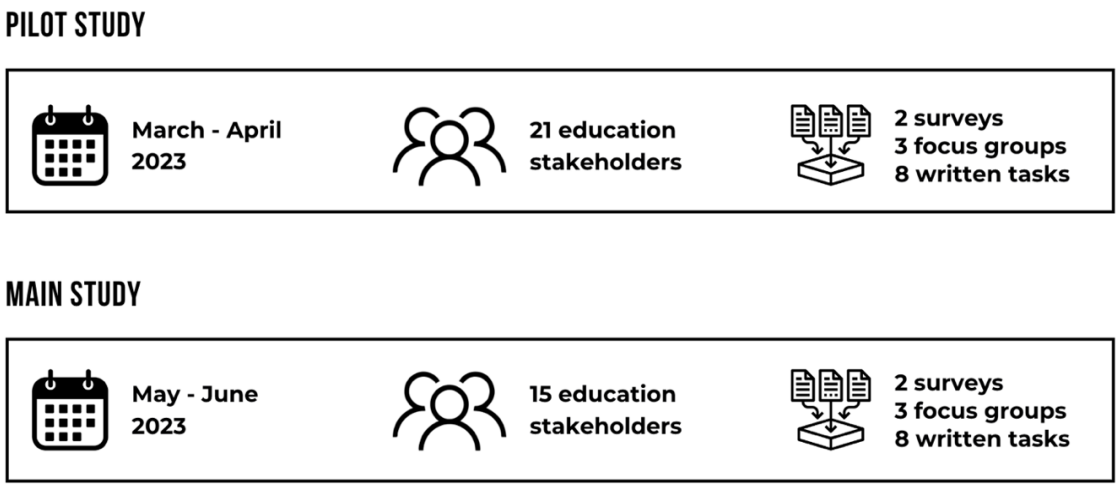

Figure 1. A summary of the study design

Data collection and analysis

Participants were recruited through a social media post announcing the course. With ubiquitous computing, it is rare to find teachers who are not exposed to technology and proficient to some degree in the use of classroom software and hardware. This group of 15 participants was no different. All possessed postgraduate qualifications and had 10 years or more experience in their subject. As illustrated in Figure 2, the group of participants was a diverse, well-informed, well-educated and experienced group of educators, and thus their input gives valuable insight into current attitudes and approaches to GenAI across a range of contexts. Ethical permission was obtained from all participants through a consent form emailed to them upon joining the course. All data were stored on secure, password-protected websites and folders, and participant anonymity was maintained by referring to them with coded identifiers, for example, T1 and T2.

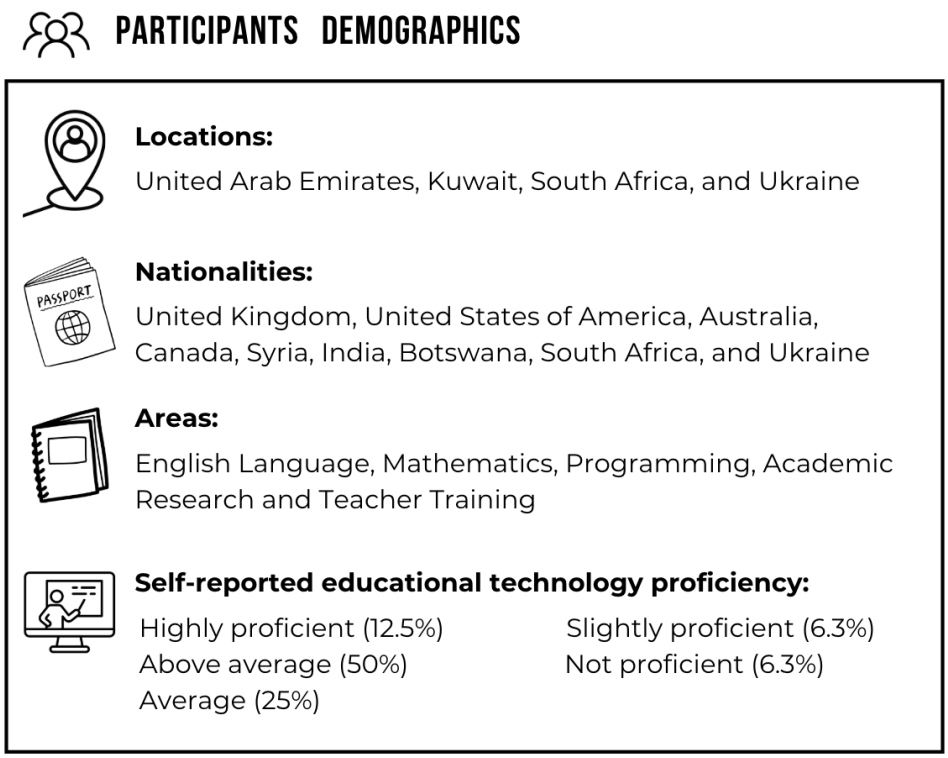

Figure 2. Demographic overview of study participants (aggregated data to protect privacy)

Data collection occurred at multiple points: through a pre-course survey assessing participants' GenAI familiarity and needs, and during the course via discussion boards, assignments and online meetings. See Figure 3 for a summary of participants' engagement throughout the course. Thematic analysis then occurred in order to identify, analyse and report patterns and themes within the data. All data were categorised in Excel by theme, week, participant and collection point to track progress and attitudes. Insights from the pilot group informed the redesign of the second course iteration, detailed in subsequent sections.

