tise transition, innovation and sustainability environments

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Generative AI Chatbots in Higher Education Teaching Environments - A Concrete Proposal for a Teacher Training Workshop

Master's thesis for obtaining the academic degree

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Stefano Zaniboni

Knowledge and Communication Management

at University for Continuing Education Krems

Advisor: Dr. Jorge Martins Rosa

Advisor: Dr. Sina Westa

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Abstract

Generative AI chatbots are a technological tool that has rapidly gained prominence in Higher Education. Its introduction into teaching environments offers considerable opportunities and challenges and requires a comprehensive understanding of their impact on learning activities. The enthusiasm to which students are rapidly adopting the technological aid for their assignments underscores their potential to transform educational practices. Despite the growing use of GenAI chatbots, there is a noticeable gap in the literature regarding their practical application and impact in higher education. Studies focus on theoretical benefits and potential risks, leaving a need for empirical research on real-world student interactions with these tools.

The thesis fills this gap, approaching the problem with a social constructivist framework of knowledge. This research first employs a qualitative method, including semi-structured interviews with international graduate students, to explore the complex dynamics between students and GenAI chatbots. In the second part, the study applies the instructional design methodology "Successive Approximation Model" (SAM) to reach a concrete proposal for a course plan aimed at training teachers in humanities in Higher Education to facilitate the positive integration of the technology.

From the findings of this research, it emerges that students are more prone to use GenAI chatbots when under academic pressure and when lacking confidence with the subject matter of study. The ease of obtaining information from chatbots is a significant factor influencing their use, although concerns in the students about misinformation and academic integrity can also influence student's decision. There is a strong demand for AI literacy programs to educate both students and teachers on the capabilities and limitations of GenAI chatbots. This thesis contributes both theoretically and practically to increase the understanding of the influence of Generative AI technology on teaching environments in Higher Education. It provides valuable insights into the real-world use of GenAI chatbots by students, offering a foundation for developing practical guidelines and educational frameworks.

Keywords: Generative AI, Chatbot, Teaching, Higher Education

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Introduction

On November 30th 2022 the world was taken by storm with the release of ChatGPT to the public. For the first time, “mere mortals” (a.k.a everyone who didn’t work with machine learning), could access and experience the seamless form of communication with machines that humans have established. The disruptive ability of ChatGPT to generate accurate responses to human requests in a perfectly human language, attracted worldwide attention, surpassing 100 million active users in just over 2 months (T. Wu et al., 2023). For a quick comparison in the market of digital products, it took TikTok 9 months to reach a similar number of users and 2.5 years for Instagram. Part of the 100 millions users were of course students, who quickly realised the potential of this product in terms of reduced workload. Students found the tool to be increasingly helpful for academic tasks (Møgelvang et al., 2023). On the other side of the barricade, teachers had unclear reactions, with emerging concerns about the potential impact on traditional educational practices and ethical concerns around plagiarism and authorship (Lo, 2023; Møgelvang et al., 2023).

ChatGPT is a primary example of Generative AI (GenAI) technology; this term includes all “computational techniques that are capable of generating seemingly new, meaningful content such as text, images, or audio from training data” (Feuerriegel et al., 2024, p. 111). In particular, ChatGPT is a “GenAI chatbot”: a text-to-text product of GenAI technology that aims to replicate human natural language and interaction. Today tools as such have multiplied, and they enable any individual with an internet connection to access augmented forms of computational intelligence tailored to the user's needs. Thus ChatGPT has paved the way for a revolution that is predicted to change the future even more than how it is currently impacting the present. If today it is almost unthinkable to enter an office or a classroom in Europe without computers or an Internet connection, in the future Generative AI will pervade humans’ operational environment in a similar way (Schöbel et al., 2024). A society voted to engage in sustainable innovation must acknowledge the scope and implications of such disrupting revolutions in time, to avoid dangerous pitfalls. What is at play with the GenAI revolution in educational environments,

is the impairment of critical thinking, and the lack of motivation to creatively engage with novel content (Bai et al., 2023), both fundamental and unique characters of human beings.

Educational systems in Europe are still anchored to antiquated structures and methods and are facing ever more challenges to meet the demands of the job world that is projected into the future. The global pandemic was a revolution that accelerated the digitalisation of educational environments, but a lot remains to be done to achieve a proficient digitalisation that does not hinder fundamental educational values. Researching the benefits and threats and educating about the nature and functions of GenAI Chatbots is a necessity to stop increasing the layoff between Universities and “the real world”.

This thesis explores the reasons for which students use GenAI chatbots, what are the opportunities and threats of this initiative, and it proposes a concrete solution to facilitate the emergence of positive learning outcomes from the use. This project is divided into two parts, with the second one building on the results of the first one.

Part One - Exploratory Analysis of the Influence of Generative AI Chatbots in Learning Activities

The first part of the thesis consists of exploratory research. According to the SAGE Encyclopedia of Qualitative Research Methods, “the term exploratory research refers to the broad-ranging, intentional, systematic data collection designed to maximise discovery of generalisations based on the description and direct understanding of an area of social or psychological life” (Given & Stebbins, 2008b, p. 327). The main object of study for this thesis is the opportunities and threats that GenAI Chatbots present to Higher Education Teaching Environments with a particular focus on Europe. Therefore the exploratory part of research aims to increase the overall understanding of the relationship between students and GenAI Chatbots to clarify the effects of this interaction. To achieve this objective the research conducted interviews with international graduate students. Given the exploratory nature of the research, data collection was guided by three equivalent questions:

How do Higher Education students in Europe utilise Gen AI Chatbots in their academic activities?

What factors influence their decisions to adopt or avoid the use of GenAI Chatbots?

What is their perception of the use of GenAI Chatbot in educational settings?

The first result section presents the findings from the interviews in triangulations with the relevant findings available from research, in order to outline any link or contradiction between the outcomes of the exploratory thematic analysis of the interviews and the academic research landscape.

From the analysis of the collected and triangulated data, it emerges that students use GenAI chatbots when they don’t feel confident in a certain subject, and their tendency to use the chatbots can rise as a response to increasing academic and social pressure. Moreover, the ease of use of the technology appears to play an important role in students' decision processes both as a facilitator and as a barrier: students mainly use it when they seek fast and seamless information; therefore, whenever additional work is required (for instance, to give context or to proof-check information) they often prefer not using the tool.

The research findings indicate that students may be concerned about issues of academic integrity as much as teachers and professors, and they share issues about the impact that the technology will have on society's abilities of critical analysis, creativity and human interactions. The disruption of GenAI tools to Higher Education environments appears so inevitable to students, that they prompt academic institutions to act fast, in order to avoid a loss of traditional educational values in the future and the exacerbation of socio-economic inequalities given by the quality of access to the technology. Positive and negative sentiments are equally distributed, and it emerges a common consensus on the need for universities to organise activities to increase AI Literacy in students and teachers, and to release clear and useful frameworks to guide the use of the technology for teaching and learning.

Having established the findings from the exploratory research, and identified the need for concrete practices that can guide and facilitate the integration of GenAI Chatbots into academic environments, the research entered into the second, design-oriented phase.

Part two: Design Proposal for a Concrete Educational Approach

The second part of this research is guided by the research question: “How to prepare teachers in European Higher Education Institutions to integrate Generative AI Chatbots into their teaching activities, enhancing benefits and avoiding hazards?” Therefore, the main objective is to design a viable course plan that can be implemented by universities in Europe, facilitating the role of teachers in integrating GenAI chatbots into their teaching methods.

To address this question, the research methodology was grounder in the Systematic Approximation Model (SAM) for Instructional Design. This model involves a continuous iteration of the design of an educational product through cycles of analysis and development to continuously update and optimise the structure and contents of a course plan. One Collaborative Ideation Workshop with students from the Transdisciplinary Master’s Program “Transition, Innovation and Sustainability Environments” and one focus group with 4 researchers from the University for Continuing Education Krems served as data collection methods for this part of the research. The thematic analysis of the data contributes to the SAM process providing critical information to steer the process of designing the course plan.

