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A teacher educators' perspective on the arrival of GenAI: this is what and how we want to learn

MA thesis

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Abstract

This thesis explores the perceived professional development needs of teacher educators regarding Generative AI (GenAI). As GenAI has found its way into the educational context, understanding the perspectives of those preparing future teachers is essential. This mixed-methods case study at a teacher training institute identifies what educators wish to learn about GenAI and how they prefer to engage in professionalisation. Data were collected via an online survey (N=25) and two focus groups (N=9).

Findings reveal that teacher educators are optimistic but cautious: they value GenAI's potential for content creation and feedback but express strong concerns about ethics, assessment and equity. Educators favour interactive formats supported by experts, pointing to the need for AI PD that is ethical, practical, and tailored to their teaching context.

Keywords: professional development, teacher educators, technology use, GenAI.

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Introduction

“When considering an ‘AI world’, it will most definitely be a world that is not static and one where new technologies are continually emerging.” (Markauskaite et al., 2022, p. 7)

Artificial intelligence (AI) and the research on it in education (AIED) have been around for many years. But it's only with the widespread arrival of generative artificial intelligence (GenAI) that a broad sense of urgency has emerged. Applications revealing AI’s ability to handle extensive datasets and identify patterns are prompting teacher training institutions to think deeply about how AI can enhance education. On the opportunity side, the promise is articulated that it could improve teaching and learning processes by enabling the creation of diverse educational resources and facilitating more personalized learning experiences (AI Competency Framework for Teachers, 2024, p. 13). But the technology also raises challenges that urge prudency in how to implement this technology. Overreliance on AI could pose challenges, as it might lead to the atrophy of critical competencies in the long term (Cukurova, 2024).

Teacher educators first need to develop their own digital competence so that they can help preservice teachers become digitally competent (Redecker, 2017). They determine the extent to which they will integrate (Gen)AI into their curriculum, both in scope and depth (Searson, Langran, & Trumble, 2024, p. 4), thereby shaping the digital competencies of the future teachers they teach. While research has begun to examine the integration of GenAI in teacher education (Searson, Langran, & Trumble, 2024), empirical research on the preferences of teacher educators regarding their own professional development in the context of GenAI is limited. The potential gap between (institutional) professional development (PD) offerings and the needs, preferences and pedagogical concerns of teacher educators risks misalignment. By uncovering how teacher educators view GenAI, what their learning preferences are and linking them to the design elements for effective PD, this study takes a step towards designing effective GenAI PD.

Theoretical overview

Arrival technology

“Historically, most education technologies have been adopted by schools; by contrast, ChatGPT arrived.” (Klopfer et al., cited in Reich & Dukes, 2024, p. 1)

The concept of ‘arrival technology’ refers to the introduction of educational technologies into education without a thorough process of adoption (Reich & Dukes, 2024). Educational technology companies are persistently pushing new technologies into the educational sector. Many faculty members feel they cannot wait for time-consuming formal curriculum revisions: will they create entirely new AI-integrated courses for teacher education, or will they simply modify their existing courses? (Searson, Langran, & Trumble, 2024, p. 5).
With easily accessible technology, rapid developments, and promising marketing campaigns, it has become increasingly difficult to evaluate these technologies' true educational value. Based on its definition, arrival technologies pose serious challenges due to their lack of planning and organisational intention regarding their integration into school (Reich & Dukes, 2024). The reality of GenAI simply arriving in schools might result in a reactive rather than a proactive approach to technology adoption. That is where Reich and Dukes (2024, p. 5) push back against its perceived inevitability:

> “If new tools enhance learning and wellbeing, let’s use them to the best of our ability, guided by robust theory on maximizing the benefits of arrival technologies. And if innovations entering our schools harm our students, let’s fight.”

In the European Framework for the Digital Competence of Educators (DigCompEdu), Redecker (2017) stated: “As educators face rapidly changing demands, they require an increasingly broader and more sophisticated set of competencies than before.” The fast-changing circumstances surrounding the arrival of GenAI are likely to intensify these demands, as teacher educators might not only have to evaluate whether such tools enhance learning, but also guide both preservice and in-service teachers in making informed, pedagogically sound decisions about their use in the classroom.

Promises and challenges of GenAI

The twofold role of both evaluation and guidance positions teacher educators at the forefront of determining how GenAI is being introduced into education. As they address these issues, a balance must be found between the potential promises as well as challenges presented by GenAI in possibly revolutionizing human learning.
To be able to evaluate the technology and introduce it accordingly to students, teacher educators should find a balance between the technology's promises and its challenges.

Promises

GenAI has the potential to transform human learning by personalizing support, diversifying learning materials, enabling immediate feedback and transforming assessment methods (Yan et al., 2024). To help learners understand their mistakes and guide them at scale, large language models could provide learners with adaptive dialogues (Arslan et al., 2024). With little previous training, these models could analyse the work of students and deliver instantaneous, personalized feedback (Yan et al., 2024). In the study done by Bower et al. (2024), respondents proposed using AI assistance to help with assessment tasks. GenAI could save educators countless hours on simple tasks that are a routine (Chiu et al., 2023; Bae et al., 2024). It can create content, like explanations for programming concepts, quiz questions or different kinds of media (Yan et al., 2024) and find materials for lessons, create study plans and even review homework (Alwaqdani, 2024).

Challenges

Despite the many promises, there are also significant challenges that follow GenAI integration into education.
A digital divide which can cause unequal access to powerful AI tools risks increasing already existing inequalities in learning opportunities (Yan et al., 2024). On the other hand, those who do have access to these tools are susceptible to a different problem. Relying too heavily on AI can weaken learner critical thinking and negatively impact their creativity, so its implementation must be thought out carefully (Yan et al., 2024). As one of the main principles in standardized summative assessments is consistency of tests and the comparability of scores, on-the-fly personalisation with GenAI, which would generate unique items during the assessment could introduce irrelevant factors into assessments, which would pose a massive challenge to reliability and validity (Arslan et al., 2024). This can be tied to

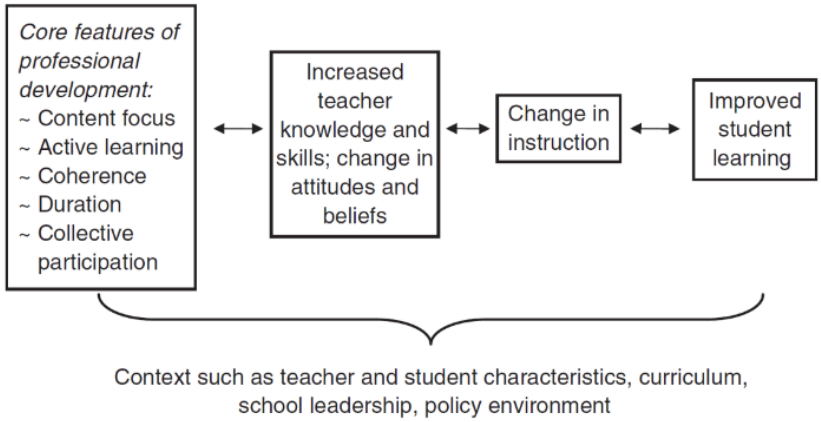
GenAI hallucinations – generating information that may not be factually correct due to the AI's training data not matching up or the task being too complex (Yan et al., 2024). Some educators have noted that AI systems fall short by delivering content in only one format, which doesn't support a wide variety of teaching styles (Chiu et al., 2023). From a survey done by Alwaqdani (2025), a majority of respondents (52%) agreed that teachers have difficulty finding time and training in effectively using AI-powered learning tools, which shows that educators could have difficulties for utilizing AI-powered tools as it would be an overload of responsibility. In the study done by Bower et al. (2024), it was widely agreed upon that assessments need more human oversight, specifically face-to-face assessments would be needed to address the problem of students plagiarising from GenAI tools as ChatGPT, which presents a challenge in academic integrity.