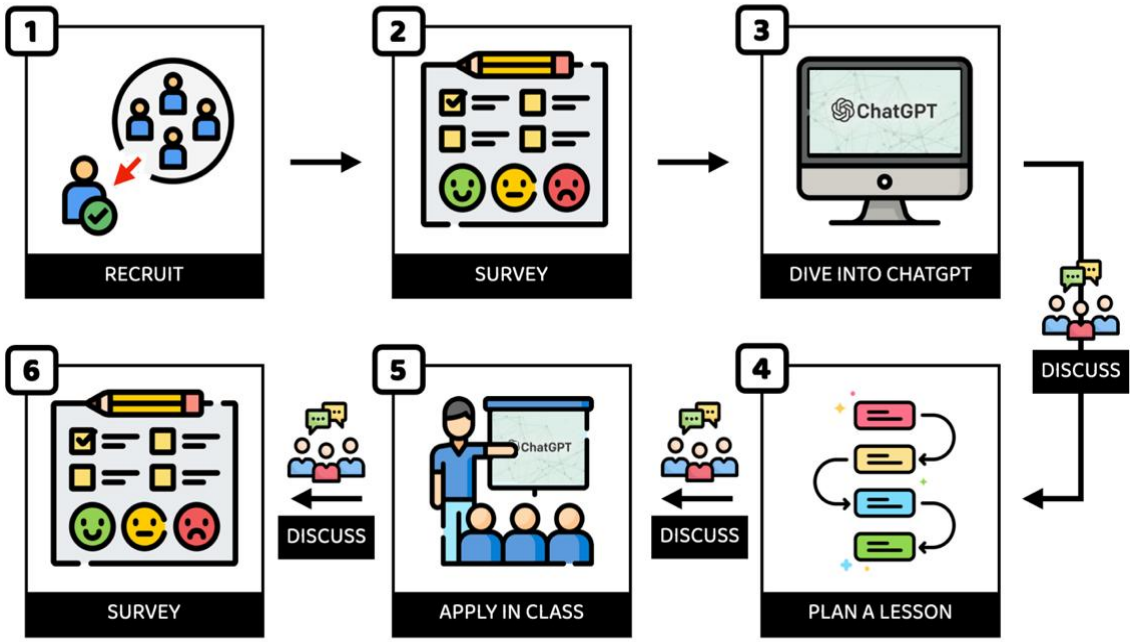

Figure 3. Course journey for participants

Findings

RQ1: What are teachers' perceptions and concerns about the use of GenAI?

As noted in the previous section, the course focused on ChatGPT as the primary GenAI example, reflecting educators' interests and familiarity during the early stages of the GenAI wave. The course centred on ChatGPT while also covering general GenAI aspects and other tools in later stages. Consequently, the study's findings primarily report teachers' perceptions and concerns about ChatGPT specifically, acknowledging its unique features compared to other GenAI tools.

Initial attitudes towards ChatGPT

In terms of ChatGPT, experience varies, reflecting a spectrum of familiarity. T1 described themselves as "quite familiar" and was using ChatGPT for "brainstorming and generating lesson ideas," T4 described themselves as "familiar but not a pro," while T9 professed to be "a novice user". In general, there was a mix of "cautious optimism" (T6) and "excitement and enthusiasm" (T7) regarding ChatGPT.

At the same time, the group recognised the need to strike a balance that maximises the benefits of ChatGPT without compromising critical thinking, human interaction and the educational process. This duality is evident in post titles on the discussion board: A Friend and a Challenge, From Sceptic to Enthusiast, Is ChatGPT Friend or Foe? and Chat GPT: Taming the Beast. These titles recognise the polarising attitudes towards this new tool.

The findings were categorised into three key areas: positive applications, such as enhancing lesson plan; challenges, including ethical concerns and AI hallucinations; and the need for institutional guidelines and teacher training. Each area will now be examined in more detail.

Positive applications

There is clearly a desire to get to grips with this new, disruptive tool. An immediate adoption is the potential of ChatGPT for generating lesson materials, perhaps an unsurprising focus given that the participants were practising teachers. This can be further broken down into six main themes: brainstorming ideas for discussion, generating cloze tests and other vocabulary or grammar activities for language development, generating topics for discussion, generating topics for writing, generating

example essays, both good and bad, and generating reading passages. Other activities mentioned included introducing students to design thinking, teaching programming concepts and provoking a discussion around stress and coping mechanisms in a war-affected country (T4, 7 and 10).

Although these initial ideas saw ChatGPT as a GenAI tool employed by teachers for the classroom, administrative tasks such as lesson planning and scheduling were also mentioned (T1). Furthermore, there was also discussion as to how ChatGPT might be used as a student-centred tool. For example, students could use it to summarise academic articles or create revision materials from student notes. As a language teacher, T3 noted that it could provide "individual help" with constructing sentences and paragraphs, giving "tips on punctuation, spelling, grammar, vocab etc". T3 went on to suggest that students could use ChatGPT to produce "individualized reading practices catered to their level and interests". This could also be of great benefit to students with special educational needs. For example, T8 mentioned that ChatGPT greatly facilitates adapting materials to differentiate for a range of needs and that other AI applications can be used for text to speech for visually impaired students or those with reading difficulties.

The participants' experiences of implementing ChatGPT- infused activities were largely positive, with T7 reporting of their reading class that "the lesson was a success". In this example, the participant created a reading text tailored to the students' interest and level and generated comprehension questions with a post-reading discussion task. One participant (T10) implemented a discussion activity based on ChatGPT-generated prompts and found their students pleasantly surprised to learn their teacher was also using GenAI, which they had "thought was their secret weapon" (T10). At the same time, limitations were recognised. T8 noticed that some generated reading texts had a "redundancy in terms of ideas" while T2 noted that a text with comprehension questions still needed "quite a lot of work to make it effective for student learning and teaching". In some cases, questions were repetitive or the language generated was too challenging for language learners. Teacher evaluation and input remained key. As an example, one teacher in the pilot noted that answers generated to mathematics problems were often incorrect.