The final result of this process is the design of a plan for a workshop in a blended learning format targeted at Higher Education teachers of Humanities in Europe. The first half of the workshop (delivered online) is structured to enhance AI literacy and the autonomous use of GenAI Chatbots by teachers in their teaching activities. It starts with the delivery of foundational knowledge about GenerativeAI and Large Language Models. The first part of the workshop also proposes content on prompt engineering and Human-AI eXperience. The importance of AI literacy, already evidenced in the exploratory part of research, is also highlighted by the result of the Collaborative Ideation Workshop and it represents a critical element to achieve the objectives of this research endeavour. The second part of the workshop (happening in an in-person setting) offers an interactive space where learners are encouraged to discuss and form an educated opinion on the integration of

GenAI Chatbots in their teaching environment. Furthermore, the workshop culminates with an activity of co-design, during which participants are guided to plan a teaching activity powered by GenAI chatbots that enhance the benefits of the technology in teachers' everyday lives. The second part of the Workshop fosters collaboration and networking among teachers, inviting them to share strategies and frameworks of use, as suggested during the focus group.

The rest of the thesis is organised as follows: first the chapter "Theoretical Foundations of the Research" presents the theory that supports the interpretation of the result throughout the research; "Part One: Exploratory Analysis on the Influence of Generative AI Chatbots in Learning Activities" presets in details the methodology and the results of the exploratory research, and offers a short conclusion, listing the main takeaway to bring on in the second part of the research; similarly, "Part Two: Case Study for a Concrete Educational Approach" presents the methodological framework based on the Successive Approximation Model, the result from data collection; the chapter "GenAI in the Classroom: Co-Designing the Future of Teaching in Higher Education - A Teacher Empowerment Workshop" offers an overview of the design of the proposed workshop, together with a discussion outlining the details and the justifications for the choices in design; the last part of the thesis is dedicated to the limitations faced by this research and the future directions.

Theoretical Foundation of the Research

This part of the thesis is to be considered a necessary map to navigate through the rest of the work. The chapter aims to establish the foundations of this study; it contains the technical specifications and theoretical background that compose the very spine of the research. To achieve its objective, this chapter first provides a detailed technical overview of GenAI chatbots, focusing on their underlying mechanisms and unique features. This is essential to understand the capabilities and limitations of the technology, which directly impacts how it can be used in educational settings (Mishra & Koehler, 2008). Following this, the chapter explores the theoretical foundations that support the integration of GenAI chatbots into teaching activities. The pedagogical frameworks of social constructivism and Technological Pedagogical Content Knowledge (TPACK) are examined to highlight the theoretical justification for this research. These frameworks provide a lens through which the benefits and potential drawbacks of GenAI chatbots can be analysed.

Generative AI chatbots have demonstrated significant potential in transforming text-based knowledge into interactive, personalised learning experiences. Their ability to generate novel and contextually relevant content on demand has been shown to enhance student engagement and motivation, providing immediate feedback and support that traditional methods may lack (Bai et al., 2023; Griffiths et al., 2024).

However, the integration of GenAI chatbots is not without risks. Over-eliance on these tools can lead to superficial engagement with content, misinformation, information overload, and a negative impact on critical thinking and creativity (Popescu, 2024; 2023; Wu & Yu, 2024). Furthermore, the social aspects of learning, which are crucial in the social constructivist approach, may be compromised, as interactions with chatbots can replace valuable human-to-human interactions (Rad & Rad).

Generative AI Chatbots: Technical Overview and Properties

Generative AI (GenAI) is an umbrella term that includes numerous AI applications that utilise different frameworks of machine learning (ML) algorithms to generate novel content such as text, images, videos, music, and synthetic data (Feuerriegel et al., 2024).
The user submits a query (or "prompt") and the application in use returns a new piece of content ("output") according to his request (T. Wu et al., 2023). A specifying aspect of how GenAI applications are built, is the un-predetermination of the content (or output), as they are programmed to generate new content rather than mechanically replicate something already existing. During the construction of GenAI products, machine learning algorithms analyse large collections of data to learn patterns and statistical structure, effectively training a machine to be able to create new and original contents as outputs that mirror the patterns in the datasets (Feuerriegel et al., 2024).
The combination between the media of the prompt and the output can vary, usually combining text, images, video or audio. Such variability defines the sub-categories of GenAI: Gen AI Chatbots, Image and Videos Generator or Speech-To-Text are some of such categories, but many others exist (Feuerriegel et al., 2024). This research focuses on the category of GenAI Products known as Conversational AI Chatbots, that are built over the machine learning framework known as "Large Language Model".

GenAI Chatbots and LLMs

A Conversational AI Chatbot is one specific product of Generative AI technology, dedicated to text comprehension and generation, and based on the Machine Learning framework of Large Language Models (LLMs). Throughout the research Conversational AI Chatbots are referred as "GenAI chatbots". The term "Large Language Model" refers to a training model that involves the use of collections of textual data including billions of sentences of human natural language (T. Wu et al., 2023). LLMs can perform a high variety of natural language processing tasks thanks to their ability to generate realistic and contextually accurate responses to user queries. Most often products of this technology present a chat-like interface (similar to the formats of traditional human-to-human webchats), with a dedicated space for the user to add their message (named "prompt"), and a space to visualise the output, together with the history of the previous

interactions (or “conversations”). Some popular products of this kind of technology are ChatGPT, Google Gemini or Perplexity AI, but many others exist. As this research evidences, GenAI chatbots are often mistaken as possible replacements for traditional search engines such as Google or Bing, but relevant differences exist: unlike search engines, that upon request explore a detailed archive of resources and directly refer to them as a response, LLMs syntentise and condense information they have been fed, and form outputs based on patterns recognized during their training (T. Wu et al., 2023). GenAI chatbots can simulate human-written text and can easily adapt their output according to a set of contextual information or instructions. They can do all this thanks to the LLMs Training Models that allow the machine to extract and replicate patterns over an outstanding amount of text data.

The GPT model

As of today, there are several LLMs available for use (LLama by Meta, Gemini by Google, GPT4 by OpenAI). Their training differs in some ways, but they share the process in general. For the explanatory purpose of this chapter of the thesis, this section will explore in detail the GPT training architecture.

The acronym “GPT” stands for (T. Wu et al., 2023):

- Generative: Its goal is to generate novel content
- Pre-Trained: GPT’s models are initially trained on a large amount of information before fine-tuning
- Transformer: The architecture (or functional framework) for the fine-tuning phase

A typical GPT model (regardless of the version or update) goes through these training steps (Bai et al., 2023):

Pre-training: The GPT model analyses a vast amount of text to learn structures and nuances of language, The goal of these foundational steps is to teach the model to predict the likelihood of a word in a text sequence

Fine-tuning (Transformer Machine Learning): During fine-tuning, the model receives training on smaller and more specific datasets to train the model to adjust its outputs

according to the relevance for specific applications. In the GPT model fine-tuning is based on the Transformer ML method, and happens in three basic steps

Supervised Fine-Tuning (SFT): During this step, the model undergoes training on high-quality human-curated data; here is when the model gains the ability to generate outputs from a selected collection of prompts, essentially establishing the desired linguistic behaviour.

Reward Modeling (RM): In this phase, multiple model's outputs are ranked by human labellers from best to worst. This operation sets the foundations for the self-evaluation of the model to assess the desirability of each output according to human standards. (self-attention mechanism)

Proximal Policy Optimisation (PPO): In the final stage of the training, the resulting model from RM is defined further using a reinforcement learning algorithm. This step updates the model based on the actions akin and associated reward, as the model is optimised towards actions that yield the highest rewards, enhancing output quality.

