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Generative Dialogues: Design Iterations in Professional Development Courses for Faculty Members to address the Challenges of GAI in Teaching

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Abstract

This study analyses the design and implementation process of two courses developed by the Centre for Innovation in Technology and Pedagogy (Citep) of the University of Buenos Aires, focused on the integration of Generative Artificial Intelligence (GenAI) into teaching and assessment practices in higher education. The iterative process of design and implementation of these courses is systematised and documented through the Design-Based Research methodology. The results underscore the importance of a flexible, dialogic and multidimensional approach that fosters critical reflection on the integration of GenAI into teaching. Key design dimensions such as participatory co-design, pedagogical isomorphism, tutor moderation and the opportunity to experiment and create are identified. The conclusions suggest there is a need to prioritise continuous teachers' professional development programs

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centred on the design of new teaching strategies and opportunities for critical reflection on the academic and ethical challenges posed by GenAI in higher education.

Keywords: e-learning; design-based research; generative artificial intelligence; ChatGPT; teachers' professional development; educational technology.

Introduction

The emergence and accessibility of Generative Artificial Intelligence (GenAI) such as ChatGPT has triggered numerous debates in relation to education, industry, employment and society. GenAI's ability to process and generate information, creating novel, human-like realistic content, represents a milestone in the evolution of AI. This synergy between humans and intelligent digital systems transforms the interaction with information and the construction of knowledge. In addition, it redraws the boundaries of production and innovation, making new opportunities visible, such as skill augmentation, automation and collaboration between humans and technological entities (Carrión, 2023; Schecter et al., 2023).

However, these advances also give rise to ethical and social issues. Ethical issues include transparency, hallucinations, biases, prejudices and stereotypes, privacy and data security, and also misuse of AI (Blanco Marañón, 2023; Crawford, 2022; Sadin, 2018). There is increasing concern about dehumanisation, job losses due to automation, and an ethics gap in the development and use of AI.

This technological advance should be analysed particularly in education (Hodges and Ocak, 2023; Ribera and Díaz Montesdeoca, 2024; UNESCO, 2023a; UNESCO, 2023b) to reflect on the transformations in teaching design and learning dynamics (Artopoulos, 2023; Campi, 2023; Lion, 2020; Santiago-Ruiz, 2023; Selwyn, 2024). Furthermore, new problematics emerge in relation to academic integrity that require rethinking of the notions of authorship, plagiarism and creativity in universities (Cotton et al., 2023; Farrelly and Baker, 2023; Gallent-Torres et al., 2023; Perkins, 2023; Vashista et al., 2023).

The Centre for Innovation in Technology and Pedagogy (Citep), dependent on the Office of Academic Affairs of the University of Buenos Aires (UBA), has been exploring AI in education since 2019 (Andreoli et al., 2019). In 2022, Citep published *Inteligencia Artificial y Educación*: *Un Marco para el Análisis y la Creación de Experiencias en la Educación Superior*, a document promoting initiatives aimed at integrating AI into university teaching through teacher training courses. These initiatives provided insight into this technology transcending mere instrumental approaches. Among the most notable actions are the Artificial Intelligence Laboratory in Higher Education, implemented in collaboration with the National Autonomous University of Mexico, and the execution of the Artificial Intelligence Teacher Training Series called Iterations in Mutant Universes, in 2023, dealing with topics such as algorithmic and data literacy, ethics, teaching strategies and computational thinking.

The main purpose of this study is to identify key dimensions to be applied to the design of teacher training courses on GenAI and Education. To such effect, an analysis will be conducted on the design and implementation process of two courses—Diálogos Generativos

I (DG1) and Diálogos Generativos II (DG2)—aimed at integrating GenAI into university teaching and assessment practices.

Theoretical Framework

Today's context is marked by social, cultural, political and economic changes driven by rapid technological development. These transformations are the result of a mental and social revolution, rather than a direct consequence of technological advances (Baricco, 2019). The ability to accumulate vast amounts of data and the use of Artificial Intelligence (AI) by means of complex algorithmic methods to process it has had a significant impact on all areas of modern life, transforming industries, economies, and societies as a whole (Crawford, 2022; Sadin, 2018). This impact highlights the importance of having a thorough understanding of the implications of AI to critically handle potentially associated challenges.

In the field of education, the document Beijing Consensus on Artificial Intelligence and Education has set a milestone by referring to the integration of AI into open and quality education systems, aligned with the Sustainable Development Goals (SDGs) (UNESCO, 2019b). These initial guidelines were later expanded with documents that addressed ethical issues, best practices and the formulation of education policies for AI integration (UNESCO, 2019a; UNESCO, 2020; UNESCO, 2021a; UNESCO, 2021b). Since then, various international bodies have recognized as critical the debates on the ethical issues, rights and legal frameworks associated with the integration of AI into higher education (Andreoli et al., 2022).
In this context, the European Commission's Ethical Guidelines on the Use of Artificial Intelligence and Data in Teaching and Learning for Educators (2022) provide a detailed framework that acknowledges fundamental principles such as human agency and oversight, transparency, fairness, societal and environmental wellbeing, privacy and data governance, technical robustness and safety, and accountability, with the aim of ensuring that AI systems are reliable, fair, safe and ethically used in educational settings.

By the end of 2022, the advent of GenAI, especially the availability of ChatGPT to generate coherent and compelling content, including text, images, audio and code, has sparked renewed interest in the field of education.
As GenAI becomes gradually integrated into teaching and learning practices in higher education institutions, the need for in-depth knowledge about its implications is revitalised. Recent research points out the opportunities and challenges of GenAI, as well as the need for a critical and reflective approach to its implementation. Consequently, several articles and guides for teachers acknowledge the complexity of the constantly evolving educational framework (CUAIEED UNAM, 2023; Gómez Cardosa and García Brustenga, 2023; Hodges and Ocak, 2023; UNESCO, 2023b; Universitat Oberta de Catalunya-UOC, n.d.). In response to this need, it is essential to closely explore research that specifically analyses the integration of GenAI into higher education. Several studies cover various aspects of its implementation and address crucial issues such as teachers' perceptions and experiences, design of training courses, impact on teaching and learning processes, and ethical and regulatory considerations.