Challenges

The overriding concerns around ChatGPT relate to ethics and academic integrity, and in particular to plagiarism. Students are already using it to produce work, and teachers fear it is inevitable that students will use ChatGPT to *help* them complete projects and assignments. However, what students see as *helping* may, in fact, lead to accusations of academic dishonesty. This concern echoed throughout the course. For those teaching a skill such as programming, those using ChatGPT cannot be identified "due to the nature of the questions we provide" T8. A language teacher stated, "Oh great! Another cheating tool to contend with!!" (T3).

To counter this challenge, several participants mentioned the need to change the way teachers assess students' learning. If they do not do this, then "the temptation to use ChatGPT to cheat will be too great and far too easy" (T2). For example, T1 stated that teachers should focus on "higher-order thinking skills (HOTS), synthesizing and applying knowledge", rather than traditional summative assessments such as a written essay. Another participant (T3) planned to ask students to show drafts as well as the final version of any written pieces of work. In this way, the teacher can promote ethical use – the student drafts their piece then uses ChatGPT to refine it, but submits both versions. Although teachers may be able to change the way they assess their own students, they may lack the agency to do so at an institutional level, but the participants showed a willingness to adapt and change their own approach, at least at the classroom level, in order to promote ethical use, for example, revising a draft or taking a different approach to the final product used to assess student learning. Interestingly, none of the cohort mentioned using any of the current tools that claim to be able to detect AI usage. This is a positive omission – the participants were interested in training students in ethical transparent use rather than catching and punishing transgressions. We will return to this in the next section – The need for institutional guidelines and teacher training.

There are also concerns over the accuracy of the information produced. As we have seen, GenAI is susceptible to *AI hallucinations*, a term used to refer to hard-to-detect, superficially convincing fabrications (Ji et al., 2023). As T6 stated, they are concerned about "the accuracy of information

provided" as it "may not always be reliable … and could lead students astray". If students simply believe everything that is generated, this could lead to *uncritical cheating*. In other words, students will simply ask for answers to, for example, an essay prompt and submit what has been generated without further thought. However, teachers are already seeing a potential teaching point. By using the hallucinations and biases created, students can be taught about accuracy, fact-checking, reliability of sources. (T1, T4, T7, T9) For example, ChatGPT could generate a programme, and programming students could check the code for errors. In other subjects, students could check the veracity of information against a reliable source. For example, history students could ask for a text about the life of King Henry VIII of England and then check this against encyclopedia entries. Generated articles could also be checked for inclusivity and bias, under the guidance of a teacher, so that students learn to carefully proof and check artificially generated information. These are likely to become increasingly valuable skills as the use of GenAI increases throughout education and the workplace.

As we have seen, the participants' concerns were not simply expressed as dystopian distrust or Luddite reaction to new technology. The concerns were tempered with the recognition that ChatGPT needs to be approached positively, and, like any new tool, we need to train teachers and students how to use it effectively and, most importantly, ethically. We will now discuss this point.

The need for institutional guidelines and teacher training

Although many universities are now creating institutional policies and guidance, as well as training, at the time this course ran none of the participants were aware of these existing in their own workplaces. As one participant mentioned, "in my university we have no restrictions on using AI … so it's up to me" (T10). T1 was able to point the group towards a guide for updating academic honesty policies in the age of AI that a well-known anti-plagiarism software company had produced, but nobody had received direct guidance or clear direction from their own institutions. As we have seen, it is crucial that teachers – and students – are trained to use ChatGPT and other GenAI tools effectively and ethically. Challenges can be "transformed into valuable teaching moments" (T1), but changing the approach to assessment, as mentioned in the previous section, needs to be embraced at the institutional level. These changes should be multi-voiced – teachers on the front line need to be able to give their input (T3, T11, T12).

Although many universities now provide AI usage guidelines in their library reference guides, these often emphasise that unauthorised AI use in assessments constitutes academic dishonesty. Effective training, guidance on appropriate, transparent usage, and a change of mindset over assessment are challenges that all institutions need to embrace.

RQ2: What training strategies are most effective for preparing teachers to use GenAI?

Learning outcomes and materials development

The GenAI training course had three main learning outcomes (LOs):

(1) Familiarise teachers with ChatGPT as a tool; explore its capabilities and limitations
(2) Highlight relevant and effective ways to use ChatGPT for teaching and learning
(3) Discuss the implications of using ChatGPT for teaching and learning.

To address LO1, a dedicated session explored GenAI's operational principles and limitations. Based on feedback from the pilot group, this technical content was separated from LO2 to allow deeper technical coverage. The session balanced technical depth with accessibility for non-engineers, focusing on three core concepts: training data fundamentals, GenAI's data utilisation and its generation processes. Following this technical foundation, the session introduced prompt engineering principles to optimise GenAI interactions and improve output quality (Eager & Brunton, 2023; Johnson, 2023; Knoth et al., 2024). Figure 4 shows an example of two prompts discussed during the course. Data analysis revealed that understanding GenAI's technical fundamentals enabled teachers to better grasp its capabilities and limitations. Notably, this knowledge alleviated concerns among some educators who were apprehensive about GenAI making teachers redundant. Developing a better understanding of the limitations of GenAI tools increased their willingness to explore GenAI applications in their classrooms.