These steps support the abilities of the machine to understand the meaning of a certain query and replicate the patterns it analysed from the dataset and thus understand and replicate natural patterns of human language. However, this architecture of training, together with other issues, exposes the use of GenAI Chatbot technology to potentially harmful ethical and social consequences

Limitations of GPT training models and Ethical consideration

The training and operational processes of LLMs present challenges related to data transparency, model reliability, and ethical considerations such as bias and privacy concerns (Bender et al., 2021). The lack of transparency in training data and the "black-box" nature of these models often make it difficult for users to understand what criteria are in use during the generation of the outputs, to predict the model's behaviour reliably. Moreover many of these issues relate with the necessity for LLMs to be trained on an incredibly large quantity of text-based data. This creates problems in any phase of the development and use of GenAI Chatbots (Bender et al., 2021):

- in the very first phase of data collection for the training: the developer needs to collect and use text whose ownership is often unclear, creating opportunities for privacy breaches
- during development and training: if the sources in the dataset are not diverse enough, the model could easily pick up patterns coming from biassed sources and reinforcing stereotypical discriminations in their outputs
- during user interaction: the chatbot could misinterpret an request or information, presenting false information as true. These phenomena are usually called “AI Hallucinations”.

Additionally creating GenAI and LLMs models requires significant computational and human resources, so it is important to understand the environmental and social implications of these technologies (Bender et al., 2021).

To apply a conscious use of these tools and thus to avoid incurring in misuse or being negatively impacted by the technology, it is important to have a comprehensive understanding of how this technology operates. This paragraph briefly presented the main technical aspects of GenAI Chatbots, its unique features and functioning methods together with the potential issues and concerns derived by their characteristics.

The following paragraphs focus on the pedagogical paradigm that outlines the whole thesis and the influence that Generative AI technology can have on this paradigm.

Pedagogical Frameworks

This section delves into the fundamental pedagogical considerations that must be made when it comes to integrating a product of GenAI technology into teaching and learning activities.

It starts with the presentation of the pedagogical framework that underlies the whole research: the social constructivist theory of learning from Lev Vygotsky. This theory prioritises the influence of social context in learning, suggesting that the interactions with the social environment hold a major influence on the learning process. The commitment

to this idea of learning is reflected in several parts of the research, from the analysis of literature to the final design.

Following the paragraphs on social constructivism is TPACK, a teaching framework aimed at comprehending the relationships between content expertise, pedagogical orientations and technological tools. In every teaching endeavour, there are elements that need to be delivered, educational methods to follow and technology can be integrated to facilitate the process. TPACK offers a helpful overview to understand this network and facilitate teaching with technological aids.

Lastly, the section concludes with a discussion on the possible influence of GenAI products on teaching activities, from a social constructivist perspective. The discussion is conducted through the lens of the TPACK, and it presents the rationale for this research. GenAI products, such as chatbots, are creative and social like no other technology has ever been before; the psychological reality of GenAI Chatbots is a huge deal for teaching since it allows the technology to enter for the first time into the social space, which is where learning happens, according to the social constructivist theory.

Social Constructivism

Social constructivism is a sociological theory of knowledge acquisition and learning and it consists of a variation of cognitive constructivism that find his foundations in the importance given to collaboration in learning (Amineh & Asl, 2015). It was developed by Soviet psychologist Lev Vygotsky, who, unlike cognitivists like Piaget, believed that learning cannot be set apart from its social context (Tudge & Winterhoff, 1993). The soviet scientist argued in his accounts that the cognition is a byproduct of interpersonal interactions and that social elements, such as language and culture, play a radical role in human intellectual development (Vygotsky, 1978).

While cognitive constructivists affirm that the learner actively constructs knowledge in response to interactions with environmental stimuli, Vygotsky believes that knowledge is co-constructed together with the other actors interacting in the environment(Tudge & Winterhoff, 1993). Social constructivism distinguishes between two different stages that are part of the learner development: “the level of actual development”, and “the level of

potential development” (Rose-Duckworth & Ramer, 2009, p. 36). The first corresponds with the confidence zone of the learners, and it is a level at which they can autonomously solve problems with their own abilities; the second is the maximum level of development that they can reach with guidance and collaboration from teachers and peers. Vygotsky defines the social space between the two levels as “Zone of Proximal Development” (Amineh & Asl, 2015).

The primary goal of a teaching activity is to facilitate the learner to enter this developmental process, and a teacher can do so with a structured pedagogical planning of scaffolding activities that consider collaborative learning. This is what capable teachers use their position of authority for, establishing collaborative leadership among the participants in the learning activity, so that the learners can benefit from prolific social interactions, where new knowledge is constructed (Rose-Duckworth & Ramer, 2009) .

Several findings from this research point to the fact that GenAI chatbots will have a disruptive effect on the balance of such a teaching system. These tools can communicate with users through their same language, and they convey original and novel sentences and meaning so that they are themselves socially interactive. Among the foundational elements of social constructivist education that are in jeopardy are the interactions among peers, teachers' authority and guidance, and the learner's motivation to develop.

Throughout the course of the research process, the social constructivist framework has been an underlying presence, offering means for the interpretation of findings in the literature, the results from the analysis of the interviews and to establish the objectives in the course plan.

The Social Constructivist paradigm alone is not enough to interpret the complexity that derives from the introduction of the educational process of a new revolutionary technology such as GenAI, but it needs to be accompanied by a framework that specifically focuses on the pedagogical nuances of technology in education: the TPACK framework.

Technological Pedagogical Content Knowledge (TPACK)

The TPACK framework is a framework that encompasses all the information that educators must possess in order to proficiently incorporate technological enhancements into their teaching practices (Mishra & Koehler, 2008). Essentially it aims to guide teachers and educators to "find the right combination of technologies, teaching approach, and instructional goals." (Mishra & Koehler, 2008, p. 2). The framework thereby considers three foundational elements that are at play when teaching with technology: content knowledge, pedagogical knowledge, and technology knowledge. Content Knowledge (CK) "is knowledge about the actual subject matter that is to be learned or taught" (Mishra & Koehler, 2008, p. 4): teachers need to be knowledgeable about the fundamental ideas, theories, facts, and procedures of a particular field and they need familiarity with the explanatory frameworks that link and organise ideas (Shulman, 1986). Not having such basic comprehension can lead them to misrepresent the subject to students, thus failing the purpose of teaching. Pedagogical Knowledge (PK) is the knowledge about educational purposes, values and aims of teaching. It consists of the understanding and conscious choice of instructional methodologies, classroom management tactics, assessment procedures, and the knowledge of how humans learn (Mishra & Koehler, 2008). Finally, technology knowledge (TK) encompasses the familiarity with a technological tool that's being used in the teaching process. Within this framework, the term "technology" is to be intended in its etymological essence as the practice of crafting tools and systems that enhance human capabilities. Therefore, the TPACK framework considers books, blackboards or pencils as much a technology as modern calculators and the internet (Mishra & Koehler, 2008). Today, teachers must have a basic comprehension of digital products (hardware and

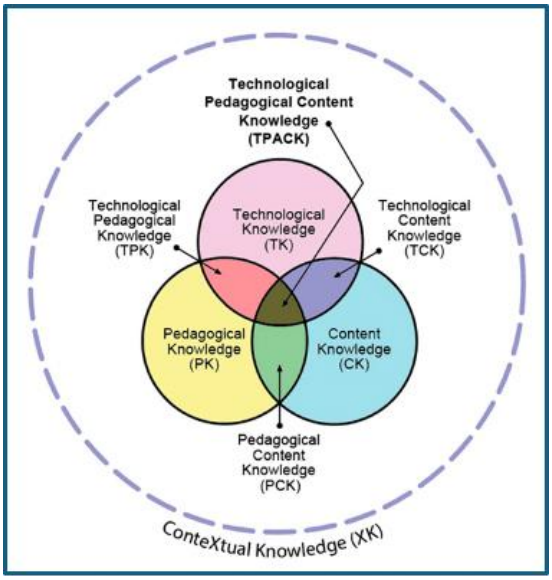

Figure 1 - TPACK Framework (Mishra et al., 2023)

software), and understand how the internet and search engines function. Moreover, this research argues that basic levels of AI literacy will become ever so important in educating students (Mishra et al., 2023).