Design elements of effective professional development initiatives

Little (1987, cited in Desimone, 2009) broadly defines professional development (PD) as any activity improving staff performance. Desimone (2009) builds on this by proposing critical features for a more measurable approach: content focus, active learning, coherence, duration, and collective participation. Merchie et al. (2016) also emphasize formal, intentionally designed activities, defining Professional Development Initiatives (PDI) as those enhancing educators' and students' knowledge, skills, and attitudes. Darling-Hammond et al. (2017) identify formal PD as a subset of PD designed to result in professional learning, which they define as structured experiences leading to changes in teacher practices and student learning outcomes. Building on Desimone's (2009) framework (see Figure 1), Darling-Hammond et al. (2017) describe seven key characteristics of effective PD, guiding its design and implementation. Effective PD typically:

1. Is content focused
2. Incorporates active learning
3. Supports collaboration
4. Uses models and modelling of effective practice
5. Provides coaching and expert support
6. Offers opportunities for feedback and reflection
7. Is of sustained duration

Figure 1: Desimone's (2009) core conceptual framework



While frameworks vary, they broadly categorize features into what is being learned (content) and how it is being learned (structure) (Merchie et al., 2016; Darling-Hammond et al., 2017). The following sections apply these categories using Darling-Hammond et al.'s (2017) characteristics, adjusted with Merchie et al.'s (2016) insights (e.g., combining 'active learning' with 'feedback and reflection').

What

What is being learned refers to the content (or 'substance') of professional development - what Merchie et al. (2016) call its *core features*.

To address the needs of teachers and, PD should be content-focused (Merchie et al., 2016; Darling-Hammond et al., 2017). The content needs to be coherent with teacher goals and standards, and evidence-based (Merchie et al., 2016). This involves connecting teaching strategies to specific curricula, particularly in core areas like mathematics, science, and literacy, and being context-specific and job-embedded by focusing on the content teachers teach in their own classrooms (Darling-Hammond et al., 2017).

Application to (Gen)AI:

UNESCO's AI Competency Framework for Teachers highlights the importance of a human-centred mindset, ethics, AI foundations, pedagogy, and AI for professional development (Miao & Cukurova, 2024).. Effective AI training for educators, however, must be contextualised to their specific setting (Luckin et al., 2022). Using practical, curriculum-aligned use cases is one way to do this. Research by Ding et al. (2024) shows that case-based discussions encourage teachers to identify learning struggles, problematic AI use, and issues

with AI tool design. These discussions can then help address misuse, overreliance and explore mitigation strategies.

How

How the learning occurs reflects what Merchie et al. (2016) call *structural feature*s. This refers to how PD is designed and implemented to support effective teacher learning.

Active learning that incorporates feedback and reflection

In active learning, teachers are co-creators of knowledge (Merchie et al., 2016). They directly engage in learned practices, ideally connected to their classrooms and students (Darling-Hammond et al., 2017). When teachers actively co-create their professionalisation, rather than just consuming knowledge, it reduces resistance (Merchie et al., 2016). Effective PD frequently provides dedicated time for teachers to reflect on, receive input about, and adapt their practice (Darling-Hammond et al., 2017), fostering continuous inquiry and reflection on professional and academic knowledge (Merchie et al., 2016).

Application to GenAI:

Learning about GenAI should be contextual, active and participatory (Luckin et al., 2022). UNESCO's AI4T-MOOC case shows that stand-alone online courses can fall short because they lack hands-on practice and tailoring to specific needs (Miao & Cukurova, 2024). Instead, teacher educators could share insights with peers or analyse classroom data to understand GenAI's impact on their teaching. To facilitate teachers' self-efficacy beliefs in the integration of AI-based technology Yang et al. (2024) suggest incorporating lesson planning, enactment and reflections.

Use models and model effective practices

"While feedback and reflection are two distinct practices, they work together to help teachers move thoughtfully toward the expert visions of practice that they may have learned about or seen modelled during PD" (Darling-Hammond et al., 2017, p. 14).

According to Merchie et al. (2016), peer observation and feedback support collaborative learning. Darling-Hammond et al. (2017) stress the importance of models - examples of effective teaching that ground teacher learning in realistic scenarios - which may include:

- video or written cases of teaching,
- demonstration lessons,
- unit or lesson plans,
- observations of peers, and
- curriculum materials including sample assessments and student work samples.

Application to GenAI:
To bridge theory and practice, teachers could first work on well-structured problems that link theory and apply it in context, before moving to their own scenarios (Ding et al., 2024). Modelling effective practices involves demonstrating how GenAI tools can be used meaningfully in teacher education. This could include showing annotated examples of AI-generated lesson plans, videos of teacher educators modelling responsible prompt engineering and case studies analysing both successful and problematic uses of GenAI in assessment or content creation.

Supporting collaboration

PD that effectively supports teachers to solve problems and learn together could contribute to student achievement (Darling-Hammond et al., 2017). Observing models and reflecting together is a way to set-up collective or collaborative participation (Merchie et al., 2016). Further highlighting the collaborative elements, Warmoes et al. (2025) define Professional Learning networks (PLNs) as a possible structure that focuses on “collaborative learning with one or more school-external structural members to improve teaching and learning in their school(s) and/or the school system more widely".

Application to GenAI:
To plan learning outcomes and monitor progress the AI competence framework for teachers (AI CFT) could be used in peer coaching and communities of practices (Miao & Cukurova, 2024). Community support assists teachers in overcoming challenges when integrating AI-based technology in their lessons (Yang et al., 2024). Collaborative PD sessions could include discussions around AI integration cases but also joint analysis of AI-generated materials or co-design of guidelines for ethical AI use. From their short-term AI PD program Ding et al. (2024) concluded that combining direct instruction with case-based discussions in small groups can improve teacher competencies.

Coaching and expert support

Experts can play a critical role in providing one-on-one coaching, as facilitators of group workshops or as remote mentors communicating through technology (Darling-Hammond et al., 2017). In this context, Merchie et al. (2016) highlight the importance of trainer quality in delivering tailored support.

Application to GenAI:

Trainers are expected to apply AI step by step with those that are being trained (Luckin et al., 2022). Coaches should be proficient in both GenAI tools and pedagogical integration, they could assist teacher educators in designing syllabi that incorporate GenAI and create classroom policies.

Sustained duration

"Professional development that is sustained, offering multiple opportunities for teachers to engage in learning around a single set of concepts or practices, has a greater chance of transforming teaching practices and student learning." (Darling-Hammond et al., 2017, p. 15)

Effective PD is not a one-time event. Sufficient time for implementation, practice, and reflection is essential, especially for technologies that evolve rapidly.

Application to GenAI:

Long-term PD should be viewed as an iterative and reflective process. As Fawns (2022) argues, educators need to intentionally and regularly revisit their purposes, values, and teaching contexts to make informed decisions about how technology is integrated. To embrace and benefit from AI, Luckin et al. (2022) designed the AI readiness framework which has seven steps: excite, tailor and hone, identify, collect, apply, learn and iterate.