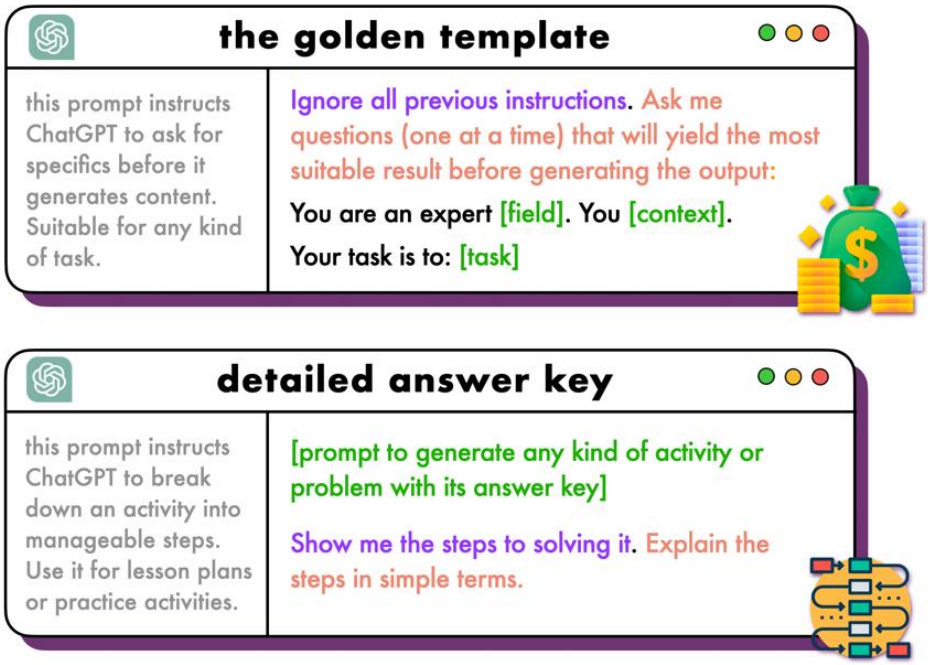

Figure 4. An example of prompts discussed during the training course

For LO2, the course focused on the practical applications of GenAI, by examining published educator experiences and HE case studies (e.g., Adıgüzel et al., 2023; Baidoo-Anu & Ansah, 2023; Miao et al., 2021; Miao & Holmes, 2023; Sabzalieva & Valentini, 2023). Insights from the researchers' own practice and previous cohort participants provided additional context, while participants were encouraged to reflect on these examples through the lens of their own teaching experience. As participants reflected on their own practice, pedagogical knowledge and learners' needs, their ability to plan for and conceptualise the integration of GenAI into their practice was amplified. This was one of aspects that T14 appreciated about the course: "The emphasis on pedagogical contextualisation and constant guard against presenting ChatGPT to students as solid expertise, and rightly so because students must know about its 'false expertise' in many areas of learning".

Finally, LO3 permeated the entire course, with a heightened focus in the final week addressing implications of GenAI for assessment, curriculum redesign and students' AI competencies. This discussion was critical for looking beyond the classroom level of GenAI implementation. During these discussions, participants emphasised the need for institutional support and policy redesign.

Course design and assignments

The course was built around Wenger's (1998) concept of community of practice – "It is a process of learning how to put knowledge into practice through engagement in practice within a community of practitioners" (Schlager & Fusco, 2003, p. 205). Hence, the course was designed to encourage participants to learn with and from each other through structured breakout discussions and asynchronous discussion boards. Throughout the course, participants engaged in peer feedback, instructor interactions and collective development of GenAI teaching practices. As shown in Figure 5, weekly themes structured content delivery and guided participants' discussions and engagement with GenAI. These themes and required course activities were communicated to participants in the initial course outline.

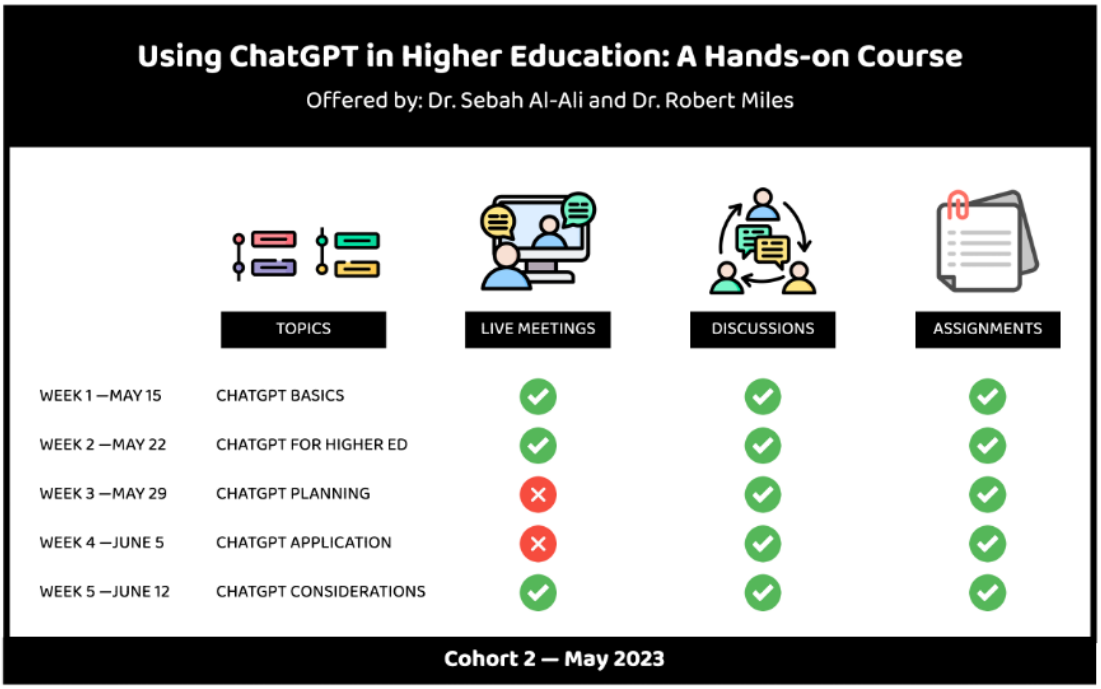

Figure 5. Course outline

Weekly discussion boards were visible to all participants, while assignments were submitted privately to trainers. Participants responded to theme-related questions on the discussion boards and were required to engage with at least two colleagues' posts to foster community interaction (see Figure 6). The discussion board component emerged as one of the course's most valued elements according to participant feedback: "I enjoyed the discussion forums. The questions were thought provoking, and reading the entries of others was very interesting" (T13). Weekly assignments aligned with course themes and prompted reflection on GenAI applications in HE and in participants' own practice. Participant submissions informed ongoing course modifications and content covered in meetings to optimise learning outcomes.