Having established the three fundamental domains of modern teaching, the model proceeds with an outline of the relationships between them. The statement is that they cannot be treated in isolation, but they exist in a continuous negotiation among the three. Figure 1 visually represents the interrelationships among the domains: when two spheres of knowledge fuse together, the result is not only the sum of the two but an entirely new form of knowledge. According to Shulman (1986) - the mind behind the original version of this framework - the result of the encounter between content knowledge and pedagogical knowledge (PCK) is the set of knowledge that one needs to make a subject accessible to learners. This particular capability represent the core essence that constitutes the professional competence of a teacher (Kleickmann et al., 2013). In the case of Technological Content Knowledge (TCK), the main component is the understanding of the influence of technological tools have over content delivery and how they constrain each other. This set of knowledge recognises the influence that technology has on the characteristics of a given discipline, defining what and how content can be taught. Since the invention of primal forms of writing, technology has always opened new possible representations of content, allowing for varied and flexible navigation of a subject (Mishra & Koehler, 2008). Teaching mathematical functions with the aid of a modern graphic calculator is very different from drawing plots on paper with a pencil: the content is the same but the two teaching actions can yield different results. Nevertheless, using more advanced technologies does not automatically mean an increase in teaching outcomes, and this type of knowledge is important to set awareness that the tools in use constantly define what and how content can be taught, and vice versa, the content marks the technology that should be in use. Finally, the overlap of technological and pedagogical knowledge (TPK) is the understanding of how technology and pedagogy mutually enhance and limit each other in the teaching process. Specific technologies offer different mediatic experiences that can change the teaching dynamics: knowing how a technology works is fundamental for teachers to apply it to their pedagogies, and eventually know if

the chosen pedagogy needs adaptation because of the tool's characteristics. In this sense, TPK allows teachers to make strategic and educated decisions that can increase the value of the teaching action (Mishra & Koehler, 2008).

At the centre of them all is the Technological Pedagogical Content Knowledge (TPACK), the ultimate knowledge one needs to achieve effective teaching. This complex form of capabilities is mandatory to ideate, plan and implement any teaching activity in the post-modern world. According to TPACK, teachers "are the conduit for taking disciplinary knowledge of a given domain and transforming it (using the right technology) for the benefit of learners and their educational development" (Mishra et al., 2023, p. 244). When the three dimensions presented in this paragraph work in tandem, each one can respond to the shortcomings of the other and establish an environment that massively encourages learning. It is the role and responsibility of a teacher to establish the right balance, and for this reason, the final purpose of this research is dedicated to educate teachers to deal with a new, disruptive technology.

The social constructivist theory, adopted in this thesis, suggests that learning happens as a result of social interactions and context. The context where teaching happens has also a major relevance in TPACK, which "exists within broader systemic and cultural contexts and discourses, which may include (but surely are not limited to) teacher performance evaluation systems, school rankings, current budgetary constraints, state-level policies and standards, and more" (Mishra & Warr, 2021, p. 2). The context defined within this research are the faculties of Humanities in the European Higher Education system: the choice of the context within this project is important because it ensures the reproducibility of the proposed design within a system that will likely accept it and embrace it.

TPACK framework offers a clear structure to deepen the topic of the integration of GenAI Chatbots into teaching. However, the new, revolutionary features of these tools are something that somehow is changing forever the relationship between humans and technology. Such characteristics must be considered since they have the potential to heavily interfere with the delicate balance between technology, pedagogy and content

Key pedagogical consideration of Generative AI

This paragraph is dedicated to a preliminary discussion on the characteristics of GenAI technologies that can impact teaching and learning environments. “Technology” is a wide term that includes different products that present different properties, and these properties should be carefully taken into account when introducing technology. (Mishra et al., 2023). The features listed in these paragraphs can help to understand how GenAI Chatbots are currently proposing themselves as a new actor within the social environments of teaching. According to Mishra et al. (2023), GenAI sits in the category of digital technologies, with which it shares three main features:

Adaptable

It refers to the capability of dynamic simulation of diverse media types (text, audio, images, etc.), making it adaptable for a wide range of applications. GenAI’s adaptability is one of its main features: many products of this technology have the ability to transform content from one media format to another (text to image, audio to text, text to video and so forth). The practical consequence of GenAI’s adaptability is a remarkable ease of interaction with “new forms of knowledge synthesis, discovery and creative expression” (Mishra et al., 2023, p. 240)

Opaque

Digital technologies are a mystery for their most basic users, since their inner operations and working methods are often concealed. The interaction with computers happens through “symbolic and arbitrary experiences” (Mishra et al., 2023, p. 240). In the case of GenAI, the dynamics of Machine Learning and Large Language Models are easily perceived as mysterious and incomprehensible, almost magical, not only to the average user, but it has happened that the technology behaves so unpredictably that it surprises even its very own developers (Mishra et al., 2023, p. 240; Zewe, 2023).

Unstable

Digital technologies are unstable, in the sense that one single error, because of malfunctioning or misuse, can hinder the whole process. Their correct functioning is not assured, as one usually needs a level of training to understand correctly and interact with digital technology. In the case of GenAI models, they are typical to “hallucinations”, that is the production of outputs that although they contain wrongful informations, they presented as real and certain information. In general, the output of GenAI is heavily influenced by the quality of the input, which needs to follow certain guidelines to avoid un-optimal or misleading answers to queries (Mishra et al., 2023).

GenAI represents a revolution in the world of digital technologies, and presents two unique traits that no other technology has exhibited before with the same magnitude:

Creative

GenAI creativity is profound and revolutionary: every output is unique and created in real-time, and there are no datasets with pre-made sentences ready to be picked at use (Mishra et al., 2023), to the extent that the same prompt repeated five times will receive five different answers. The novelty and originality of the outputs make it cognitively hard for humans to believe that behind the interface there is a machine. While experts can easily identify its limitations, naive users can be deceived and even lied to (Kan, 2023). Due to their lack of true contextual understanding and consciousness, GenAI Chatbots have not yet passed the Turing Test, but seeing the increasingly rapid pace to which they are evolving, we may not be as far as we used to think two years ago (Gams & Kramar, 2024; Turing, 1950).

Social

This characteristic involves the technology as much as the user’s response to it. Human interactions occur through natural language, and until its outbreak, language was an exclusively human capability. These technologies are able to comprehend the context

within a history of interactions and adapt their behaviour to it. Every interaction with GenAI is distinct, varied, and emergent - just like when interacting with other humans. Moreover, an iterative conversation is the most efficient way to communicate with the tool - no need to learn complicated programming languages - and this facilitates the anthropomorphisation of the tool. Interacting through conversations makes it simpler to act and think about the technology as a psychological entity rather than mere machinery. (Mishra et al., 2023, p. 241)

It is dangerous to think that technologies are neutral: their presence, their features, and their strengths and weaknesses actively influence our interaction with the world (Latour & Venn, 2002; Verbeek, 2015). This is especially true for GenAI technologies and ever so important for the purposes of teaching: when students and teachers interact with a GenAI Chatbot, the machine is programmed to behave according to precise behavioural structures and thus follow certain “frameworks of interaction” that are inherently natural in human beings and can then reproduce typical social interactions. Rad & Rad (2023) conducted a focus group with ten psychology students, and their findings confirm that the psychological presence of chatbots is already impacting social interactions.