Purpose of the study

"Educational institutions must invest in ongoing professional development and support systems to help teachers manage techno-stress and workload burdens from adopting new technologies." (Yan et al., 2024, p. 1846)

Literature highlights both promises and challenges regarding the use of (Gen)AI in learning and teaching. While empirical studies examine how opportunities and concerns translate into concrete professional-development (PD), the alignment between general PD, the implication of fast-evolving technology and teacher educators' real priorities are limited. Given that PD is more meaningful when responding to teachers' self-identified needs and interests (Merchie et al., 2016), we could ensure that teachers have a say by linking the features of effective PD to the identified teacher needs (Darling-Hammond et al., 2017).

Therefore, this research tries to understand teacher educators' professionalisation needs regarding GenAI PD. This thesis explores what teacher educators, within a single context, want to learn about these technologies and their preferred approaches to professional development. It addresses two questions: (1) What themes do teacher educators identify as crucial for their own professional development regarding the integration of GenAI in their teaching? (2) How do teacher educators want to be professionalized, given the fast-changing nature of these technologies?

Method

Research design

This study used a mixed methods design to explore teacher educators' professional development needs concerning the integration of GenAI into their teaching. The primary rationale for using a mixed methods approach was to first use a survey (N=25) to gain a broad understanding of participants' stance towards GenAI and to quantify their perspective. These findings informed the subsequent focus groups (N=9) to deepen and contextualise the findings focusing on specific PD needs. This design aligns with the exploratory aim of the research and supports the triangulation of data to enhance credibility and trustworthiness.

Sample

Participants were teacher educators voluntarily recruited through institutional channels. The survey gathered responses from a broad group, of which thirty responses were received, of which five were excluded: three were incomplete and two were from respondents without teaching experience (likely researchers). Oft the teacher educators who participated in the survey fourteen expressed interest in participating in the focus groups, from which nine

confirmed their availability. This resulted in two separate sessions: the first with five participants and the second with four. Participation was based on informed consent, ensuring ethical standards of voluntary involvement and confidentiality.

Instruments

Survey

A custom-designed online questionnaire investigated teacher educators' perspectives on GenAI, their self-perceived competency, the promises and challenges they associate with GenAI integration, and their preferred forms of professional development (Appendix 1). The survey included closed and open-ended questions. Key areas included:

- Relationship with technology and GenAI.
- Current use of GenAI in teaching.
- Ranking of GenAI's promises and challenges (based on Yan et al., 2024).
- Professional development preferences.

Focus groups

Semi-structured focus groups followed a standardised protocol (Appendix 3). The discussion aimed to build upon survey results and invited participants to reflect on their current engagement with GenAI, share experiences and challenges and design their ideal professional development program regarding GenAI. The discussion guide included starter questions, critical reflection prompts, and a structured activity where participants designed and shared professional development plans.

Data collection

Survey data were collected online over twenty days, with a personal reminder sent on day six. Participants who indicated interest in the follow-up study were contacted and scheduled for focus group participation. Each focus group was conducted online and lasted approximately one hour and twenty minutes. Researcher 1 moderated the discussions using the prepared guideline, while Researcher 2 took detailed notes and monitored equitable participation. All sessions were recorded with participant consent for analysis purposes.

Procedure

Email invitation

An email invitation was distributed via the institute's staff mailing list. Prospective participants clicked a link and only after providing electronic informed consent the survey was accessible.

Online survey

The Qualtrics survey (Appendix 1) remained open for 20 days. A single personalised reminder was e-mailed on Day 6. Thirty responses were received. After screening for completeness and teaching experience, 25 valid cases formed the survey dataset.
At the end of the survey, respondents could opt in for a follow-up discussion. Fourteen volunteered. They were sorted into two sessions based on availability (5 + 4 participants). After this, calendar invitations and consent confirmations were sent.

Focus-group sessions

Both 80-minute sessions were held on Zoom. Researcher 1 facilitated the session using the semi-structured protocol (Appendix 3). Researcher 2 monitored equitable participation, kept field-notes, and managed the chat. After a brief warm-up, participants (a) reflected on survey highlights, (b) shared GenAI experiences and (c) designed an ideal professional-development pathway using a shared whiteboard and (d) exchanged ideas/thoughts about them.

Recording, transcription and anonymisation and storage

Meetings were audio- and video-recorded with permission. All personal identifiers were replaced by codes, and the cleaned files were stored on a university server. The recordings were deleted after the analysis.
The final survey and focus groups transcripts were stored in a secure project folder accessible only to the research team.

Data analysis

Survey

Quantitative data were processed using descriptive statistics in Qualtrics. Open-ended responses were analysed through qualitative content analysis, where initial codes were

developed inductively. Researcher 2 reviewed and validated the coding performed by Researcher 1 to ensure accuracy and minimize bias.

Focus Groups

Thematic analysis was applied to the transcripts. The analysis proceeded in several stages:

- Familiarization with the data,
- Initial coding,
- Identification and refinement of themes aligned with the research questions. Themes from the focus groups were compared to survey findings to enhance credibility through triangulation.

Ethical considerations

Participation was voluntary and based on informed consent. Data were anonymised before analysis. Ethical considerations were integral during both data collection and analysis stages, following university guidelines for research ethics.

Results

This study explores teacher educators' professional development needs regarding the integration of GenAI into their teaching. The questionnaire first dug deeper into the teacher educators' context (e.g., their relationship with technology, their perceived competency and their current use), followed by their preferred themes to learn about the technology (RQ1) and their preferred professional development formats (RQ2). A partial report of the survey data can be found in Appendix 2.

Understanding and quantifying participants' stance (survey)

Relationship with technology

Respondents were asked to describe their general relationship with technology (Figure 2) and if their relationship with GenAI is different from the relationship with other technologies (Figure 3).

Figure 2. Participant self-described relationship with technology.

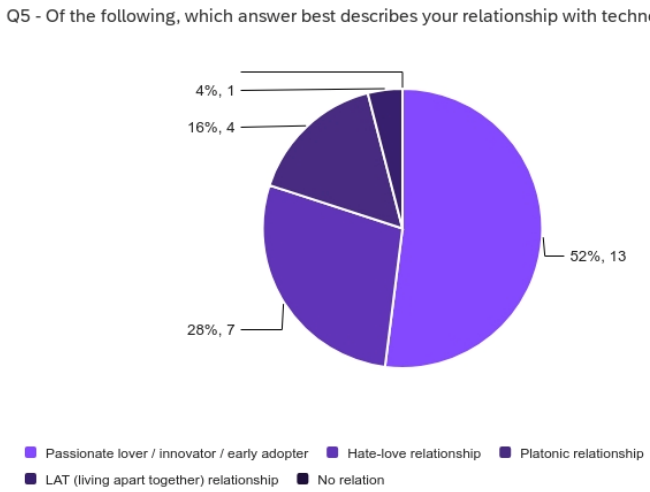
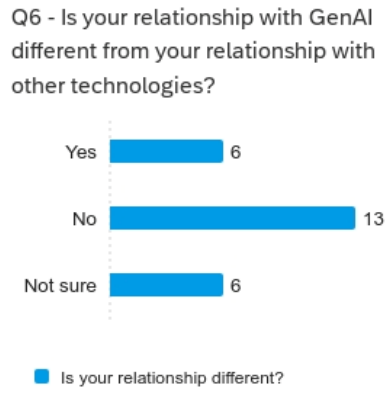


Figure 3. Participant perception of whether their relationship with GenAI differs from other technologies.



A majority (52%) identified as “passionate lovers” of technology. About a quarter (28%) described a “hate-love relationship,” while others selected a “platonic relationship” (16%) or “living apart together” (4%). None reported having no relationship with technology.