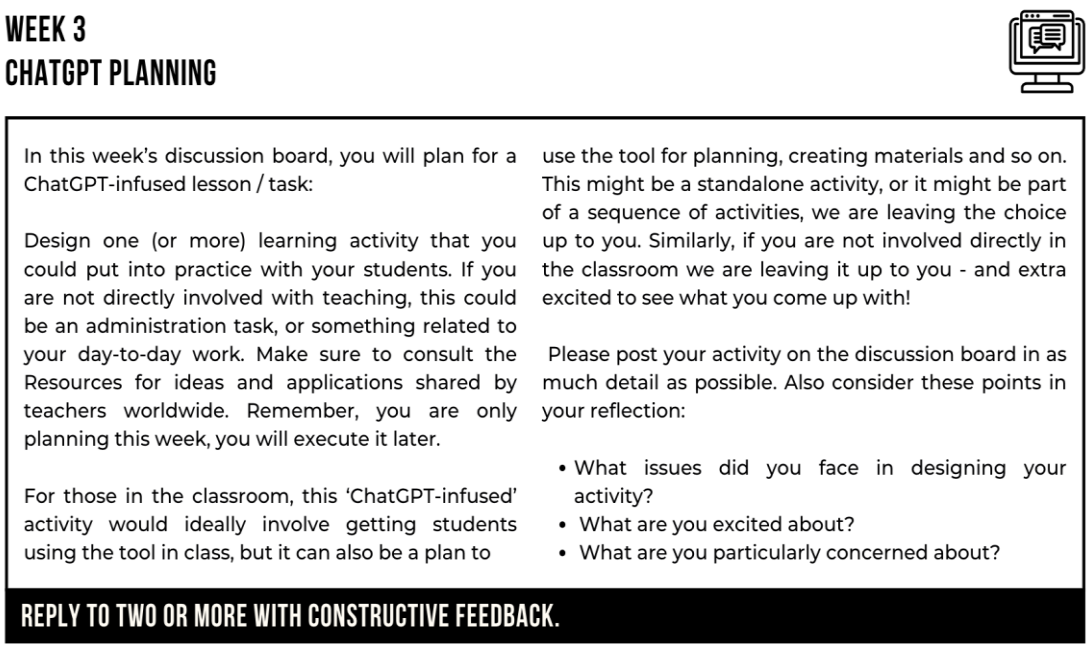

Figure 6. An example of a weekly discussion board task

Meetings were online and scheduled for 3 weeks instead of 5, but feedback indicated that participants would appreciate weekly live meetings. T10 commented, “Your course is just fantastic! Maybe more online meetings. I have no other thoughts”. Meetings did not exceed 90 minutes. Each consisted of an interactive presentation, guided breakout discussions and a weekly task overview. The format encouraged continuous participant engagement through questions and suggestions, with the breakout sessions receiving particularly positive feedback. Overall, the structure of the course was effective, encouraged participation and allowed for flexibility given the busy schedules of the participants.

The course pace was an issue for some participants. It was structured to be for 5 weeks mainly because it was assumed that educators would appreciate a shorter engagement. T5 noted, “It was not overwhelming in the time frame given – well paced and reasonable workload”. However, since participants were expected to explore tools independently for assignments and discussions, some struggled to finish tasks despite full attendance and engagement for the entire duration of the course. Therefore, it could be worth considering extending each theme to a 2-week period to enhance accessibility and better support educators managing substantial teaching responsibilities.

Discussion

Implications for integrating GenAI in HE

Although ChatGPT has been a major disruption to the classroom, those at the sharp end of education are willing – and able – to rise to the challenge. The approach of many institutions, to ban the use of ChatGPT and other types of GenAI, is not the answer and is clearly not one favoured by teachers at the practical forefront of education, such as those who participated in the course. One major issue is that if teachers do not address AI constructively, they risk creating a fraud triangle (see Figure 7 for an illustration).

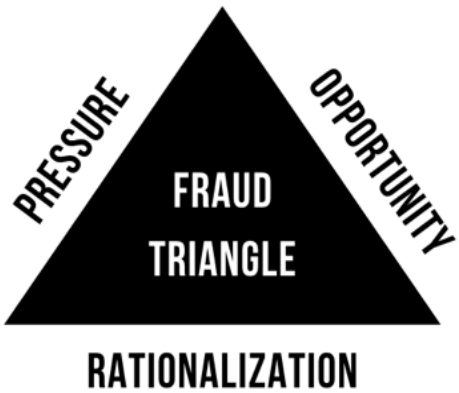

Figure 7. The fraud triangle

A fraud triangle (Albrecht et al., 2008) occurs when individuals perceive pressure, see an opportunity and are able to rationalise their decision to commit fraud. Originally, the fraud triangle applied to financial fraud in business and industry scenarios. This could be fraud against a company (e.g., embezzlement) or fraud on behalf of a company (e.g., fraudulent financial statements to make a company’s performance appear better than it is). In either case, there is perceived pressure. The individual may have personal finance issues such as debts or a gambling addiction. The company fraudster may have perceived pressure from shareholders and the board of directors. In either case, there is a perceived opportunity that allows for the fraud to be committed with little risk of being caught, and rationalisation then occurs at a personal level. Debts have been cleared, boards and investors are satisfied.