“Chatbots can simulate human-like interactions, and this can result in users feeling a sense of connection and social support from them. However, this interaction is one-sided and lacks the reciprocity and depth of a genuine human interaction. This may lead to a decrease in social skills and the ability to form and maintain meaningful relationships” (Rad & Rad, 2023, p. 51)

The first paragraph of this section mentioned how language holds radical importance for social constructivists, and one would wonder how Vygotsky would have reacted to tools such as ChatGPT. Suddenly, human language is not a human exclusive anymore and machines are now called “study buddies” - digital friends that are supposed to scaffold students while they try to reach the next level of the educational ladder. (Zimmermann & Rohrer, 2024). Moreover, there is an important aspect that reinforces the effort of GenAI to perpetually engage in conversation with the user, and that is the fact that not only the user will benefit from the technology but also the other way around. To improve their

abilities, GenAI needs to feed on as many interactions as possible, to learn all the nuances of human behaviour, language, and preferences; while we are using it, the technology is also using us. This recalls the idea of co-construction of knowledge, while a student is trying to improve their understanding of a subject and asking questions to a chatbot, the chatbot is improving its understanding of the student, their preferences, needs and knowledge level, supposedly to better serve them.

The presence of a technological and alien intelligence in the space of a classroom, that has only been inhabited by human minds before, is revolutionary in its essence and prompts educational practitioners and researchers to ask fundamental questions about the future of the role of a teacher as a facilitator of student learning.

The following section delves into the questions that have already been asked and the answers that have been given by institutions and academics.

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Literature Review

This section presents the available frameworks and findings that are available in the space of academic research. First, it presents the numerous frameworks of interpretation and action on the topic of GenAI and educational institutions, then moving on to the benefits and threats identified by researchers.

Existing Frameworks for Generative AI in Education

In recent years, research and practice have increasingly focused on the integration of generative AI in educational settings. Various frameworks have been developed to guide educators and policymakers in harnessing the potential of generative AI tools.

Numerous actors from research and practice have increased their attention towards the effect and strategies of GenAI integration in educational contexts (Chiu, 2024).

Institutional Frameworks

Various governmental and non-governmental institutions have made an attempt to establish a framework to guide educators and policymakers. Among the most important

are UNESCO, the Australian Government, and most recently the European Union with the “AI Act”. Each of these attempts to guide their respective educational endeavours, regulating the application of AI and GenAI tools in educational activities but failing to provide concrete approaches or suggestions to practitioners.

In September 2023, UNESCO paved the way to establish a GenAI framework for both students and teachers. The document “Guidance for Generative AI in Education and Research” is an attempt to establish Human-Centred objectives to guide the influence of GenAI within education activities, with an emphasis on Human Rights and Dignity and the attempt to reinforce human agency. Apart from a brief mention of the suggested use of GenAI to facilitate creativity, the document remains rather vague in terms of practical and actionable proposals and applications of the framework in various classroom settings, highlighting a need for research on such approaches (Miao, 2023).

Australia shortly followed the example of UNESCO and presented their guidelines. The Australian framework is more brief than the UNESCO one, focusing on the domains of teaching and learning, transparency, privacy, security, fairness, human and social well-being, accountability, and safety (Department of Education, 2023, p. 4). Similarly to the UNESCO framework, it also seems to lack a practical implementation strategy. Above all, the document stresses the need for educational strategies aimed at critically understanding the nature of GenAI and the role AI plays in the augmentation of teacher expertise. However, there is the perception that, without a set of guidelines that is more rooted into a real-world scenario, these would only remain good intentions. (Department of Education, 2023)

More recently, on March 13th 2024 the European Union ratified the “Artificial Intelligence Act”, a legislative document, aimed to rule the implementation of AI technology in every sector of activity of the EU (therefore, it contains guidelines not only for education). Across its entirety, the framework presents a risk-based approach, where the combination of technologies and their field of application receive an evaluation on four different levels of risks to breach the EU values and principles. It goes from “Minimal Risk” to “Unacceptable Risk”. Regarding the role AI in of education, it states the importance “to promote high-quality digital education and training and to allow all learners and teachers to acquire and

share the necessary digital skills and competencies, including media literacy, and critical thinking, to take an active part in the economy, society, and in democratic processes" (European Parliament, 2024, p. 53). The document classifies AI in education as High Risk (level three out of four) considering its potential application in significant educational decisions, such as admission, assignment to institutions or programs, evaluation of learning outcomes, determination of educational levels, and monitoring during tests. The Act seeks to achieve a balance between allowing AI technologies that improve accessibility and streamline tedious work and limiting those that run the danger of violating people's rights or causing damage. However, it does not mention directly GenAI and the impact of its features on learning environments, and little to no space is dedicated to recommended practices.

The absence of a practical approach is also widely spread at a lower institutional level. (McDonald et al., 2024) analysed the publicly available policies for GenAI use in the classroom documents from 116 Higher Education Institutions in the USA. Its findings paint a situation where "Institutions seem so concerned about GenAI's entrance that they confuse acknowledging it with experimenting with it in the classroom" (McDonald et al., 2024, p. 20), Moreover, more than one-third of the institutions that encourage the use in the classroom in their guidelines offer only minimal guidance on the technology and its application in classrooms. These findings highlight the importance and urgency of establishing a reproducible framework of instruction that enables teachers of autonomy and critical knowledge in their decisions about the GenAI chatbot.

All the presented frameworks contain information that guided this research in its attempt to facilitate the responsible use of GenAI Chatbots in teaching environments. The framework's common limitation, namely the lack of specific, actionable advice for practitioners and educators displays an urgent need for more studies that support the creation of workable plans to help teachers autonomously integrate GenAI technologies. This research is an attempt to bridge the gap between theory and practice, to avoid the dangers of frameworks remaining only theoretical goals.

Scholarly Proposed Frameworks

Besides the perspective of institutions and governments, scholars are also channelling efforts into research around the introduction of AI and GenAI Chatbots in education and releasing more practical contributions on the topic. Most of the instances are looking at the problem from the perspective of the Self-Determination theory of learning (Zimmerman, 2002), and are directed to K-12 as a field of application. While the Self-Determination theory is consistent with the Social Constructivist approach that is the foundation of this research (enhancing student autonomy and active learning), it does not comply with the constructivist emphasis on the importance of shared experience and social interaction in the process of constructing knowledge.

Chiu & Chai (2020) in their article “Sustainable Curriculum Planning for Artificial Intelligence Education: A Self-Determination Theory Perspective” proposed a practical approach for the inclusion of GenAI for K-12 curriculum through 5 stages: (1) reparation (training teachers with essential competencies to comprehend and use AI), (2) content design (creating material and assessments and that adhere to current topics and make use of powerful multimedia concepts), (3) process design (creating project-based, student-centred educational activities), (4) implementation (carrying out the programme with continuous assistance) and (5) Continuous renewal (updating and refining the curriculum to keep pace with technological advancements and students feedback).

This publication represents a refreshing attempt to establish a useful set of instructions, however, it overlooks the importance of collaborative learning environments and the role of social context in curriculum planning, which are central to the social constructivist theory.

On a similar note, Kong & Yang (2024)developed “A Human-Centred Learning and Teaching Framework Using Generative Artificial Intelligence for Self-Regulated Learning Development through Domain Knowledge Learning in K–12 Settings”. The framework they present is an effort to show how generative AI technologies have the potential to completely change education and make teaching and learning more human-centred. It argues that teachers' responsibilities are changing and that they are becoming more adept facilitators and humanistic storytellers who create customised teaching and work

to support students' personalised learning. The framework directs students in utilising generative AI tools to enhance their attentiveness, promote active learning, obtain prompt feedback, and foster introspection. However, similarly to the previous work, this one is also missing special attention to the social environment of learning and it fails to recognize generative AI as a “new psychological being” within the environment (Mishra et al., 2023, p. 241), and all the implications of such a new presence.

Specifically at the university level Chan (2023) developed an evidenced-based framework to reach a “nuanced understanding of the multifaceted implications of AI integration in university settings and ensures that stakeholders consider the broader context of AI adoption and its impact on various aspects of teaching and learning” (Chan, 2023, p. 20). Within the “AI Ecological Education Policy Framework”, this research and its attempt to offer concrete methods of training are to be related to each of the key areas of “Pedagogical Dimension”, and holds strong relations with the key area in “Providing training and support for teachers, staff and students in AI literacy” within the Operational Dimension.