Six participants reported a different relationship with GenAI compared to other technologies, most commonly because they viewed GenAI as more disruptive or were cautious about its implications.

Perceived impact and use

Respondents generally anticipated a positive impact of GenAI in the next two years. The highest positivity was expressed toward its impact on their teaching (80%), followed by

education and their personal lives (64% each). One respondent expressed concerns about both positive and negative outcomes.

Eighty percent of respondents believed they should engage with GenAI to assess its value. Among them, 52% had already integrated GenAI into their teaching. In total, 64% reported using it in their teaching, with 28% specifically mentioning its use in interactions with students.

Table 1. Examples of current GenAI applications by surveys' participants.

Guiding students in responsible AI use.
Teaching AI-based writing skills.
Adapting lesson materials and planning with GenAI.
Using models like TPACK and SAMR to frame GenAI use.

Preferred themes

Table 2. Teacher educators' reported interests regarding GenAI-related learning.

Themes	Mentioned elements
Fundamentals	Prompts, responsible usage, and identification of text generated by GenAI
Use cases	Material creation, grading support and feedback generation
Concerns	Ethical issues, cognitive and environmental impact and sustainable use
Advanced use	Using it beyond text generation, deploying open-source models and offline usage

Promises of GenAI

Figures 5 and 6 show the promises of GenAI that respondents wanted to focus on. Respondents ranked "learning support" as the most promising aspect (42% ranked it first). "Creation of learning resources" followed as second (33%). "Assessment" received the fewest top rankings. Reasons provided for this ranking included: pedagogical logic, perceived utility, and alignment with current needs.

Figure 5. Line plot of participants' rankings for GenAI promises.

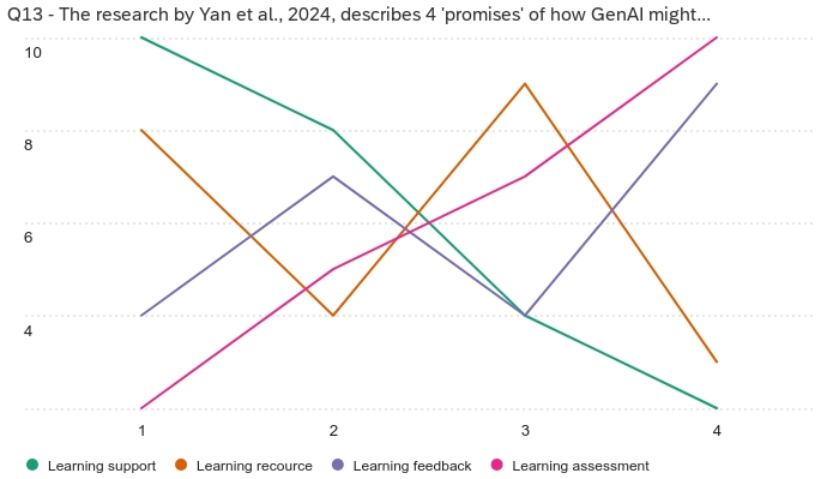


Figure 6. Distribution of participants' rankings for GenAI promises.

Q13 - The research by Yan et al., 2024, describes 4 'promises' of how GenAI might...

Field	1	2	3	4
Learning support	41.67% 10	33.33% 8	16.67% 4	8.33% 2
Learning resource	33.33% 8	16.67% 4	37.50% 9	12.50% 3
Learning feedback	16.67% 4	29.17% 7	16.67% 4	37.50% 9
Learning assessment	8.33% 2	20.83% 5	29.17% 7	41.67% 10
Total	24	24	24	24

Challenges of GenAI.

Figures 7 and 8 show the challenges of GenAI that respondents wanted to focus on. "Ethical dilemmas" were ranked as the most pressing challenge by 71% of respondents. "GenAI's imperfections" were a common second choice (54%). "Disruption of assessment" was most frequently ranked last, with some participants indicating the term was unclear.

Figure 7. Line plot of participants' rankings for GenAI challenges.

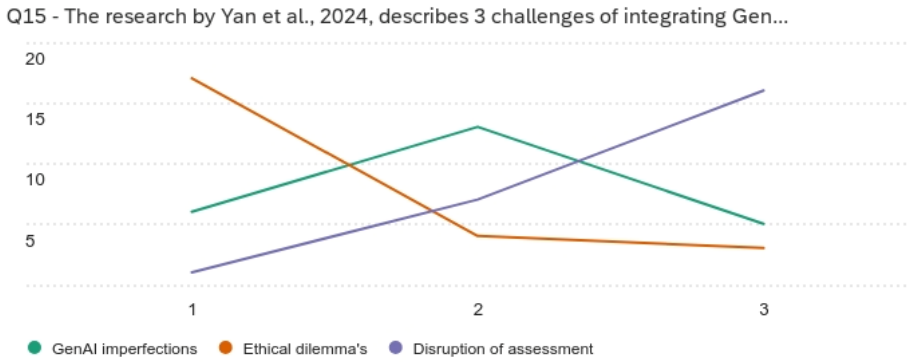


Figure 8. Distribution of participants' rankings for GenAI challenges.

Q15 - The research by Yan et al., 2024, describes 3 challenges of integrating Gen...

Field	1	2	3
GenAI's imperfections	25.00% 6	54.17% 13	20.83% 5
Ethical dilemma's	70.83% 17	16.67% 4	12.50% 3
Disruption of assessment	4.17% 1	29.17% 7	66.67% 16
Total	24	24	24

Preferred Professional Development Formats

Figure 9 shows that teacher educators favoured in-person, interactive formats:

- Top preferences: coaching or mentoring, workshops/seminars and peer collaboration or learning communities
- Less preferred: asynchronous or online-only formats.

Figure 9. Teacher educators preferred professional development formats for learning about GenAI.

Q18 - Given the rapidly evolving nature of these technologies, which forms of professional development do you prefer for learning about GenAI? (Select all that apply) - Selected Choice

Field	Choice Count
Coaching or mentoring from experts	15
Workshops or face-to-face seminars	13
Peer collaboration or learning communities	12
Online courses/modules (asynchronous)	9
Synchronous webinars or virtual labs	4
Other	3

Asynchronous or online-only formats were seen as less desirable. Face-to-face engagement, peer exchange, and practical applicability were key motivators. Some participants appreciated informal approaches such as short practical tips or inspiration from colleagues.

Beyond format, several participants emphasized the need for institutional leadership in professional development. One respondent highlighted the lack of transparency and coherence in GenAI practices across the institution, noting that unequal access to secure tools and inconsistent practices risk widening the gap between educators. Clearer policies, institutional tool support, and integrating AI literacy into teacher training programs to ensure both ethical use and future readiness were proposed.

Participants also suggested institutional actions such as:

- Crafting a dynamic vision for GenAI integration
- Organizing diverse professionalisation formats
- Providing tool licenses and clear student guidelines

Deepening and contextualising findings (focus groups)

In the two focus groups we further explored how teacher educators currently engage with GenAI, their perceptions of its potential and its risks and their professional development needs. The results are presented thematically, supported by quotes from participants. Anonymity was ensured through participant numbering. The thematic analysis resulted in six core themes (‘Current use varies a lot’, ‘Relationship status: It’s complicated’, ‘It’s all about how you use it’, 'We are worried about ethics and pedagogy’, ‘Assessment is up for debate’ and ‘Let’s address practical PD needs together’) that reflect commonalities and contrasts.