In education, this pressure is created with summative assessments and then confirmed with the often-high costs of education that combine with societal pressure to succeed, to pass. This pressure may then force students to rationalise academic dishonesty. A pass-at-any-cost mentality is being fostered. This creates the perceived pressure on the student. The opportunity, GenAI such as ChatGPT, now exists, and students feel there is little chance of getting caught. Success on the assessment then rationalises and justifies their action. The new tool – GenAI – has created a new opportunity for academic dishonesty that is scaring institutions and educators into knee-jerk reactions.

However, educators need to look instead at the fraud triangle education has created and then change the current approach. If the focus is moved to the process and the pressure removed from the outcome, educators and institutions can reassess how they assess and perhaps remove the fraud triangle from the equation. Creating a fraud triangle and looking to punish academic users is a dystopian solution. It is necessary to look forwards, not backwards. Institutions, governments and nations need instead to focus on policies that support a triple approach of AI literacy, AI ethics and AI academic integrity. There is a need to revisit pedagogy from policy down to practice – and then from practice back up to policy – in order to embrace the opportunities AI can bring, not only to education but to society in general. The triple approach is shown in Figure 8.

Figure 8. The triple approach

This triple approach needs to be the basis of all approaches towards the use of ChatGPT and other GenAI tools in education. Once this becomes a central tenet of the approach to this new tool, educators and institutions can move ahead with more confidence. While challenging, this is not impossible. AI literacy is obviously promoted through training and the incorporation of AI-related tasks into the curriculum, for example, solving real-world tasks. AI ethics committees can be established to provide guidelines that ensure equity and fairness, while an AI disclosure policy that insists students document how AI has contributed to their work will promote AI academic integrity. A good starting point for institutions is the work already done at UNESCO with their AI frameworks for teacher and student competencies (Miao & Cukurova, 2024). These works take a practical approach to building integrity, literacy and ethics in the practice of key stakeholders.

Implications for upskilling teachers in HE

This research project was built on the premise that upskilling educators is essential for the effective integration of GenAI in education. Many researchers and educators have shared this need (Al-Ali et al., 2024; Lodge et al., 2023; Mathew & Stefaniak, 2024; Ng et al., 2023). The study's findings reveal that effective integration of GenAI in education requires addressing four critical areas of teacher support and development, as outlined in the TPTP Support System for Teachers in Figure 9. The first and second aspects can be covered in a well-designed training course for teachers. The third and fourth aspects require institutional engagement.

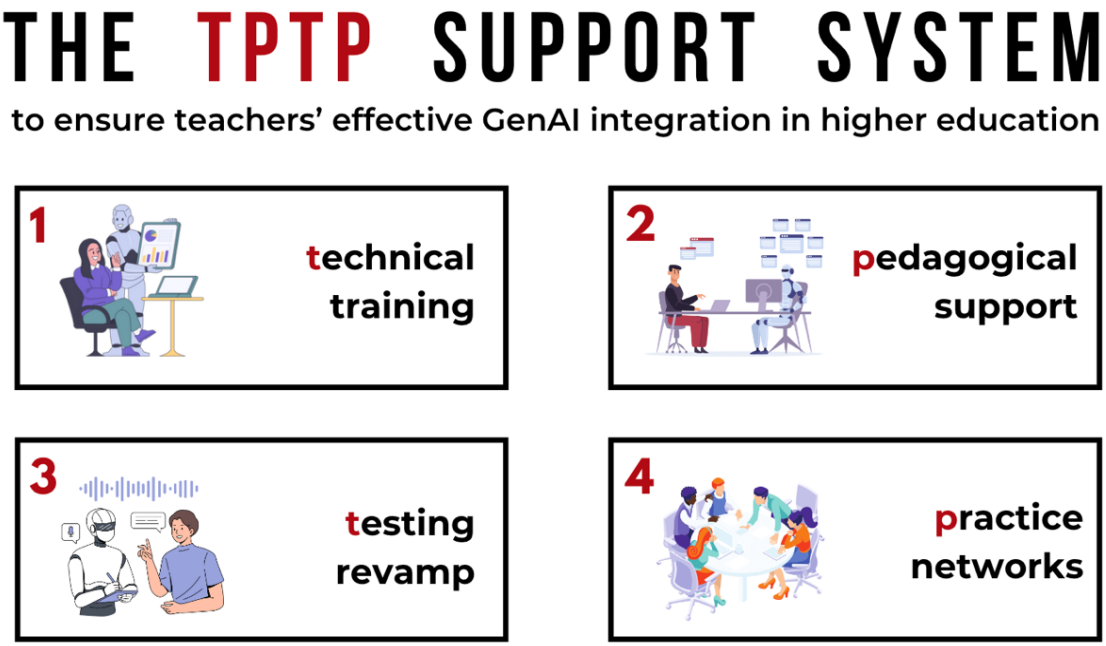

Figure 9. The TPTP Support System for Teachers

The first aspect is technical training. As previously discussed, educators, as well as users in general, will struggle to set appropriate expectations of GenAI unless they understand how GenAI tools operate and the critical role played by the kind and scope of their training data. It would also be harder to realise GenAI tools' limitations and to optimise their interaction and output. Technical training should be accessible to non-engineering educators and should address four main questions:

1.1 How do GenAI tools operate?
1.2 What are the limitations and red flags?
1.3 How to effectively prompt GenAI?
1.4 How to critically examine GenAI content?