Some papers, through a systematic literature review and bibliometric analysis, identify emerging trends and research patterns on the use of GenAI in education. The Bozkurt (2023) study distinguishes seven potential areas of research in the context of educational practice with GenAI, namely: interaction and communication with chatbots, the impact of GenAI on teaching and learning, the use of conversational educational agents, GenAI and cognitive processes, AI literacy, the expansion of academic capabilities through GenAI and educational experiences boosted by human-AI interaction. The results of the Reyes-Moreno et al. (2023) study show the relevance and potential of the integration of chatbot systems, such as ChatGPT, in educational processes, as well as the importance of taking into account both teachers and students in the process of development and application of these technologies in the educational environment.

Research on teachers' perceptions also offers a comprehensive view of the adoption of GenAI in education. The key aspects outlined are, namely: disciplinary variations in the adoption of AI, correlations between teachers' age and their willingness to use it (García Cuevas et al., 2023), the potential of GenAI to rethink pedagogical practices (Andreoli et al., 2024; Kap, 2024), ethical and practical challenges such as technological dependence and lack of critical skills (Morán-Ortega et al., 2024), and the importance of developing comprehensive strategies and continuous teacher training.

Research on the design of teacher training courses on GenAI shows a convergence on the importance of providing a practical and technical understanding of these tools as well as the need for continuous training and the consideration of the ethical aspects (European Schoolnet Academy, 2023).

Some studies, such as van den Berg and du Plessis (2023) and Prieto Andreu and Labisa Palmeira (2024), explore how GenAI can assist in lesson planning and materials production for both teaching professionals and students. Besides, research such as that of Khosravi et al. (2023) proposes an analytical framework that promotes collaboration between students, educators, and AI systems for the co-creation of educational content, revising traditional roles.

Other studies focus on providing guidelines for the design of teachers’ professional development programs. Kohnke et al. (2023) demonstrate, through interviews with teachers, the significance of providing personalised support and continuous training so that teachers can incorporate these technologies while they manage to overcome ethical and practical challenges. Bower et al. (2024) and Nyaaba and Zhai (2024) also identify the need to offer personalised support, continuous training, and spaces to explore GenAI tools, encouraging the development of digital skills and pursuing ethical reflections.

Although there is consensus on the need to design teacher training courses, there are differences in terms of methodological approaches, the scope of the proposals and the populations studied. Some papers provide general guidelines, while others focus on specific contexts and disciplines. However, all these studies highlight the importance of developing comprehensive strategies for the incorporation of GenAI in teacher training, considering the technical, pedagogical and ethical aspects.

Also important is to retrieve research that addresses interactions between humans and conversational technologies. Human-machine interaction has been studied for decades. Turkle (2011) traces the evolution of technological influence on the perception of conversational bonds with machines, highlighting the impact of digital artefacts such as the Tamagotchi pet in the 1990s, which involved an engagement that led to developing emotional

attachment. However, today's conversational technologies resignify these interactions. The implications of the conversational bond with technological entities present ambivalences and tensions that require examination.

Human-to-human dialogue is a fundamental process for mutual understanding, but it is influenced by various factors that can impair it, such as cultural discontinuity, power relations and attitudes such as impatience and intolerance. To overcome these obstacles, Burbules (1993) stresses the importance of cultivating essential communicative virtues, such as tolerance, patience, willingness to admit mistakes, self-control and active listening. It is also crucial to recognise the risks and challenges inherent to dialogue, such as the possibility of imposing one's own ideas, which can hinder genuine understanding.

Nicholas Burbules (1993) emphasises the importance of dialogue as a transformative tool in education, since it promotes both deep understanding and critical thinking, where emotional elements such as expressions of affection, gratitude, care and encouragement play a fundamental role in strengthening dialogic relationships. Any educational process involves a dynamic of divergence and convergence in dialogue. Divergence in dialogue is characterised by open exploration and the generation of ideas without immediate constraints, fostering creativity and allowing participants to consider multiple perspectives. On the other hand, convergence in dialogue focuses on synthesising and consolidating ideas to attain a common understanding or decision, which is essential for problem solving and the implementation of educational strategies. An appropriate balance between both types of dialogue in the classroom enhances the learning process by helping develop essential skills such as creativity, critical analysis and effective decision-making capacity.

Recent studies, such as Shi et al. (2023), provide a comprehensive framework and taxonomy of human-GenAI interactions from a variety of perspectives, including collaboration, assistance, user control and model feedback. This taxonomy details different levels of engagement and interaction between humans and GenAI, providing a basis for a better understanding of these dynamics. Besides, research such as that of Harris-Watson et al. (2023) points out determinants for human. AI collaboration by revealing that perceived kindness and qualification in AI agents are indicators of higher human willingness to work with them.

The research by Aubert et al. (2024) depicts the experience of teachers interacting with ChatGPT during a training course. Teachers express to have felt closeness, gratitude and even friendship towards the virtual assistant, sometimes even disregarding that it is software without real emotions. But on the other hand, they fear that this artificial interaction will replace dialogue and critical reflection between human colleagues. It warns about the risks of superficial relationships, however, it recognises prospective opportunities for collaboration and co-creation. Therefore, teachers should be equipped with conceptual and methodological tools to navigate this complex human-AI relationship in the educational environment from a conversational perspective.

The papers reviewed are enlightening regarding the increasing implications of GenAI in higher education. Besides, the potential of GenAI to transform educational practices, implement strategies to personalise teaching and facilitate administrative tasks is evident. Moreover, substantial challenges related to the lack of a sound conceptual integration of GenAI in teaching practices and the need to promote significant teaching innovation are identified. There is a clear need to develop teacher training courses that address not only the required digital competencies, but also promote ethical reflections and consider the

necessary curricular and pedagogical transformations.
Besides, the conversational and interactive aspects in the design of training offers calls for special consideration. The papers further stress the ambivalence and tensions that teachers experience when interacting with GenAI, oscillating between a willingness to accept it as an interlocutor and a fear that it will replace genuine dialogue between human colleagues.

Admittedly, it is necessary to navigate approaches that allow teachers to explore the complex human-AI relationship, encouraging collaboration and co-creation, but without overlooking the ethical challenges and the importance of preserving authentic human-to-human connections. Training courses should provide conceptual and methodological tools to address these tensions, as well as encourage reflections on divergent and convergent dialogue dynamics that can be integrated when working with the GenAI. Curricular and pedagogical transformations are to be brought back to discussion and ethical reflections on the responsible use of these technologies, such as considerations related to privacy, fairness and transparency in the use of GenAI in educational environments.