Current use varies a lot

Participant use of GenAI varies greatly: from not using it at all, to sophisticated, experimental implementations. One participant (P7) showed caution: “I’m not using GenAI in my work. I’m a bit hesitant, because I don’t know what the effect will be.”. Others (P3, P4, P5) were less cautious mentioning using it as a daily aid, such as replacing Google with ChatGPT. Four participants (P1, P2, P3, P6) indicated using GenAI for content creation, from creating lesson plans (P1) and feedback generation (P2, P3) to generating levelled text based on CEFR and questions based on the text (P6). Two participants (P2, P3) developed their own

CustomGPT's to generate detailed feedback. With one (P8) even hosting a model on a Raspberry Pi for training purposes. Finally, P9 explains experimenting with AI-generated avatars to help students overcome their reluctance to appear on camera: "Students do not like talking in front of the camera and seeing themselves on screen, so they actually use an AI tool - you just give the text, and it generates an avatar that talks for you."

Relationship status: 'It's complicated'

When asked about the arrival of GenAI, at times, participants saw GenAI as something that no one can avoid using, at other times they argued that it's only a tool that shouldn't determine what we choose to do. P8 strongly stated: "It's inevitable, that scares the hell out of me." but also mentioned:

> "GenAI is not the goal but a means to do something. The first question is: what is the goal? ... If you're going to talk about the human body, then maybe it's more useful to go to the library and get the skeleton and talk about all the bones in the body with the skeleton than to produce a PowerPoint presentation."

It's all about how you use it.

On the upside, several participants celebrated how GenAI helps them spark ideas and brainstorm. P4 mentions:

> "I think ChatGPT helps me to think more out of the box and to generate ideas, even though the ideas are not in themselves good ideas. But it inspires me to generate good ideas".

One participant (P2) uses GenAI particularly for making her feedback better:

> "I don't like writing generally, ... When I'm grading, I can ask AI to assist me in how to write my feedback a little bit more positive or critical, or even with some humour in it to uplift my feedback. ... I designed my own CustomGPT to do that for me in giving good feedback."

Others see that it could be used as an inclusive tool to help students with learning difficulties (P6) or use the errors of chatbots as a learning event (P8).

We are worried about ethics and pedagogy.

Alongside the advantages come deep worries and concerns about GenAI use. Not knowing how the algorithms work or not knowing what data or how the data is being used was mentioned by multiple participants (P3, P8, P6):

> "What does GenAI exactly base itself on to come to some kind of evaluation of a work? You should be able to explain it! And there I see a problem, that you cannot really explain it because you don't see all the data on which it has been trained."

P2 was worried about the risk of "big data companies influencing what we are thinking" and mentioned the large amount of time necessary to redesign criteria, curricula and evaluation.
A critical issue mentioned by the participants (P2, P9) was the digital divide between early adopters, those who have access to premium GenAI tools and those who are later adopters of the technology:

> "It's getting quite unfair for students. How can we make sure that we reduce the digital gap with the premium accounts with students using €200 accounts on ChatGPT? They have so many more benefits than using the free version or not using it at all."

Assessment is up for debate

Assessment practices were discussed, as participants had different views. P2 insisted that "the educator should still be the one giving feedback", while P1 welcomed GenAI as it is making educators rethink evaluation methods: "The way we assess is like often still old school, because we don't pay a lot of attention to it. ...And now we are forced to do that".
P9 also mentioned GenAI making educators rethink evaluation:

> "It's a bit like Covid. How do you want to give form to education? We had blended learning a lot. Maybe then, the technology was the outcome. Now, it's the technology that pushes us to rethink evaluation, so it's the other way around."

P5 saw that this could be a threat to their profession: "It feels so wrong. It feels like an attack to the core of my profession. It gives me a really strange and uncomfortable feeling.".

Let’s address practical PD needs together

Finally, participants outlined their learning needs for an effective and ethical GenAI professional development path. P4 expressed wanting practical, hands-on training regarding chatbot development. P1 and P9 mentioned peer-to-peer showcases of GenAI tools, with P9 commenting that P2 has a lot of experience in this regard. P6 said that they need to learn more about developing learning resources, assessments and feedback. P3 and P4 both mentioned a learning community setting, with P3 saying: “Just sitting together with colleagues and each one in turn presenting a case, a problem which they are confronted with and helping them to reflect on it.”.
P1 stressed the need for knowledge, as: “It's difficult to talk about ethical things if you don't know what exactly we're talking about, so I think professional development is crucial, and to bring that ethical dimension in is, of course, also very important”.

Discussion

GenAI has arrived rapidly and without predefined structure or thoroughly planned out adoption and support. This, in combination with the ethical considerations and the concerns around the pedagogical value of the technology makes our teacher educators look at the technology with both interest and caution.
This study revealed a positive disposition of the respondents towards GenAI’s impact on teaching. The high percentage of educators identifying as “Passionate lovers” suggests a community open to technological innovation. However, respondents were also sceptical about the integration of the technology into education. For one, the disruptive nature of GenAI is mentioned repeatedly by participants. Like Cukurova (2024) and Reich and Dukes (2024), teacher educators challenge the notion that GenAI should be adopted merely because it is available. Focus group members emphasized that a sudden, decontextualized GenAI adoption is not welcomed and could be harmful to their teaching.

Understanding the limitations and challenges enriched by the real concerns of teacher educators about its integration, helps frame the conversation in reality. With this study we investigated the professional development needs of teacher educators in the context of integrating GenAI. The findings provide nuanced insights into the attitudes, the use, the expectations and the concerns surrounding GenAI.

With 64% (16) of respondents reporting they have not only used GenAI but also to have integrated it in some way into their practice and 76% (19) of respondents having a clear opinion on how their relationship with GenAI compares to other technologies, it is safe to say that GenAI has arrived at the studied teacher training institute.
In the survey teacher educators were very interested in learning about the ethical considerations linked to GenAI. In Yan et al's (2024) work the main concern regarding ethics was the digital divide, where unequal access to these technologies can increase existing inequalities in learning opportunities. But during focus groups participants focused more on the fact that they don't know whether GenAI is actually helping students, what data GenAI is trained upon and the disruption it brings to assessment. Cukurova (2024) supports this cautious perspective, noting that the non-transparent, "black box" nature of GenAI systems and their frequent production of incorrect information might limit its value in educational tasks.

What we want to learn.
The disruption of assessment was seen as an existential problem, rather than a technicality. Interestingly, while the promises of GenAI our teacher educators wanted to learn about most were strongly associated with learning support and content creation, assessment was ranked lowest. This may reflect unease regarding automated forms of evaluation which one of the participants described as a threat to their professional identity as teacher educators. This might also link to what Luckin et al. (2022) describe as the worries that human experts are left out of the loop with AI systems act on their diagnoses.
On the other hand, participants also pointed out that the arrival of GenAI offers a way to rethink assessment. Even though for most of the participants of the survey the 'disruption' of assessment was deemed less important for their professional development than the ethical dilemmas and imperfections related to integrating GenAI in their practice, it was a clear concern in the focus groups.

Our respondents have a desire to develop practical competencies around GenAI, linked to prompt engineering, feedback generation and chatbot design. It is also clear that the need for professional development is not only linked to technical proficiency but also to critical engagement. This includes fostering competencies such as reflective thinking, self-regulation, and ethical decision-making (Yan et al., 2024). These skills are already central in teacher

education and align with the goal of preparing educators to evaluate and guide the use of GenAI with their pedagogical purpose. As Markauskaite et al. (2022) argue, the question is not merely which tools teachers use, but what learning experiences those tools enable and what teachers need to know to use them well. This sentiment was echoed by participants who viewed GenAI as a means to support specific learning goals rather than an end in itself.