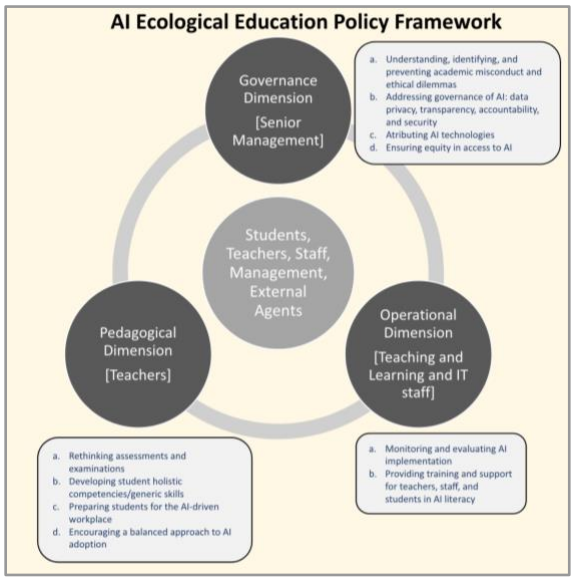

Figure 2 - AI Ecological Education Policy Framework (Chan, 2023)

In another attempt to frame the integration of generative AI into the university environment, Su & Yang (2023) proposed the "IDEE" theoretical framework. It consists of four steps: identifying desired outcomes, determining how much automation is necessary, making sure ethical issues are taken into account, and assessing efficacy. While the framework appears solid in its first part, suggesting to define the intended results in advance, the rest of its content appears rather vague: for instance, it neither proposes guidelines to predict/assess the amount of automation needed for the task, nor

parameters to assess the efficacy of the use of GenAI chatbots into educational activities. This, and the lack of evidence supporting this approach, makes it an insufficient attempt to clarify the landscape of GenAI in university.

Finally (Chukwuere, 2024) developed a framework to support Higher Education Institution research in understanding the transition to the adoption of GenAI Chatbots. It combines components from popular theories of technology adoption with featur

Table 1 - Key areas of attention accroding to Chukwuere (2024)

Readiness	**Perception**	**Basic infrastructure**	**Personal factors**
Optimism	Perceived usefulness	Facilitating condition	Social influence
Innovativeness	Perceived ease of use	Social factors	Hedonic motivation
Discomfort		Economic factors	Habit
		Political factors	Gender, Age, Experience, and Voluntariness of use
			Subjective norms
			Consequences
			Ethical Concerns

The indications of this framework are solid and in many instances they overlap with the findings of the exploratory part of this research. However, once again the framework fails to include a concrete path to translate this into useful information and resources for the integration of AI in Higher Education.

Potential benefits and threats of GenAI Chatbots in Higher Education

A consistent part of the research does not present entire frameworks but rather focuses on qualitative and quantitative research on the influence of the use of GenAI Chatbots on the processes that are typical to teaching and learning activities. This paragraph presents

an overview of the knowledge available, organised by benefits and threats according to a social constructivist approach to learning.

The integration of Generative AI (GenAI) chatbots in higher education presents a complex interplay of benefits and threats that demand careful consideration. The literature highlights significant advantages, such as the ability of GenAI chatbots to enhance student engagement and motivation through interactive and personalized learning experiences. These tools can also provide substantial support to educators by reducing their workload and offering round-the-clock assistance to students, particularly in areas like academic writing. However, the potential drawbacks cannot be ignored. Overreliance on chatbots may lead to superficial engagement with content, misinformation, information overload, and a negative impact on critical thinking, creativity, and problem-solving skills. Furthermore, the use of chatbots could undermine the development of interpersonal skills and disrupt traditional classroom dynamics, which are vital for holistic education.

The results of the exploration of the literature suggest that while GenAI chatbots can offer precious support to educational practices, their benefits are maximised only when integrated thoughtfully and responsibly. Teachers play a crucial role in this process, as their active involvement is necessary to guide meaningful and dynamic interactions between students and chatbots. Educators must foster a balanced approach that leverages the strengths of GenAI while mitigating its risks, ensuring that the technology serves as a complement rather than a replacement for human interaction and critical engagement in learning. This balanced approach will be key to harnessing the full educational potential of GenAI chatbots and preparing students effectively for the future.

Benefits

Researchers generally agree that GenAI Chatbots present a spectacular ability to make text-based knowledge interactive and that this is the most impactful of its characteristics. This ability is a direct consequence of the “Social” and “Generative” characteristics of GenAI (see the paragraph “Key Pedagogical Consideration of generative AI”): these machines can approach content and re-elaborate it in any form the user can request, producing original and coherent content - if prompted properly.

In practice, this means a higher level of interaction with the contents of teaching, effectively increasing the student's engagement and activation of motivation. (Bai et al., 2023). Jin et al. (2023) provide a picture where the aspect of motivation is particularly relevant during the performance phase of learning (when learners apply strategies to meet the goals that were set previously) because it provides an immediate answer to questions. Also, the quantitative analysis of Qawqzeh (2024) confirms that student engagement with various subjects can increase, thanks to the support of ChatGPT. On a different tone are Wu & Yu (2024) in their conclusion, which acknowledges the positive impact of the technology on students' motivation, but also suggests that when excitement and intrigue for the use of a new tool fades away, the level of motivation is likely to decrease. Thus, it appears that student motivation and engagement can be fostered through the use of chatbots, but it is still in the hands of teachers to foster and maintain dynamic interactions "to both harness and guide the pedagogical potential of human-computer dialogues" (Yu, 2024, p. 11).

Thanks to the possibilities of customisation of instructional materials and techniques GenAI chatbots demonstrate great potential to provide a personalised learning experience (Baidoo-Anu & Ansah, 2023). Such potential is confirmed by Chiu (2024) after a qualitative investigation of 51 undergraduate and postgraduate students, where it appears that personalisation through chatbots can benefit both the domains of knowledge delivery and feedback. Moreover, findings from Jin et al. (2023) also confirm the positive impact of GenAI chatbots supporting activities of self-assessment, and also highlight the possibility of creating personalised study plans.

From the teacher's perspective, one of the main benefits identified is the unlimited teaching support offered by GenAI chatbots (Bai et al., 2023). For the teachers, this can mean a reduced workload and the possibility to invest more time in educational planning for which they can be supported by chatbots, while students can benefit from a 'round the clock support' even outside of teaching hours, potentially facilitating spaced learning and memory retention (Bai et al., 2023; Gökçearslan et al., 2024; Popescu, 2024). The advantages of unlimited teaching support in Higher Education appear particularly relevant in the context of training students' academic writing skills: (Imran & Almusharraf, 2023)

conducted a systematic literature review on the topic of ChatGPT and academic writing, finding a general consensus on the positive effects that the technology can have as a writing assistant. According to (Tossell et al., 2024) students with weaker writing performance can benefit particularly in drafting and generating initial ideas for their essays but also in refining writing, checking for mistakes or requesting suggestions on their text. To facilitate a positive integration Kong et al. (2024) propose a framework for the use of GenAI chatbots for writing based on 5 steps: planning, prompting, previewing, producing, and peer reviewing.

This review suggests that GenAI chatbots could significantly enhance student motivation and engagement, customise the students' approach to knowledge, and offer unrestricted teaching support. To optimise the educational potential of human-computer dialogues, teachers must play an active part in promoting meaningful and dynamic interactions, which is ultimately what determines how beneficial this technology will be in the classrooms.