Research Methodology

This study has been conducted using the Design-Based Research (DBR) methodology. The teaching design approach focuses on ideation and implementation processes as iterative and continuous cycles with the purpose of consistently improving and transforming the educational experience. This approach recognises the inherent complexity of teaching and learning. It promotes innovation and continuous improvement by considering design as a dynamic process, rather than a linear and static one (Moretti and Pinto, 2005). Therefore, design is perceived as a series of decisions based on initial hypotheses, involving multiple iterations of creation, implementation results analysis, and a parallel, retrospective process of constant reflection on the design and its results. This critical reflection allows for adjustments, refinements and redefinitions of the design in response to emerging needs and realities, thus generating an iterative cycle of continuous improvement.

Educational design goes beyond the creation of plans, training offers or static materials; it requires the ability to address challenges and opportunities that arise from the educational context. Moreover, educational design is basically a philosophical process that exceeds the mere application of techniques or methodologies. It involves the creation of new educational realities and experiences that challenge existing assumptions and paradigms. Citep has adopted the design approach from its inception as a foundational principle (Pinto, 2014). Regarding educational design as an iterative, reflective and transforming process, Citep deals with the new challenges and opportunities arising from the technologies available and the design of relevant and innovative teaching experiences with a comprehensive approach. As suggested by Bruno Latour (2009), the design process intrinsically constitutes an act of redesign, marked by a constant reconfiguration and interpretation of the practices and contexts in which it is inserted. These action dynamics, identified as iterations, prove that each return to a previous stage entails a new perspective, involving moments of critical distance and subsequent reconnections that unlock the possibility to make adjustments and reflections leading to specific goal accomplishment. Remarkably, this iterative and reflective process describes how Citep's designs are envisaged. This approach catalyses teaching and

learning innovation in higher education based on the analysis of cultural and technological trends, as well as on the identification of the challenges associated with the construction of knowledge throughout disciplines and pedagogies. It also highlights the need for commitment with continuous transformation and teaching practices.

This methodological approach provides a valuable perspective to delve into the challenges and opportunities arising from the design, implementation and evaluation of educational proposals and the integration of technology into teaching practices (Amiel and Reeves, 2008). Development and research converge into a process of iterative cycles of design, implementation and evaluation that enables fine-tuning and enrichment of the perceptions at each iteration. In this iterative dynamic, knowledge is constructed through a series of “provisional understandings” (Moretti and Pinto, 2005) that are progressively refined and further explored, requiring crucial and systematic documentation along the whole process.

Anderson and Shattuck (2012) define Design-Based Research in education using five key features: contextualization in real learning environments to ensure validity and applicability of results; development and testing of significant interventions in diverse contexts; adoption of mixed methods to assess these interventions with methodological flexibility; execution of multiple iterations in the design process towards continuous improvement; and promotion of cooperation among investigators and professional educators giving special value to the complementarity of knowledge and positions that fosters enrichment in teaching practices. These features contribute to strengthening the validity and robustness of the results.

Nonetheless, it is equally important to consider the limitations inherent to this methodology. Barab and Squire (2004) sustain that a deep involvement of the investigator in the conceptualization, design, development, implementation and analysis of a pedagogical approach may jeopardise credibility and reliability of the investigators' assertions. Limitations acknowledged, it should be noticed that none of these methods is able or intended to eliminate any investigator's bias in the research process.

The main purpose of this study is to identify key aspects for the design of teacher training courses based on GenAI and Education. Therefore, an analysis will be conducted on the design and implementation process of two courses identified as DG1 and DG2 aimed at integrating GenAI into teaching practices and learning assessment in higher education. The study intends to: (1) systematise and document the design of the course proposals; (2) present teaching decisions at each stage; (3) identify main debates taking into account conversational technologies functionalities and ethical issues in higher education; (4) characterise teaching strategies that enable a critical approach to GenAI possibilities and challenges.

Several instruments are used to conduct the study, namely: work documents, documents prepared to present design ideas, documents that systematise decisions related to the activities proposed and prototypes produced by the design team and discussed with all the members of the Citep team. Furthermore, initial and closing surveys were completed by participants of courses DG1 and DG2, and the responses of educators as to the various activities proposed in the courses were analysed.

The initial survey included questions on the participants' profiles and a question about their expectations regarding the training course. The participation of educators has been recorded through the on-line boards and forums included in the activities for later analysis. This process consisted in a three-cycle encoding with the rotating participation of two investigators at each cycle.

The analysis of the instruments produced by the design team, survey responses and educators' participation in selected activities allow further triangulation of data and profound comprehension of the phenomenon under study.
The study sample comprised a total of 248 educators: 168 participated in DG1 and 80 in DG2 (Figure 1). The informed consent of participants had been received prior to the beginning of the courses and the study. The informed consent accurately stated that initial and closing survey responses and entries in the activities of each course would be collected anonymously.