How we want to learn.

Participants expressed needs, both implicitly and explicitly, that align closely with the described features of PD.

Coaching and expert support were top-ranked formats in the survey and were frequently mentioned in the focus groups. This shows the teacher educators' need for guidance on how to integrate GenAI tools in their teaching.

Active learning was being referred to as hands-on experimentation, such as creating their own version of GenAI tools, learning how to generate lesson plans, co-creating rubrics and "uplifting" feedback. Participants expressed the need for practice-oriented tasks and articulated a willingness to actively co-construct knowledge.

Darling-Hammond et al. (2017) notes that an often-used form of active learning is for teachers to engage in the same learning activities they are designing for their students.

Collaboration was a key theme as participants mentioned the need for peer-learning communities where colleagues present real-life challenges and reflect on them collectively. In the focus groups participants referred to 'design teams' and an existing learning community called "The book club". Its format could be linked to reflect deeply together on urgent and less urgent matters. Feedback and reflection, central to PD literature, were less frequently mentioned in direct terms.

Similarly, the notion of sustained duration was not discussed in depth, though the evolving nature of GenAI makes it a critical concern. As Fawns (2022) notes, teachers must continuously revisit their values and pedagogical goals in response to technological change. Without long-term structures, there is a risk that GenAI professionalization becomes fragmented and reactive.

Limitations, strengths and implications for future research.

This study has several limitations that should be acknowledged when interpreting the findings.

First, some methodological limitations should be acknowledged. The study employed a

convenience sample. In addition, participants chose to participate possibly indicating a greater intrinsic motivation than the broad population. Although the survey instrument was pretested with three participants to enhance clarity and relevance, no formal psychometric validation (e.g., calculation of internal consistency measures such as Cronbach's alpha) was conducted. Second, the research was designed as a single case study within one institutional context and included a relatively small, self-selected sample. While the combination of survey and focus group data provided rich, illustrative insights, the findings are not generalizable to a broader population of teacher educators. A multiple-case study approach could offer deeper comparative insights, particularly regarding contextual factors such as institutional policy, access to technological resources, and prior experiences with innovation.

Third, the study was conducted as a cross-sectional investigation, capturing perceptions at a single point in time. A longitudinal design could offer valuable insights into how teacher educators' attitudes, competencies, and uses of GenAI evolve with growing experience and as the technology itself matures.

Fourth, during the focus groups, it became clear that participants were relatively like-minded, especially in the second group, where all had identified as "passionate lovers" of technology. The online format of the focus groups may also have constrained the depth and spontaneity of the discussions, compared to face-to-face formats.

Despite these limitations, the research presents a meaningful foundation for further exploration and potentially for action research. By involving teacher educators in articulating their learning needs and preferred development formats, the study considered professional ownership and agency, two critical factors shown to support motivation and effective professional learning (Merchie et al., 2016). This sense of agency could be further developed so teacher educators take ownership as co-designers of their PD.

In future research, the design of PD and policy regarding GenAI could be investigated by building on Kennedy's (2014) perspective, providing a way to analyse the underlying perspectives on professionalism. For instance, Garone et al. (2025) identified three profiles - high, moderate, and low acceptance - each linked to distinct PD preferences, showing that technology acceptance levels influence how educators prefer to be professionalised. Additionally, investigating Professional Learning Networks (PLNs), where school-external members structurally participate in collaborative learning (Warmoes et al., 2025) could offer promising insights for GenAI development."

Conclusions

This study underlines that effective PD related to GenAI must not only be responsive to what educators want to learn, but also how they want to learn.

The blackbox nature of the technology in relation to its algorithms, its inherent ethical dilemmas and teacher educators' feeling of not having control over the data it is based on, are areas of great concern. Even though assessment was less seen as an opportunity or a threat in the survey, focus group participants had strong opinions about the idea of machines evaluating students. The technology was welcomed in a sense that it pushes to rethink assessment practices.

The findings reveal that teacher educators favour a setting where technology serves pedagogical goals rather than determining them. Most of the participants prefer PD formats that are interactive, context-sensitive and grounded in practice. The desire for in-person community-driven professionalisation format is also expressed. Most teacher educators preferred to learn from coaching by experts and from peer collaboration rather than more traditional course formats.

Collectively deciding on what, when and how to learn could give teacher educators ownership over both content and process. Seeing teacher educators as co-creators of knowledge, embedding it in a broader institutional vision for GenAI, designing PD that is grounded in established research and frequently revisiting it, institutions could move from reactive adoption to more proactive supported integration.

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Introduction – Thibaut Cromphaut
Theoretical overview
    Arrival technology – Thibaut Cromphaut
    Promises and challenges of GenAI – Indriķis Andris Birznieks
    Design elements of effective professional development initiatives – Thibaut Cromphaut
Purpose of the study: Thibaut Cromphaut and Indriķis Andris Birznieks
Method – Thibaut Cromphaut
Results – Thibaut Cromphaut and Indriķis Andris Birznieks
Discussion – Thibaut Cromphaut and Indriķis Andris Birznieks
Conclusions – Thibaut Cromphaut and Indriķis Andris Birznieks

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Authors declarations

We hereby declare that we have written this thesis independently and that all contributions of other authors and supporters have been referenced. The thesis has been written in accordance with the requirements for graduation theses of the Institute of Education of the University of Tartu and is in compliance with good academic practices.

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Appendices

Appendix 1

Survey - A teacher educators' perspectives on GenAI

Start of Block: Background

Q1 How old are you?

_____

Q2 How many years of teaching experience do you have?

_____

Q4 What is your primary teaching domain or subject area?

_____

_____

_____

_____

_____

Q5 Of the following, which answer best describes your relationship with technology?

- Passionate lover / innovator / early adopter You embrace technology. You are knowledgeable about (innovative) technology and possess the necessary skills. (1)
- Hate-love relationship You strive to be digitally proficient, but you struggle with technology's inherent paradoxes. (2)
- Platonic relationship You desire more interaction with technology but don't use it frequently. (3)
- LAT (living apart together) relationship You maintain a distance from technology, conscious of its potential drawbacks. (4)
- No relation You feel that digital technologies are imposed upon you against your will. (5)

Q6 Is your relationship with GenAI different from your relationship with other technologies?

- Yes (1)
- No (2)
- Not sure (3)

Display this question:

If Is your relationship with GenAI different from your relationship with other technologies? = Yes

Q7 Why do you think your relationship with GenAI is different from your relationship with other technologies?

_____

_____

_____

_____

_____

End of Block: Background

Start of Block: Perceptions/beliefs

Q8 Competency

	Not competent at all (2)	Not competent (3)	Competent (4)	Very competent (5)
How competent do you feel about using GenAI? (1)	○	○	○	○

Q9 How do you think GenAI will impact the following in the next two years?

	very negatively (11)	negatively (12)	no impact (13)	positively (14)	very positively (15)
Our Lives (1)	○	○	○	○	○
Education (4)	○	○	○	○	○
Your teaching (5)	○	○	○	○	○

Q10 "We, as teacher educators, should engage with GenAI to assess its value in our pedagogical practice." Do you agree?

- Yes (4)
- Maybe (5)
- No (6)

Q11 Have you incorporated GenAI tools or technologies into your teaching?

- Yes (1)
- No (2)
- Not sure (3)

Display this question:

If Have you incorporated GenAI tools or technologies into your teaching? = Yes

Q12 How have you incorporated GenAI into your teaching?