Threats

The major risks associated with the use of GenAI chatbots in learning activities are many, but they can be mitigated with the correct use of the tool: Abdullah & Zaid (2023) warn over the risks of overreliance on chatbots and that strategies to preserve high-level thinking skills must be adopted. Misuses of the technology can produce superficial and sloppy engagement with knowledge and limit the scope of understanding of certain topics (Baidoo-Anu & Ansah, 2023). It appears that this class of problems occurs when the user does not have a clear idea in advance of what they need to use the chatbot for, making the undefined role of chatbots in the educational environment one of the main barriers to implementing proficient use. The IDEE framework exposed in the previous section ("Existing Frameworks for Generative AI in Education") can be helpful as a prevention method since it invites users to describe and justify the use of a chatbot before the assignment (Su & Yang, 2023).

Misuse and overreliance can also increase the risk of Misinformation and Information Overload. The first one naturally occurs because GenAI is "Unstable" (see the paragraph

“Key Pedagogical Properties of Generative AI”), and therefore prone to error: over-using the chatbot without warrant scrutiny of the information received can contribute to the spread of false information and hinder the learning process (Baidoo-Anu & Ansah, 2023). According to Wu & Yu (2024), information overload can occur due to a prolonged and voracious research session on a topic: being able to effortlessly access a huge amount of information in a limited amount of time misguides students to go over their cognitive and mnemonic possibilities and lead to poor learning outcomes. It is not the first time that educational research dealt with such a problem: the evolution of the internet during the past 20 years enabled access to billions of terabytes of academic and educational resources. In 2017 Kurelović et al. (n.d.) conducted a study among higher education students on the causes and effects of information overload induced by digital technologies and found out that a proficient level of “information literacy” is needed to avoid the risk of information overload. Similarly, for GenAI, knowledge of the tool and of the application of techniques of information processing is required to avoid the pitfalls.

On a similar note is the exploration of the effects on the process of development of critical skills: Qawqzeh (2024) conducted research to identify the correlation between the use of ChatGPT and the application of critical thinking, problem-solving and creativity skills: the findings point to polarised effects (both extremely positive and negative) of the technology, highlighting an interconnectedness between the three skills, potentially influenced by ChatGPT. For this research, this means that creativity and problem-solving exercises can be applied to preserve critical thinking skills. Moreover, Abbas et al. (2024) presented convincing findings suggesting that the use of ChatGPT in students can increase procrastination levels in students and lead to loss of mnemonic skills. Once again it seems that the teachers (and their institutional support systems) have the possibility to deter students from abusing ChatGPT by providing them with new forms of assignments and projects that require them to apply their own critical thinking and creative skills (Baidoo-Anu & Ansah, 2023).

From a social constructivist perspective, the effects of GenAI Chatbots on the domain of interpersonal relations and soft skills hold the potential for a total disruption of the learning process and experience, as Vygotsky has imagined. For instance, some rather shy

students may prefer not to socially expose themselves to the eyes of their peers when in need to ask a question to the teacher, and in such cases GenAI Chatbots can offer a valid alternative (Bai et al., 2023). However, each interaction between students and chatbots also represents a missing opportunity for a teacher to gather valuable information about students' doubts, lack of knowledge or brilliant intuitions, and for the students to overcome peer-pressuring. The reduced human interaction is seen as a threat to the Higher Education students' learning process by Baidoo-Anu & Ansah (2023) since this process can be accompanied by the underdevelopment of soft skills such as teamwork, mutual understanding and debating. (Kim et al., 2024, sec. Conclusion) statistically confirmed that the use of ChatGPT decreases the level of active learning interactions among learners and with the teacher, due to a "relatively higher proportion of active learning interactions occurring predominantly between individual students and ChatGPT). This outcome poses a threat to several dimensions of learning, as it is fundamental for all the actors involved in the educational process to share a common social environment. With one more actor in the equation, it is fundamental that teachers in higher education reflect on their role and the impact of technology in their classrooms. It is important to emphasise peer interactions in the classrooms to avoid the loss of collaborative skills in future citizens according to Bai et al. (2023)

Moreover, both Wu & Yu (2024) and Atiyah (2023) report positive effects of the use of GenAI for reducing anxiety in learning. (Rad & Rad, 2023, p. 50) identified "a sense of obligation to continue interacting with a chatbot, even when they were not enjoying the conversation or receiving helpful responses" in the student-user. A further investigation of the perceived obligation to respect the conversation with the chatbots may reveal interesting details about the social value of student chatbot interaction.

Part One: Exploratory Analysis on the Influence of Generative AI Chatbots in Learning Activities

The rapid advancement of GenAI technologies is introducing a new paradigm in higher education, particularly with the use of GenAI chatbots. Besides offering unprecedented opportunities for academic support, the introduction of these tools into the social environment of the classroom also poses significant challenges and ethical considerations that require a holistic evaluation. This first, explorative part of the research aims to explore the multifaceted relationship between higher education students in the European context and GenAI chatbots, focusing on how students utilise these tools, the factors influencing their adoption or avoidance, and their perceptions of the potential effects that the technology will have on educational settings.

Despite the growing interest in GenAI chatbots, there is a noticeable gap in the literature regarding their practical application and impact on Higher Education. Previous studies have primarily concentrated on the theoretical benefits and potential risks associated with AI technologies. This study aims to return a holistic picture of how and why students interact with these tools in real-world academic environments, by providing a comprehensive qualitative analysis of students' experiences and attitudes toward GenAI chatbots.

Given the exploratory nature of this research, semi-structured interviews were conducted with six international students enrolled in the international and transdisciplinary TISE (Transition, Innovation, and Sustainability Environments) Master's program. This program's diversity in the student body provides a rich context for examining the nuanced ways in which students engage with GenAI chatbots. The semi-structured interviews aimed to capture a wide range of perspectives, from practical usage patterns to ethical concerns and future implications.

The qualitative methodology employed in this study is particularly suited to uncovering the complex dynamics at play. By adopting an inductive approach, the research built a network among the information provided by the participants in the interviews to communicate and generate new or reviewed concepts, for then confronting the concepts

with the research available. This approach aligns with the conditions outlined by Given and Stebbins (2008b) for exploratory research, addressing a relatively uncharted territory that has evolved rapidly and requires open-minded investigation.

This research addresses three core research questions:

How do International Master's students in Europe utilise GenAI chatbots in their academic activities?

What factors influence their decisions to adopt or avoid the use of GenAI chatbots?

What is their perception of the use of GenAI chatbots in educational settings?

Through detailed thematic analysis, the study reveals four key themes that offer insights into students' methods and frequency of chatbot use, the criteria influencing their decisions, their ethical concerns, and their views on the future impact of these technologies on education.

By triangulating interview findings with existing literature, this research not only illuminates current practices and perceptions but also provides a foundation for developing frameworks and strategies to enhance the integration of GenAI chatbots in educational contexts. Such foundations are then put into practice during the second part of the research: "Case Study for a Concrete Educational Approach". The findings underscore the need for increased AI literacy and clear guidelines to navigate the ethical and practical challenges posed by these technologies. As educational institutions grapple with the implications of GenAI, this explorative study offers timely and valuable insights to inform policy and practice, ensuring that the adoption of AI tools contributes positively to the educational landscape. The rest of the chapter presents in detail the methodological procedure that guided the data collection and analysis, followed by the results and its 4 themes, and finally, a conclusion that sums up the major takeaways useful to bring on the research.

Methodology

The nature of this research and its methodological procedure is inherently exploratory. The Sage Encyclopaedia of Qualitative Methods defines exploratory research as

“the preferred methodological approach under at least three conditions: when a group, process, activity, or situation has received little or no systematic empirical scrutiny, has been largely examined using prediction and control rather than flexibility and open-mindedness, and has grown to maturity along the exploratory/verificational continuum but has changed so much on the way that it begs to be explored anew. Whichever condition pertains, the accent in exploratory research is always on inductive generation of new concepts and empirical generalisations.” (Given & Stebbins, 2008b, p. 327)

The use of GenAI Chatbot is very recent, and although its introduction in Higher Education is a topic that clearly creates discourse, there is not enough literature available to base data analysis on established and verified frameworks, thus fulfilling the first of the three possible conditions for exploratory research listed by Given and Stebbins (2008). For this reason, the study employs a qualitative exploratory analysis to investigate the complex issue of the integration of GenAI chatbots and educational activities. Because of the research objective, it was important to opt for a methodology that can detect all different nuances of the contamination of this technology in students’ activities. Semi-structured interviews were the chosen methodology for collecting data, allowing for both structured guidance and spontaneous participant narratives (Given & Brinkmann, 2008, p.470).