It should be noted here that the skill set needed for the critical examination of GenAI content differs from the common and traditional understanding of critical examination of online content. The problems that arise due to how GenAI operates are unique and require a different approach. More research needs to be directed at this area to define effective ways to critically examine output generated by GenAI in educational contexts (Bearman et al., 2024).

Another aspect for institutions, trainers and course developers to consider as they attempt to prepare and support teachers to utilise GenAI is pedagogical support. This area is meant to facilitate teachers' realisation of GenAI as a learning tool in the classroom. Therefore, these four main questions need to be addressed:

2.1 How do we set up a GenAI-friendly environment?
2.2 What kinds or levels of learning allow for GenAI?
2.3 How do we ensure the responsible use of GenAI?
2.4 How do we build a safe GenAI-infused environment?

When addressing these questions, course developers and trainers should consider the institution's policy, assessment strategies and course design practices. Although academic integrity and conduct guidelines are broadly consistent across institutions, the specific limits vary based on the kinds of assessments and courses provided by each institution. Answering these questions should account for these limits and/or seek to redefine their boundaries in light of GenAI (Luo, 2024). It is also important that while the training course seeks to address these points, there should be room for teachers to discuss and reflect upon their

experience as they engage with the training course, allowing teachers to contextualise their own teaching practice and learners' needs.

The third aspect for teacher support is testing revamp. It should cover three main questions:

3.1 How do we develop the learning outcomes to account for the existence of GenAI?
3.2 What do we change about assessments to allow students to utilise GenAI?
3.3 What kind of courses can allow GenAI integration?

In the context of GenAI advancements, assessment reform is a pivotal educational priority (Gamage et al., 2023; Lodge et al., 2023; Luo, 2024; Rudolph et al., 2023; Shoufan, 2023; Thanh et al., 2023). As Sharples (2022) concluded, "An education system that depends on summative written assessment to grade student abilities may have reached its apotheosis" (p. 1125). Additionally, the way GenAI tools work makes many of the traditional assessment strategies inappropriate if teachers truly aim to assess students' learning and progression. Relying on AI-detection methods to force students not to use GenAI is as successful and effective as catching the wind in a net. Many researchers have found these tools generally unreliable (Elkhatat et al., 2023; Li et al., 2023; Liang et al., 2023; Matthews & Volpe, 2023; Sharples, 2022; Weber-Wulff et al., 2023). We strongly believe that no matter how advanced these detection tools claim to be, there will always be ways to outsmart these tools (using AI too), and GenAI will keep developing and outpacing these detection methods. As Liu et al. (2023) concluded from their discussions with HE experts, "detection, even if feasible, could only be a solution to a short term problem – as human-AI collaboration is normalised and becomes more sophisticated, and AI becomes integrated into the functionality of desktop applications that are routinely used, detection becomes less relevant" (p. 6). Furthermore, the high false positive rate of detection tools and the lack of clear and reliable evidence of misconduct mean that AI-detection tools cannot be used as part of misconduct responses. To do so would risk breaching students' rights to be considered innocent unless proven otherwise. Another issue with traditional assessments is their focus on one singular output as the ultimate and, in many cases, only way to assess learning. Swiecki et al. (2023) explained, "these assessments may be discrete, providing only snapshots of what students can do at a single point in time. While these snapshots may tell us something about what students do and do not know at a given time, they may tell us nothing about learning" (p. 2). For teachers to effectively and meaningfully integrate GenAI into their classroom, the institution needs to reconsider their assessment, strategies and approaches in HE (Rudolph et al., 2023; Thanh et al. 2023; Thompson et al., 2023). Usually, this kind of restructuring takes place above the teacher level, at higher levels that involve curriculum committees, accreditation regulations and others. That said, the primary focus of this paradigm shift should move away from merely assessing rote memorisation capacities to a focus on "developing uniquely human capabilities rather than those that can easily be undertaken by readily available technologies" (Bearman et al., 2024, p. 894).

Finally, practice networks need to be fostered and facilitated in ways that encourage teachers to support one another without increasing their workload. This need is based on the concept of community of practice (Wenger, 1998), a group of people who share similar interests or share similar concerns and interact regularly to learn from and with each other. Peers and colleagues who teach at the same institution or in similar contexts are one of the best sources of professional development (Park et al., 2018). Therefore, effective support for teachers as they attempt to integrate GenAI into their practice should aim to answer these three questions:

4.1 How can we set up effective practice networks among teachers?
4.2 How can we keep teachers up to date of GenAI developments and changes and their pedagogical implications?
4.3 What kinds of support do teachers need as they engage in GenAI practices?

Creating sustainable practice networks can be a challenging task for institutions. Based on results from this study, creating an online space for educators to share their experience and thoughts can be a fruitful experience where teachers learn from and support each other to improve their practice. As suggested by Murphy (2004), collaboration in these online spaces can facilitate the creation of knowledge and artifacts. Findings from this study suggest that effective practice networks should provide questions, topics or tasks

that are of relevance and significance to participants, assign moderators whose main role would be to keep the conversation going and to engage with participants or topics that might be sidelined for some time and encourage participation through a recognition or reward system that can add a sense of competitiveness and/or allow educators to claim credit for their participation in these venues. Analysis of discussion board interactions in this study underscored the importance of implementing incentive structures to foster participation and engagement within practice networks. Although mandating engagement with peers' posts (e.g., requiring responses to two or more) can ensure participation from everyone, such approaches risk transforming the experience into an overwhelming task. Instead, the strategic use of incentives may create a more inviting and rewarding environment, thereby promoting authentic engagement and meaningful discourse.