_____

_____

_____

_____

End of Block: Perceptions/beliefs

Start of Block: Priorities

Q35 Assuming you are willing to learn more about GenAI and you have the time to do so. What would you like to learn more about?

_____

_____

_____

_____

_____

Q13 The research by Yan et al., 2024, describes 4 'promises' of how GenAI might transform human learning. Rank them in order of importance for your own professional development? (from first to last) *Yan, L., Greiff, S., Teuber, Z., & Gašević, D. (2024). Promises and challenges of generative artificial intelligence for human learning. Nature Human Behaviour, 8(10), 1839-1850. https://doi.org/10.1038/s41562-024-02004-5*

_____ Learning support *Learners receive personalized and adaptive support from GenAI tutors, which are codesigned with educators and have access to previous learner data and domain knowledge.* (1)

_____ Learning resource *Educators use GenAI to create multimodal learning resources, incorporating text, audio and video content.* (2)

_____ Learning feedback *Educators collaborate with GenAI to deliver multimodal feedback to learners.* (3)

_____ Learning assessment *GenAI agents use input requirements from educators, previous learner data and domain knowledge to create assessment activities that evaluate learners.* (4)

Q14 Why did you rank the 'promises' this way?

_____

_____

_____

_____

_____

Q15 The research by Yan et al., 2024, describes 3 challenges of integrating GenAI into human learning. Rank them in order of importance for your own professional development? (from first to last) *Yan, L., Greiff, S., Teuber, Z., & Gašević, D. (2024). Promises and challenges of generative artificial intelligence for human learning. Nature Human Behaviour, 8(10), 1839-1850. https://doi.org/10.1038/s41562-024-02004-5*

_____ GenAI's imperfections *Hallucinations, inaccuracies, instability, and biases.* (1)

_____ Ethical dilemma *Transparency and privacy concerns, equality and beneficence.* (2)

_____ Disruption of assessment (3)

Q16 Why did you rank the challenges this way?

_____

_____

_____

_____

_____

End of Block: Priorities

Start of Block: Support and professional dev.

Q18 Given the rapidly evolving nature of these technologies, which forms of professional development do you prefer for learning about GenAI? (Select all that apply)

- Workshops or face-to-face seminars (1)
- Online courses/modules (asynchronous) (2)
- Synchronous webinars or virtual labs (3)
- Peer collaboration or learning communities (4)
- Coaching or mentoring from experts (5)
- Other (6) _____

Display this question:

If If Given the rapidly evolving nature of these technologies, which forms of professional development... q://QID20/SelectedChoicesCount Is Not Empty

Q36 Why did you choose these forms of professional development?

_____

_____

_____

_____

_____

Q17 In your view, which measures should your institution take to encourage effective professional development concerning the use of GenAI?

_____

_____

_____

_____

End of Block: Support and professional dev.

Start of Block: Contact

Q19 Do you have any questions or comments for us?

_____

_____

_____

_____

_____

Q20 May we contact you to invite you for a focus group? (The focus group would take a maximum of 1.5 hours.)

- Yes (1)
- No (2)

Display this question:

If May we contact you to invite you for a focus group? (The focus group would take a maximum of 1.5... = Yes

Q21 Please provide your name and email address so we can contact you.

- Name (1) _____
- Email (2) _____

End of Block: Contact

Appendix 2

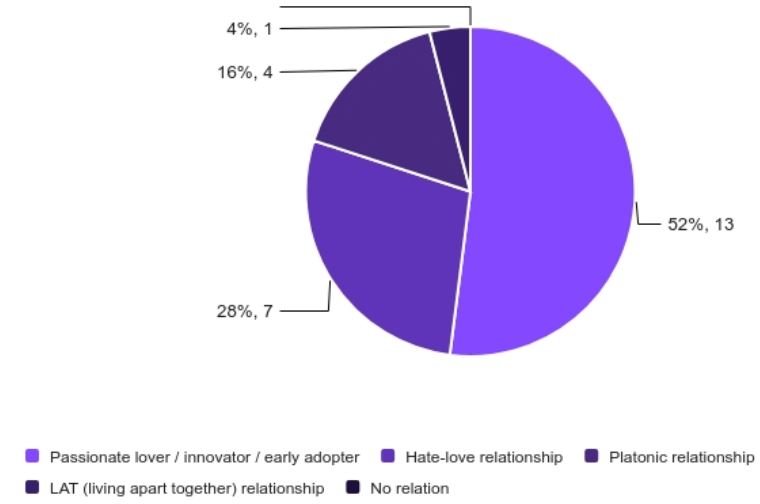
Q1 - How old are you?

Field	Responses	Min	Max	Mean	Median	Standard Deviation
How old are you?	25	29.00	58.00	43.52	46.00	8.44

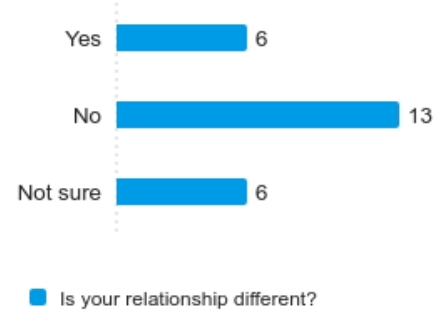
Q2 - How many years of teaching experience do you have?

Field	Min	Max	Mean	Median	Standard Deviation
How many years of teaching experience do you have?	1.00	31.00	16.68	15.00	9.12

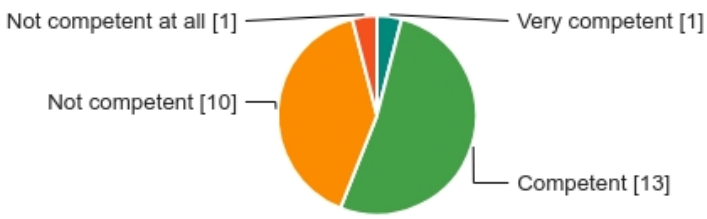
Q5 - Of the following, which answer best describes your relationship with technology?



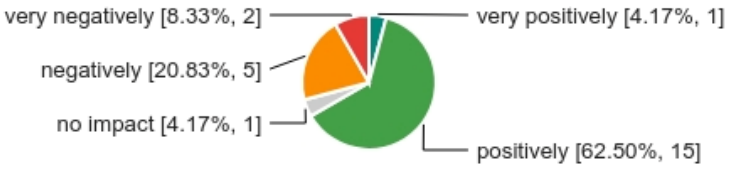
Q6 - Is your relationship with GenAI different from your relationship with other technologies?



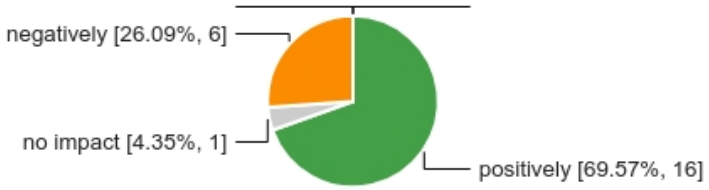
Q8_1 - How competent do you feel about using GenAI?



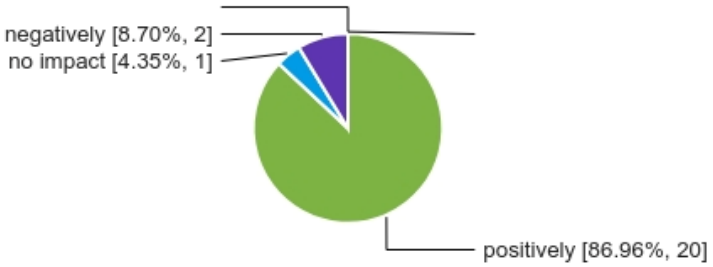
Impact on our lives



Impact on education



Impact on your teaching



Q10 - "We, as teacher educators, should engage with GenAI to assess its value in our pedagogical practice." Do you agree?