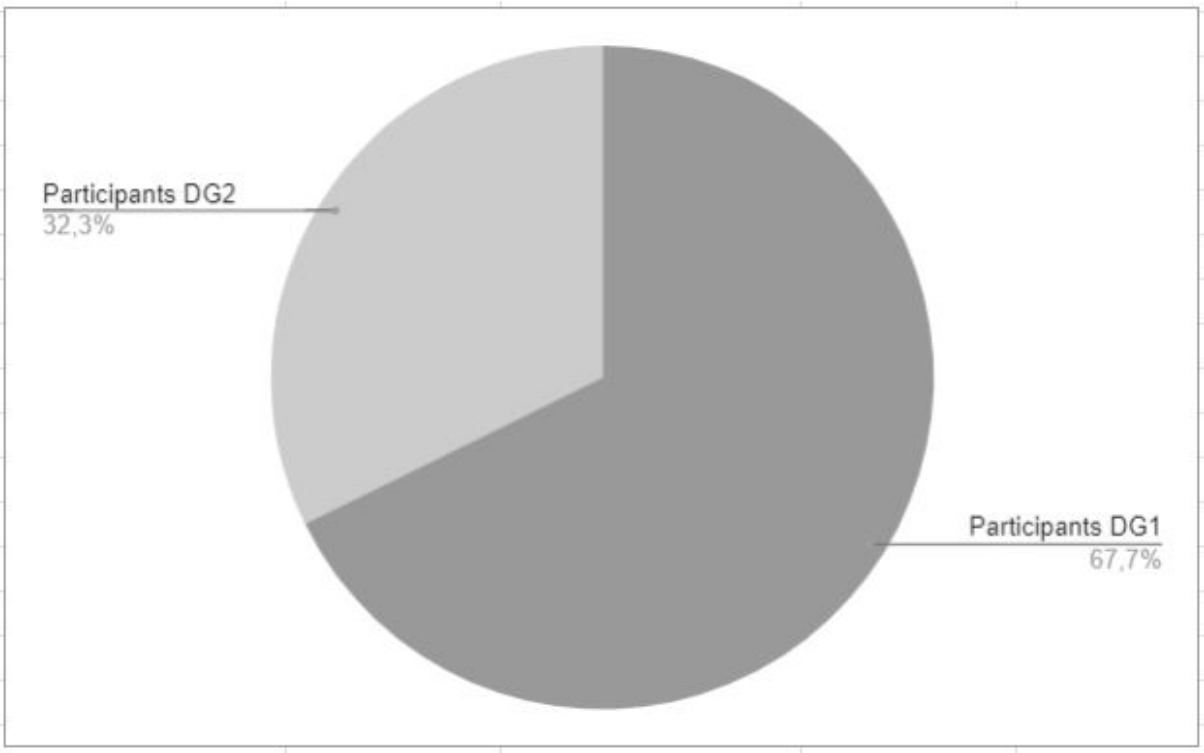

Figure 1: Sample Distribution by Participation in DG1 and DG2 Courses

Table 1 summarises the general distribution of teachers participating in DG1 and DG2 courses. Table 2 shows the distribution of UBA faculty members as per Academic Unit.

Category	Quantity
UBA Faculty Members	215
Retired UBA Faculty Members	2
Faculty Members fron other institutions	31
Total	248

Table 1: General Summary of the Sample

Faculty	Quantity
Architecture Design and Urbanism	31
Pharmacy and Biochemistry	26
Economic Sciences	22
Social Sciences	21
Psychology	20
Medicine	18
Agronomy	15
Common Basic Cycle	15
Law	11
Engineering	9
Philosophy and Literature	8
Exact and Natural Sciences	7
Veterinary	6
Dentistry	4
UBAXXI	2
Total	**215**

Table 2: Distribution of UBA faculty members by Faculty or School

The analysis process involves exploring the decisions, reflections and results of the implementation by the design team. Emphasis is placed on the research and the specific context where courses are designed and implemented. Note that Design-Based Research encompasses active participation of the research team in the whole process of conceptualization, design, implementation and analysis of training courses for educators. To examine possible biases and subjective perspectives in the study, the following strategies were applied: 1. *Reflective processes of the research team*: Along the process, the team maintained a continuous dialogue and critical inquiry over the decisions and interpretations made, as well as over the results achieved. The team's joint reflections enabled identification and questioning of possible biases or underlying assumptions; 2. *Triangulation of sources and methods*: Multiple data sources were employed (surveys, activities of participants, design documents) and quantitative and qualitative methods were combined for analysis. This triangulation allowed comparison among the various perspectives and minimisation of the biases derived from using single information sources; 3. *Cycles of peer investigators*: Rotating cycles were set out to analyse the participation of educators to later encode and categorise findings; 4. *Peer review*: Preliminary designs, instruments and findings were submitted for revision by other researchers and experts in the field, members of the Citep team involved in other centre projects, who contributed external viewpoints and constructive criticism; 5. *Documentation*: A detailed registration of the entire research process has been conducted, including decisions, justifications, adjustments and reflections. This facilitated a transparent and auditable follow-up of actions carried out.

Analysis and Results: Design Iterations

Seven key iterations have been identified in the design process, which provide a comprehensive perspective and underscore the decisions made at every stage. Each of the iterations involves a brief introduction, a detailed account of the actions performed, the analysis of the results and a summary of the main discussions. These iterations encompass the initial conceptualisation of the course proposals, moments of reflection, prototyping, implementation and final assessment. Each iteration entailed a reconfiguration and interpretation of the didactic design within a cyclical and dynamic process.

First Iteration: State of the Art in GenAI

The first iteration focused on establishing the State of the Art in GenAI, at the beginning of 2023. A diverse range of sources, including scientific articles, research papers, journalistic articles and essays published in various formats and languages, were gathered and examined. These sources were analysed and discussed during both in-person and hybrid meetings of Citep's whole team, composed of experts specialising in pedagogy, didactics, educational technology, communication, literature, history, psychology, audiovisual production and editing.

Results: The diversity of the team contributed to more profound conceptualisations and critical reflections. This multidimensional approach—which encompasses educational, social, ethical, cultural, economic and political dimensions—involved an exploratory divergent phase that contributed to the development of analytical frameworks essential for designing future training courses. The reference material reviewed was shared using tools such as RSS feeds, shared documents and online boards.

Discussion: The collection and analysis of these sources facilitated the identification of key debates in the field of education. These findings informed initial design decisions and provided a solid foundation for subsequent iterations.

Second Iteration: In-depth Exploration of the Educational Dimension

The second iteration aimed to delve deeper into the educational dimension in order to identify the key aspects that would enable contextual analysis and advance towards potentially relevant topics to be addressed in training courses. This included hosting an academic event called Co-presencias algorítmicas y simbióticas where the team's exploration and findings were shared with the University faculty.

Results: The identified topics included knowledge construction, development of complex skills, distributed cognition, technological environments, the emotional component of learning, the unique role of teachers and students, authentic tasks, posing sound questions, dialogue and collaboration, diversity and inclusion, and academic integrity. During the event, the teachers' uneven levels of exploration and varied approaches were detected and documented to enrich the design of the training courses.

Discussion: Identifying topics and documenting the variety of approaches chosen by the teachers provided valuable information for the design of the training courses, ensuring they addressed the various concerns and uneven experience levels of the participants.

Third Iteration: First Conceptual Mockup

This iteration involved defining the course contents and developing the first conceptual mockup. Four key topics were identified: 1. *Learning*: Profound Transformations; 2. *Teaching*: Authentic Course Proposals; 3. *Invention*: Hacked Singularity; 4) *Ethics*: Conversations and Artifices.

The contents being defined, the design of the first conceptual mockup advanced. It propounded “layers” to approach GenAI, planning time management, involving activities aimed to encompass the four topics (see Figure 2).