Overall, when upskilling educators for GenAI integration, HE institutions should:

- offer and facilitate four areas of support, namely: technical training, pedagogical support, testing revamp and practice networks
- design and deliver *technical training* that responds to the needs of their educators and develops their critical understanding of the technology
- encourage and facilitate *pedagogical support* that allows educators to realise the full potential of GenAI tools to support teaching and learning
- initiate and spearhead *testing revamp* initiatives that encourage a paradigm shift in assessment and allow for integrating GenAI in assessment practices
- foster and empower *practice networks* in which educators support one and another and build upon their collective knowledge to ensure the effective integration of GenAI into their practice and institutions.

Implications for practice and policy

An important implication to note for practice and policy is the possible resistance to change that normally accompanies shifts in educational practice and policy. Research into change management in education has highlighted the critical need for “capacity building of individuals” (Wang et al., 2023, p. 1038) and the need to offer “technological support” and “pedagogical support” (Howard & Mozejko, 2015, p. 314) for teachers to facilitate effective change at the individual level. This highlights the critical need for the first and second aspects of the TPTP Support System for Teachers model. Wang et al. (2023), moreover, emphasised the role professional learning communities play in shaping “individual readiness for change” (p. 1055), highlighting the critical role of the fourth dimension of the model in facilitating effective GenAI integration.

Considering these findings, this study identified four key areas in the TPTP Support System for Teachers for effective GenAI integration in education:

(1) customised training to enhance teachers' understanding, utilisation and decision-making regarding GenAI tools,
(2) pedagogical support for meaningful curriculum revamps that prioritise learning outcomes and human-centered education,
(3) teacher-led committees to reevaluate assessment strategies in light of GenAI proliferation, guided by learning theory and research, and
(4) practice networks fostering teacher-to-teacher support systems.

Institutions should focus on these areas to sustainably support educators in integrating GenAI into teaching and learning processes.

Limitations and future research

This paper aimed to address two main issues in relation to GenAI in HE: firstly, teachers’ perceptions of GenAI use for teaching and learning and, secondly, effective ways to upskill teachers for the integration of GenAI into their practice. Although this study offers valid insights for educators, its qualitative nature

and small sample size limit broad generalisation. Despite these constraints, we hope that the multiple points of data collection and the extended timeframe of the project have allowed for capturing a solid representation of this sample and their experience with GenAI. Further research is encouraged to validate these findings across different educational contexts. We invite researchers, policymakers, curriculum designers and teacher trainers to further investigate the TPTP Support System for Teachers in which we identified four critical areas to support teachers' efforts for the effective integration of GenAI into their practice (see Figure 10). Further studies should investigate the following:

- How do teachers adapt their practice when implementing this system, and what challenges and successes do they encounter?
- Which TPTP components show the strongest impact on teacher development, and how do the interactions between components influence teaching effectiveness?
- What refinements to the framework would maximise its utility for different school contexts and teacher experience levels?

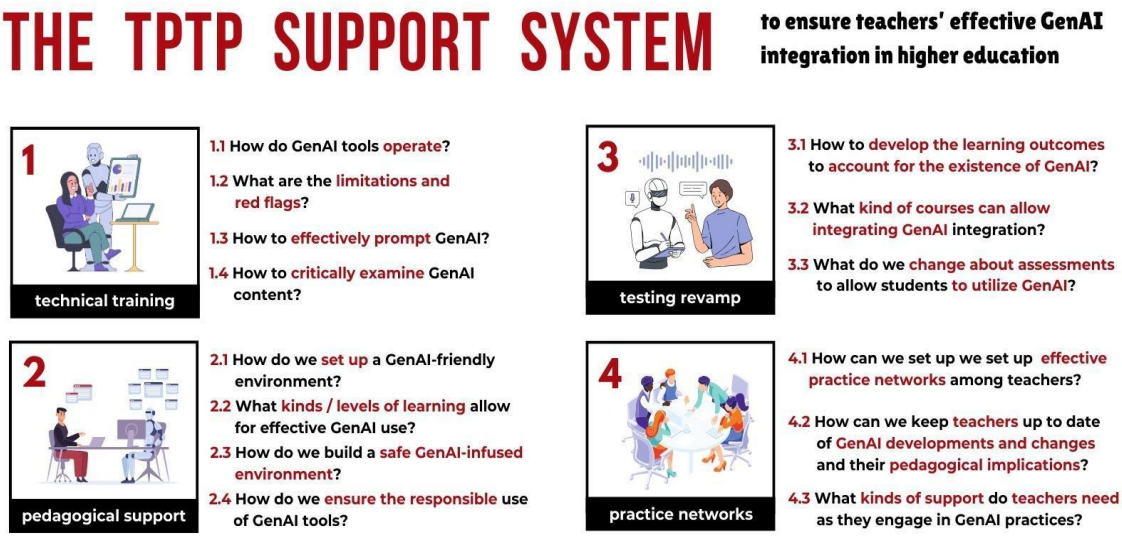

Figure 10. A summary of the TPTP Support System for Teachers

Conclusion

The introduction of GenAI to HE has caused institutional polarisation, from prohibition to a welcoming embrace. The correct response likely lies somewhere in the middle, with effective policies and training that provide guardrails to keep teachers and students ethically protected. All GenAI use in academia needs to keep the human at the centre of its activities, and by focusing on effective training and support for educators through, for example, the TPTP Support System for Teachers proposed in this paper. We believe such a system is critical in the effective, efficient and ethical deployment of GenAI in HE.

Author contributions

Author 1: Conceptualisation, Data curation, Investigation, Formal analysis, Writing – original draft, Writing – review and editing; **Author 2**: Conceptualisation, Data curation, Investigation, Formal analysis, Writing – original draft, Writing – review and editing.

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