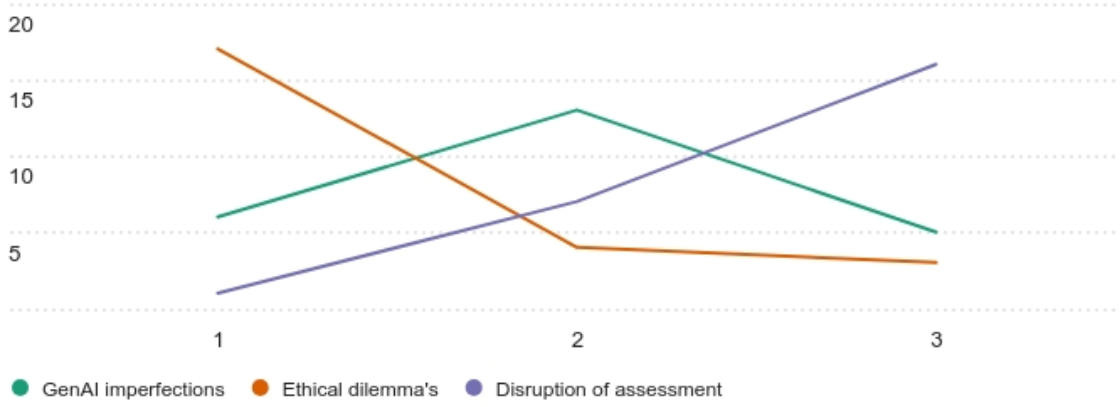
Q11 - Have you incorporated GenAI tools or technologies into your teaching?

Q13 - The research by Yan et al., 2024, describes 4 'promises' of how GenAI might...

Q13 - The research by Yan et al., 2024, describes 4 'promises' of how GenAI might...

Field	1	2	3	4
Learning support	41.67% 10	33.33% 8	16.67% 4	8.33% 2
Learning resource	33.33% 8	16.67% 4	37.50% 9	12.50% 3
Learning feedback	16.67% 4	29.17% 7	16.67% 4	37.50% 9
Learning assessment	8.33% 2	20.83% 5	29.17% 7	41.67% 10
Total	24	24	24	24

Q15 - The research by Yan et al., 2024, describes 3 challenges of integrating Gen...



Q15 - The research by Yan et al., 2024, describes 3 challenges of integrating Gen...

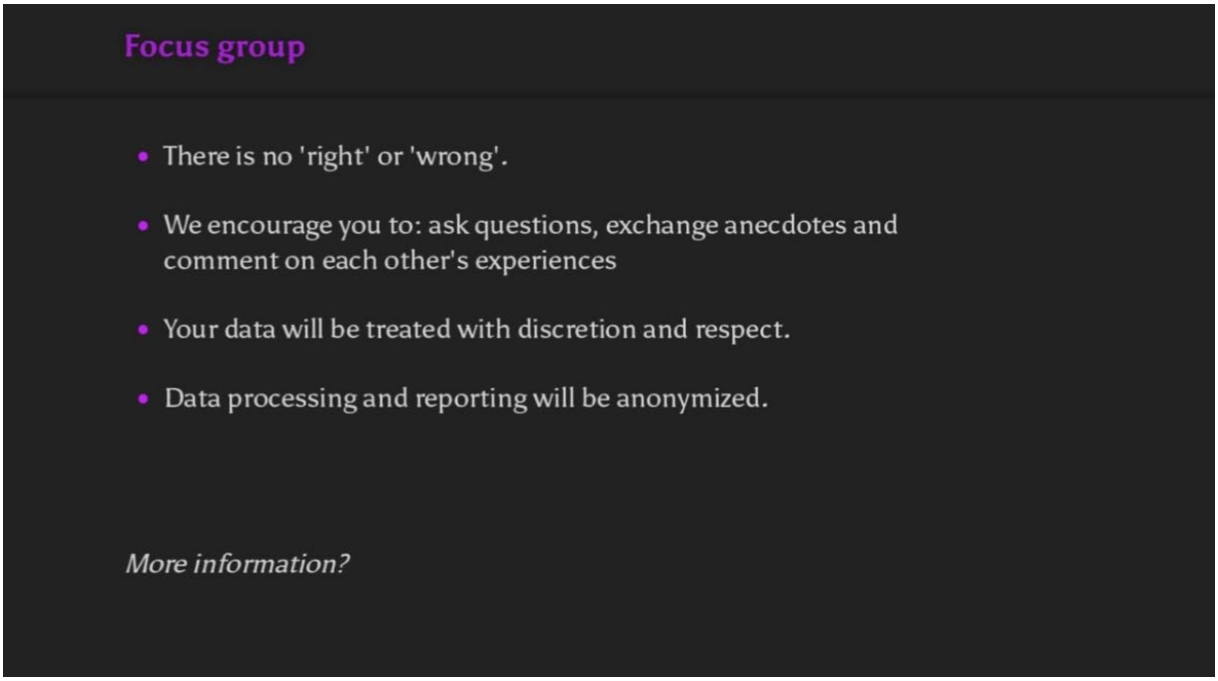
Field	1	2	3
GenAI's imperfections	25.00% 6	54.17% 13	20.83% 5
Ethical dilemma's	70.83% 17	16.67% 4	12.50% 3
Disruption of assessment	4.17% 1	29.17% 7	66.67% 16
Total	24	24	24

Q18 - Given the rapidly evolving nature of these technologies, which forms of professional development do you prefer for learning about GenAI? (Select all that apply) - Selected Choice

Field	Choice Count
Coaching or mentoring from experts	15
Workshops or face-to-face seminars	13
Peer collaboration or learning communities	12
Online courses/modules (asynchronous)	9
Synchronous webinars or virtual labs	4
Other	3

Appendix 3

Before the start of the focus groups, a short presentation was shown to the participants, explaining how the meeting is going to be conducted.



The focus groups followed these guidelines afterwards:

Introduction (5')

Welcome, to this focus group about what you want to learn about GenAI and how you want to do it. The aim of today is straightforward: design your own professional development program regarding GenAI and discuss it with each other.

We want you to share your plan with the others and comment on it. It is our ambition to combine the information of the two focus groups into two or three examples of professional development plans.

Starter question (10')

Tell us where you are with GenAI at the moment. If you want you can link it to your relationship with GenAI (passionate lovers hate-love relationship platonic relationship LAT (living apart together), no relation)

Reflecting out loud about your practice (30’)

1. Have you integrated GenAI in your practice with students?

If so, can you give one specific example? Why this example? What were the outcomes you observed?

2. Would you use a chatbot in your practice to support your lesson? (learning support)

3. What about using GenAI for assessment? It was ranked last for both promises and challenges. Why do you think that is? What about feedback by GenAI?

3.1. What if AI could check student materials, prepare grades and feedback and you would approve or alter it before sending it to the student?

4. What are some of the ethical dilemmas that you have came across or fear that you might come across? How could professional development minimize the effect of these challenges?

How would you design your professional development program?

Build (20’)

Take the building blocks WHAT and HOW and design your ideal professional development program. Did you think of something (e.g. concrete ideas) you want to share? Pick-up a post-it and place it on the board.

Share (25’)

Explain what you did. Others are invited to react.

Questions from the participants

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