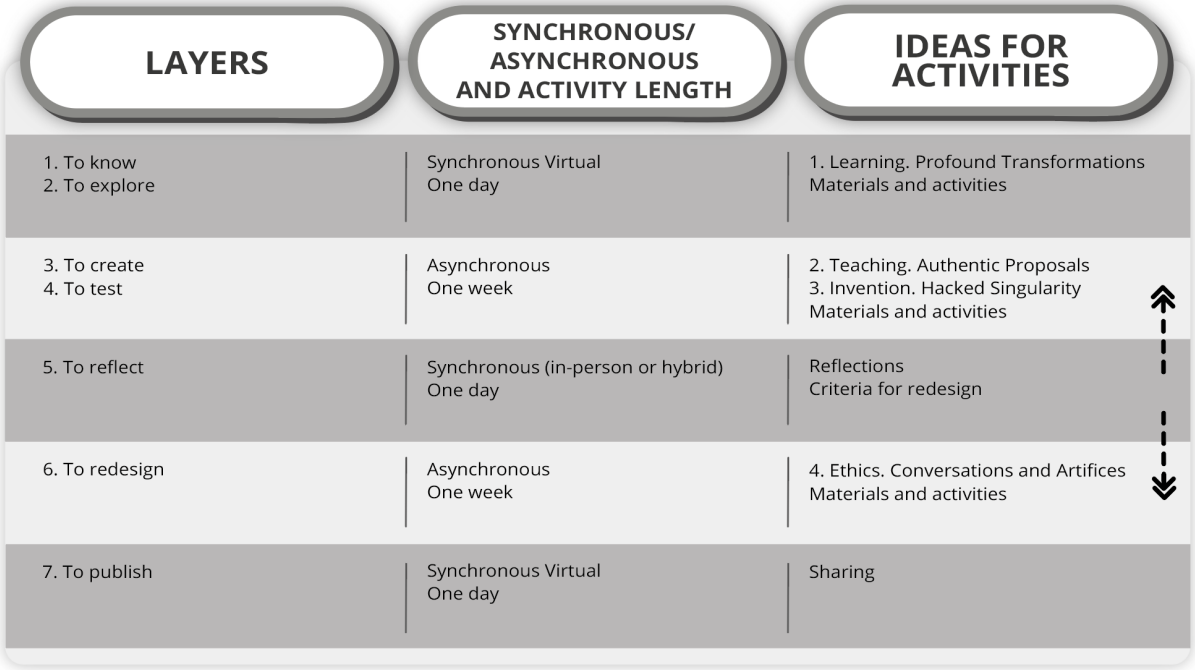

Figure 2: Design Conceptual Mockup

Results: The mockup propounded instrumental, analytical and design approaches to GenAI. This prototype was submitted for internal validation with the pedagogic team of the Centre.

Discussion: Whilst the relevance of the topics and the opportunity for shared reflection offered in the course were appreciated, limitations were noted in the uniqueness and linearity of the trajectory, which did not acknowledge the diverse previous experience of the participants. Furthermore, the combination of certain layers with specific topics, while excluding others, fragmented the conceptualisation, preventing meaningful intersections. These findings led to the redesign of the course proposal.

Fourth Iteration: Second Conceptual Mockup

The new iteration entailed decision-making on the general design of the proposal. The training scheme was structured into two courses, one focusing on teaching and the other, on assessment. Hence, each topic would be thoroughly explored with critical profoundness, considering current inquiries, related to the rise of this technology and education.

It was defined that the first course would be called: *Diálogos Generativos I: La IA en prácticas de enseñanza alquimizadas* (DG1). A new mockup was developed, including the course mode: asynchronous online, self-directed, and with tutorial moderation.

The course would include two components. The first one, called Focuses, would introduce the several topics, fostering experimentation and reflection on how to integrate GenAI into teaching. The second, Designing Rooms, would encourage the creation of teaching courses, employing diverse strategies. These components would be available sequentially, with a specified interval between them.

Results: Based on the exchanges with the team regarding the first design, it was decided that proposing more flexible trajectories, which consider the students' prior experience interacting with GenAI, and the connection among the course topics was paramount. The strategy presented focused on one essential question: Who and how do we engage in dialogue to create a teaching course proposal? An isomorphic course proposal was developed based on that inquiry, grounded in the importance that both the content of the course itself and the dynamics of participation resemble the actual interaction with technologies of this kind. Consequently, becoming aware of how GenAI fosters a conversational exchange strategy that simulates human dialogue prompted the creation of four distinct activity phases for each topic in Focuses: 1. *Dialogues with AI*: activities designed to experiment with ChatGPT; 2*. Dialogues between faculty members*: activities designed for exchange among colleagues, in two possible versions: brief (SNACK Dialogues) and extended (DEEP Dialogues); 3. *Inner dialogues*: activities encouraging participants to share their own reflections; 4. *Captured dialogues*: activities for participants to select and highlight meaningful remarks of their colleagues.

The Rooms component would propound activities to create teaching strategies based on case study, simulations and complex problem-solving. The design of these activities would follow the implementation of the first component. Each participant would choose which strategy to pursue.

Discussion: This isomorphic, participatory and flexible approach was internally validated and regarded as aligned with the Centre's goals to promote teachers training through updates on culture, technology and communication trends, which conform the framework within which teaching and learning unfold, ultimately aiming to improve teaching practices at university.

Accordingly, the course strategy simulates interactions with conversational AI technologies and proposes activities centred on dialogues with GenAI, colleagues and oneself, fostering reflection and redesign of educational offers. Additionally, allowing the participants to choose their own trajectory, based on prior exploration, field of knowledge and the specific didactics of their subjects was essential.

The decision to propose three strategies such as case studies, simulations, and complex problem-solving was aimed at promoting authentic teaching courses proposals that foster cognitive processes and higher-order skills such as critical analysis, creativity, complex problem-solving, decision-making, and abstract thinking. In this scenario, where GenAI takes centre stage, developing training course proposals involves rethinking strategies and providing cognitive processes that are less likely to be replicated by AI, thus preparing students more suitably for the challenges they will face as future professionals in a constantly

changing world. Furthermore, teachers need to enhance the elaboration of these teaching courses, and GenAI can contribute to the creative processes required by these strategies.

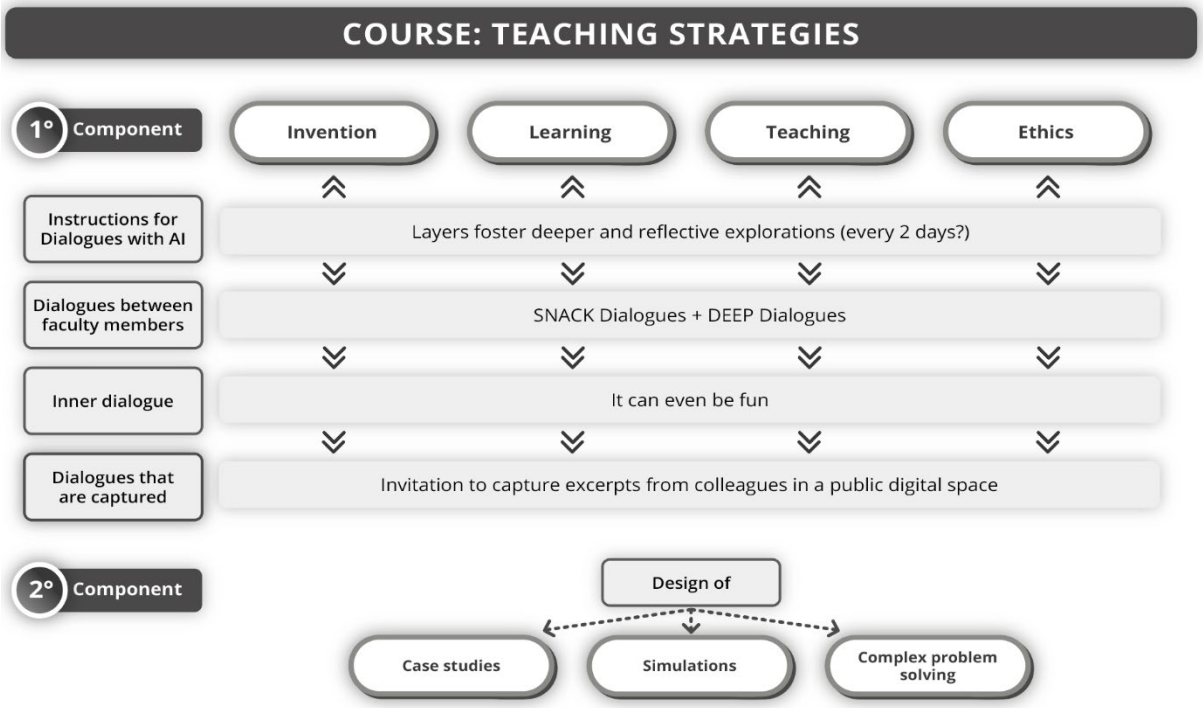

Figure 3: Teaching Dimension Course Mockup

Fifth Iteration: Materialisation. From the Mockup to the Setup

This iteration involved defining the visual identity, spatial layout of the sections, resources, and navigation flow of the virtual classroom. Afterwards, the content development for each section proceeded as follows: writing introductory texts, selecting study materials, and drafting activity tasks. Additionally, the most suitable technological tools were identified to perform each activity: forums, online boards, and social networks. Finally, the setup of the virtual classroom was established.

Results: The design of activities revisits the layered dynamic of the approach to GenAI created in the first mockup, outlining the trajectory from a more instrumental focus (Know) to increasingly deeper, more reflective, and design-oriented explorations (Explore, Create, Test, and Redesign). Considering these approaches, the instructions for ChatGPT interactions were developed with four purposes: i) to conduct an in-depth conceptualization of the four topics; ii) to generate different types of content on each topic (reviews, essays, articles, etc.); iii) to pose critical questions to detect possibilities and limitations of GenAI; and iv) to simulate role-playing scenarios: between experts and novices in a field of knowledge, between teachers and students, and between professionals and colleagues, according to their field of knowledge and professional expertise.

Simultaneously with the setup of the classroom, fifteen days before the course began, a registration form was enabled to collect, in addition to personal and institutional information, the teachers' interests and expectations.

Discussion: Documenting the process highlighted the significance of the layered trajectory designed in the first mockup, which suggested valuable approaches to interact with GenAI. The details of the course and its adjustment for implementation were also addressed. Modern and potent materials were selected, incorporating instrumental, analytical, and design perspectives. The navigation of the course was reviewed to enable multiple pathways and foster meaningful dialogues.

The analysis of the responses to the registration form revealed diverse interests and varying prior knowledge, underscoring the need to experiment with these technologies and explore their possibilities and limitations, as well as the didactic and ethical challenges involved. This information affirmed, on the one hand, the relevance of tutorial moderation to scaffold such diversity and, on the other hand, the design of activities for teachers to experiment with different strategies for engaging with GenAI and critically reflect on teaching practices.

Sixth Iteration: Diálogos Generativos I. Implementation

The DG1 course was implemented between April and May 2023. It was divided in two parts: the first one enabled access to Focuses, and the second, to Rooms. While Focuses was in progress the interactions and degree of participation were analysed, to design the activities for the Rooms.
Once the first part had finished, the course allowed a one-week break before the second part began. Upon conclusion of both components, a closing survey would gather feedback on the participants' experiences.

Results: Analysing the teachers’ participation was crucial in this process. Their early approaches to the tool, guided by precise directions in the Dialogues with GenAI activities, occurred gradually and continuously. The initial reactions of astonishment, enthusiasm, and scepticism gave way to more critical reflections on the functionality and scope of ChatGPT, highlighting the need for well-crafted instructions.

These findings prompted a change in the production tasks within Rooms. The specific instructions for interacting with the Chat of the first component, were replaced by didactic techniques related to the proposed strategies. Participants were encouraged to share the decisions made on teaching proposals, as if presenting them to their students, and to make a reflection on the experience. This approach leveraged the interaction experience and enhanced the teachers’ expertise in their fields to design a teaching strategy, assisted by the Chat.
Responded by 80 teachers, the closing survey revealed positive evaluations regarding the flexibility of the proposal, the depth of the topics addressed, and the design of the dialogic strategy:

- Flexibility: Focuses was appreciated for enabling the development of a personal trajectory based on the topic selection, and for providing multiple opportunities to engage in the diverse tasks. Rooms allowed every participant to freely choose the most appealing didactic strategy, or the one that best suited their specific discipline. The responses validate the significance of personal participation spaces within an environment of collective commitment.

- Depth of the topics covered: The teachers appreciated the didactic approach of the course, which goes beyond the instrumental view of technology. As they engaged in exchanges with ChatGPT and acquired advanced skills in formulating instructions, they could develop a critical perspective on GenAI tools and analyse both their capabilities and limitations in performing certain tasks.
- Design of the dialogic interaction strategy: The initial component was particularly appreciated for the guidance it offered in initiating interactions with the Chat. This facilitated the integration of ChatGPT conversational logic in subsequent interactions, aiding participants in refining their questions/prompts for improved results and autonomy. This scaffolding was fundamental to develop more advanced skills in Rooms, where, supported by didactic techniques, they were required to generate their own prompts.

Discussion: The analysis validated the flexible, dialogic, and iterative design of the course but also revealed some weaknesses. For instance, the brief "SNACK" and extended "DEEP" dialogues experienced high levels of participation, and the interdisciplinary exchange achieved was valued. However, twice as many participants preferred the "SNACK Dialogues." Despite the numerous responses in "SNACK," participants struggled with the proposed short response format, possibly because it required delving into topics they were just beginning to explore. As a result, they chose the brief dialogue option, neglecting the specified format. This issue is still under analysis by the team and will be addressed in another study. Consequently, adjustments to the two components were necessary to improve the interaction design for the DG2 course.

Seventh Iteration: Design, Implementation and Analysis of Diálogos Generativos II

This iteration initiated the design process for the second course, focused on Assessment: *Diálogos generativos II: Evaluar con IA. Cocreaciones más allá de las tensiones* (DG2). A specialist in higher education evaluation was integrated into the design team to address the tensions, alternatives, and potential supports that AI could provide to assessment practices.

The ideation process considered the analysis of the closing survey from DG1. Discussions were held within the team, and current articles on assessment with GenAI were reviewed. Challenges and opportunities were identified, focusing on preserving academic integrity through the ethical use of conversational technologies, both for the creation and generation of exam content and for identifying whether those exams were written by humans or by GenAI.

Results: The decision was made to retain the dialogic strategy and continue guiding interactions with GenAI to transcend instrumental approaches and address didactic challenges. Additionally, maintaining a flexible structure and navigation, presenting relevant materials, and offering a virtual, asynchronous, self-directed format with tutorial support were regarded as essential features of the course.

DG2 was built upon four pillars: 1. *Fundamentals*, intended for those who had not participated in DG1, offering an opportunity to explore key teaching approaches and interaction types; 2. *Testing*, designed for faculty members to test existing assessments used

with their students; 3. *Instruments*, focused on the collaborative creation and investigation of combined assessment instruments, which could be solved through interactions with AI; 4. *Rubrics*, devised for this instrument using combined AI tools and feedback mockups.

The activities proposed within each component involved dialogues WITH AI, AMONG colleagues, and also introduced a dialogue TOWARD didactics, intended to design and redesign assessment courses leading to the creation of instruments.

Teacher participation in DG1 provided valuable input to define these fundamental components of DG2. Initially, the progressive approach enabled them to analyse and reflect on their interactions with ChatGPT, prompting genuine concerns such as the use of GenAI by students to complete tasks undetected. As a result, the Trials component was introduced to test assessment instruments and evaluate the feasibility of GenAI. Moreover, the experimentation with ChatGPT in DG1 identified synergistic dynamics for the design of didactic strategies, which teachers appreciated. This, in turn, fostered the expansion of design processes for assessment through the co-creation of instruments and rubrics.

Upon the implementation of the DG2 course, a new closing survey was conducted to assess the pedagogical aspects of the course, with responses from 52 individuals. The analysis provided valuable insights: the course flexibility allowed participants to pursue different paths depending on their interests and capabilities. The most favoured component was Fundamentals, followed by Testing. Interestingly, only 13% of respondents opted for a single subject, whereas 83% engaged in 2 or more.

Discussion: For DG2, the team considered it vital to maintain the course flexibility and interaction with AI for designing new material, specifically, assessment instruments. The analysis of the main participation forms yielded some remarkable conclusions. Unlike the DG1 course, where peer exchange produced very high participation, in DG2, 52% of participants interacted with the texts and GenAI, 27% accessed the texts, interacted with GenAI, and exchanged ideas with colleagues, and 21% only focused on the reading material. Could the elaboration of assessment instruments have strongly appealed to a disciplinary approach? Collective activities required the production and sharing of assessment instruments as the driving force of discussion. This observation suggests a potentially strong disciplinary and instrumental approach in assessment topics, leading participants to prefer interaction with AI to collaborative commitments.

Regarding the participants' experience, 58% managed to design new assessment instruments or redesign existing ones. This component was highly valued as it enabled exploration and critical reflection to analyse the uses, limitations, and capabilities of interacting with GenAI to create new assessment methods and instruments that enhance teaching practices.

These seven iterations of the design illustrate a detailed and reflective work dynamic, showcasing the continuous evolution of the process. Each iteration has refined and enhanced the design, incorporating feedback and adapting to emerging challenges. Below is a flowchart (Figure 4) displaying all stages and key decisions in the process, which ensures a comprehensive understanding of the trajectory and puts the limelight on the interaction between phases and their influence on the final development of the training courses.

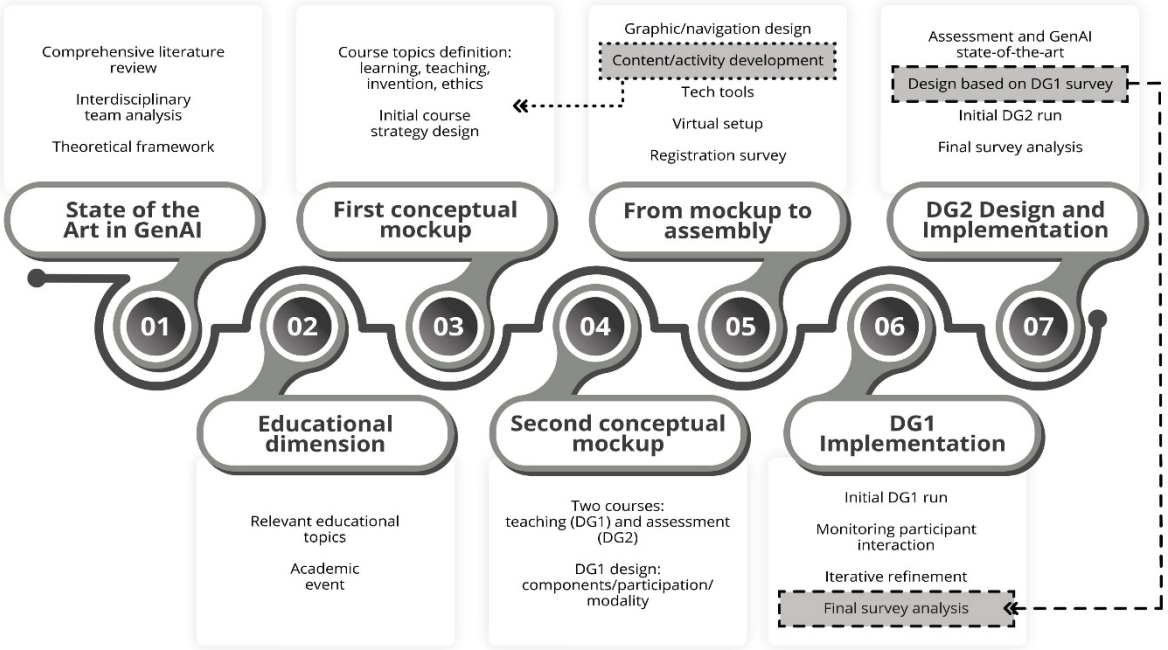

Figure 4: Flowchart displaying all stages and key decisions in the process

Key Dimensions for Designing GenAI Teacher Training Courses

This study identified key dimensions for designing GenAI and Education teacher training courses by examining the DG1 and DG2 courses, focused on the incorporation of this technology into teaching and assessment practices in higher education. Ten dimensions were discussed and classified into two levels: design-based processes and underlying principles in the design of teacher training courses.

Regarding the design process, four key dimensions were included:

1. **Iterative Design Process**: Implementation of successive approaches during the design stages to regularly adjust, achieve consensus, and explore new strategies and methodologies. This non-linear approach enables early identification of problems and addresses the complexity and uncertainty inherent in designing innovative courses.
2. **Co-design and Active Participation**: Involving all the stakeholders in the process from an interdisciplinary perspective enables the integration of diverse insights and experiences, provides a shared view of the design object, and fosters a collaborative approach at every stage of the process.
3. **Documentation and Visibility**: Thoroughly documenting decisions and making this process visible facilitates deep comprehension. By recording every step and the reasons underlying those decisions, a valuable resource is created for monitoring, replicability, and future reference and analysis

4. **Implementation, Feedback, and Adjustments**: Incorporating systematic mechanisms to collect and analyse feedback from all participants results in informed decision-making course designing. The implementation, feedback, and adjustments cycle contributes to improving the quality of the project.

Regarding the underlying principles of teacher training, we identified six dimensions:

1. **Situated Teaching Practices**: Designing educational course proposals that consider the context in which practices are deployed involves recognizing the interests of trainees and addressing the diverse didactic challenges and specificities of disciplinary fields.
2. **Flexible and Dialogic Approach to Designing Educational Trajectories**: Embracing this approach facilitates the development of trajectories tailored to participants' needs, fostering dynamic learning experiences and encouraging collaboration among colleagues.
3. **Pedagogical Isomorphism**: The close relationship between content, activity design and participation dynamics demonstrates strong coherence in the design of teacher training courses.
4. **Cognitive Externalisation**: Provide contexts to share personal experiences, make them visible to others, and recognise them as a collective metacognitive record.
5. **Critical Reflection on the Integration of GenAI in Teaching**: Promoting critical reflection implies setting aside a merely instrumental approach and considering ethical implications, the potential impact on student learning, and how GenAI can transform educational experiences while preserving the human-centred essence of teaching.
6. **Multidimensionality in Exploring Conversational GenAI Technologies**: Including the analysis of the educational, social, ethical, cultural, economic, and political dimensions along with diverse sources in this exploration enables a comprehensive awareness of the potentialities and challenges in higher education.

The dimensions identified in this study illustrate the inherent complexity and richness of the process involved in designing GenAI teacher training courses. The comprehensive approach adopted, which combines critical reflection and active participation, facilitates the continuous evolution and refinement of these training courses. This approach underscores the dynamic interaction between design processes, technological innovation, and teaching practices. Incorporating these dimensions into the design of courses enhances the professional development of educators, who respond actively and critically to the challenges and opportunities posed by GenAI in connection with higher education.

Conclusions

The analysis and implementation of the courses DG1 and DG2 have provided a profound understanding of the opportunities and challenges associated with integrating AI-generated educational technologies (GenAI) into higher education. This study explains how Citep has designed these courses using a flexible and dialogic approach, which scaffolds the gradual

development of educators' autonomy while interacting with GenAI. This approach illustrates Citep's commitment to reflective design, acknowledging both cultural and technological trends, and considering the complexity of knowledge construction across various disciplinary fields.
The iterative design process documented in this study employs a progressive and reflective methodology. Systematising these processes, subjecting them to critical review, and disseminating this information within the educational community as part of a design-based research initiative serves as a catalyst for innovation.
The findings of the study evidence the imperative for teacher training to effectively navigate the challenges and opportunities posed by GenAI. Institutions of higher education should prioritise the implementation of continuous and permanent professional development programs, with a focus on the design of new didactic strategies, including evaluation. Additionally, it is important to create avenues for critical reflection among educators to address academic and ethical challenges. The multidimensional approach of the study emphasises the significance of interdisciplinary collaboration in exploring emerging technologies and their seamless integration into education.

Despite these valued findings, it is crucial to consider the study limitations. Although the design process has been rigorously documented and peer-reviewed, involving a substantial sample of 248 participants, it would be vital to expand the research to other institutions and educational contexts. Furthermore, a longer-term follow-up would provide further understanding of the sustained impact of these training courses on teaching practices. It is noteworthy that the study specifically focuses on the integration of GenAI such as ChatGPT, thus exploring the use of other AI technologies and their impact on teacher training remains a relevant line for future research.
In such a rapidly evolving field, future studies could explore the impact of GenAI across the several educational levels, academic disciplines, and sociocultural contexts, as well as consider alternative approaches to incorporate these technologies into university teaching practices.

The key dimensions identified provide a valuable framework for the development of innovative educational courses that address current needs and challenges. The integration of GenAI has the potential to transform higher education, but it requires a carefully designed and reflective approach considering the complexities of the educational context.
As we noted at the outset, the design approach is a foundational principle of Citep. Designing and implementing constitute a complex action that involves thinking and doing. It is the co-design with all the stakeholders what sustains this flexible, multidisciplinary, and inclusive process. The coherence between the needs and interests within constantly changing educational contexts and the forms of intervention results in teacher training courses with meaning and relevance.

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