Participants

The population of the research is composed of international students currently enrolled in a high mobility 2-year European Master’s Degree “Transition, Innovation and Sustainability Environments (TISE)” (*TISE Program Description*, 2020). This program was selected due to its transdisciplinarity and high-mobility features: the curriculum of this program includes socio-cultural studies, social sciences, economics and econometrics and the impact of technology on those areas. Therefore, students during their studies are constantly facing the challenge to approach novelty, constantly aiming to reach new targets of development, in the social-constructivist sense (Amineh & Asl, 2015). Moreover, the geographical locations of the studies are also very diverse, so the students have accumulated critical experience of several different educational systems, styles, and methods. At the time of the interviews, the students were in the last 3 months of their

study programme, having already experienced a consistent package of educational challenges, due to the continuous adaptation of their learning methods. Due to the diversified baggage of experience in the population, the study acquired a comprehensive view of the possible issues of a student using GenAI tools. Six students were interviewed, aged between 22 to 28 years old. They agreed voluntarily to conduct the interviews after a collective invitation was sent to the entire cohort on WhatsApp, to which they responded positively.

Data collection

Data was collected through semi-structured interviews conducted via Zoom, lasting between 40 to 70 minutes. The interviewer had a list of guiding questions but was open to exploring unplanned topics based on participants' responses. The questions covered three main domains: practice (frequency and methods of interaction with chatbots), knowledge of technical aspects and best practices (prompt engineering), and concerns (ethical and personal concerns). The key guiding questions can be found in the Annex 1. The interviews have been video and audio recorded, with the consensus of the participants, and following standard ethical practices to ensure privacy, to which the participants agreed.

Data Analysis

After the recording, the audio files of the interviews were fed into a Microsoft Word speech-to-text processor for an initial transcription that was then refined in the following stage of the process. After the transcription procedures, the researcher entered into the data analysis phase. To analyse the information collected through the interview, an exploratory thematic analysis following the steps outlined by (Stebbins, 2001) was applied. Following the transcription of the interview recording, the process started with the “open coding” phase, during which the answers were given names and categories that identified key concepts and ideas of the sentences. It then moved on to the phase of “thematic coding” (Given & Stebbins, 2008a), during which similar codes were categorised when presenting either (a) similar information or (b) different information on a mentioned topic.

The following section illustrates the identified themes and subthemes, with added comments and a comparison of the results to relevant literature.

Results and discussion

The results section is organised into four different subsections, each one of them presenting the major themes identified within the data. The themes include self-reported methods and frequency of use, criteria influencing the decision to use chatbots, ethical concerns, and the perceived impact on education. The results collected in this section present crucial information on the various ways students interact with GenAI chatbots, their reasons for using or avoiding these tools, the ethical implications of their use, and their potential future integration into educational environments. The findings are triangulated with the available knowledge and present a situation where students are more likely to use chatbots when under pressure, but they are concerned about the risk of misinformation and hindering their critical thinking and creativity skills; because of these concerns, and their belief that the technology will progressively be more integrated into educational systems, the participants express the need for a clear guiding framework of use, and an enhancement of AI literacy to ensure beneficial integration.

Theme 1 - Self-reported method and frequency of use

The first theme includes frequency and method of use reported by the interviewees. This theme presents a situation where the interviewees reported a medium to high frequency of use of the GenAI chatbot in their academic activities. In particular, they expressed a preference to seek the support from the machine for bigger assignments rather than small ones, confirming the findings from Abbas et al., (2024, p.17) which suggests that high levels of academic pressure lead to a higher use of ChatGPT by students. Furthermore, from analysis of data, it appears that the time constraint and increasingly higher numbers of assignments contribute to building pressure on students and therefore invite them to approach the technology more frequently. As one participant reported: "*It becomes harder*

and harder, because sometimes the pace is so fast that it's like you... I feel that the environment in which we are right now is forcing us to use it".

Another significant reason for the use of chatbots is to seek help for tasks in subjects that the students do not feel confident in. For example, participants with little to no experience in computer programming languages reported receiving substantial support from chatbots for their computer programming classes and assignments. This finding aligns with the results of Møgelvang et al. (2023). Moreover, adding on to the perspective of Klímová & Ibna Seraj (2023) the evidence points out that GenAI chatbots can yield outstanding results specifically in learning and practising foreign languages (both human and computer languages).

Other reported methods of use include a wide range of activities: paraphrasing and summarising reading materials, outlining essay structures, brainstorming possible topics, and sourcing information. These results confirm part of the findings from Bjelland et al. (2024). In particular, the use of chatbots for sourcing information appears widely diffused but also presents challenges. From all the interviews it emerges a common perception of GenAI chatbots as an alternative to search engines like Google. While Møgelvang et al. (2023) also found that students perceive ChatGPT as a type of search engine, it is important to note that these technologies have distinct characteristics, features, and objectives. GenAI chatbots typically cannot explore the internet, therefore when they are prompted to return specific information, they rely solely on their training data, which can be biased and sometimes misinterpreted by the chatbot (T. Wu et al., 2023). This limitation can lead to misinformation and misguidance by the technology. On the other hand, the participants who are more knowledgeable of the technology appear to be less likely to use it as a search engine. On this topic, one participant said:

"*I wouldn't use it to do basic research, like to do bibliography research. I think It's not designed to give you this kind of answer. As soon as you understand what the technology is about… it's a word guesser, it is not that is connected to the internet as Google*".

This difference highlights the importance of educating students about the technological nature and limitations of chatbots to prevent misinformation.

Finally, three of the six participants specified that they would never use chatbots for psychological or emotional support. This is an interesting result, as it challenges the conclusions of Atiyah (2023). This quantitative study - conducted among 512 university and high school students over 18 years old and aimed to quantify the impact of ChatGPT as a emotional consultant to reduce depression and anxiety levels - has found that chatbots “dramatically lowered depression and anxiety levels in a considerable number of students, whereas another set of students had a significant drop in despair and anxiety” (Atiyah, 2023, p. 1628). While this is not necessarily a contradiction, it displays a common perception among students that is not supported by evidence.

The findings of this theme outline a situation where students' use of GenAI chatbots in academic activities is prevalent for assignments that demand a heavy workload and subjects where students lack confidence. The fast-paced academic environment further drives this usage, to the point that students may even feel “forced” to use it to stay on top of their many academic assignments. Students are also prone to use the chatbot more when their confidence level in a subject is low. While chatbots are considered helpful for various tasks, including programming support and language learning, their use as search engines highlights the need for higher technological literacy among students. Additionally, the refusal to use chatbots for emotional support challenges some existing perspectives, indicating a gap between student perceptions and reported benefits

Theme 2 - Criteria influencing the decision to use

The second theme explores the elements that play a role of influence in students' decisions to use or not a chatbot.

The most diffused criteria is the pre-existence of an alternative (“I asked myself: «*do I really need one more tool or can I manage to solve this with the tools that I already know how to use?*»”), the need from the student to perform scientific or humanistic tasks (scientific tasks are preferred rather than humanistic), and the amount of context required by the chatbot to produce decent results, as this participant noted:

"*The more generic you go, the better is the answer. If you go for things that are too specific and are too niche in the field that you need, then you are navigating a very complicated path. Whenever I want a more generic answer, I feel more confident asking the chatbot*"

On this note, further findings from the interview indicate that obligations like providing context and proof-checking the information received from the chatbot are generally perceived as demanding, leading students to either reject the use of the technology in the first place or to approach the results uncritically. Conversely, there is widespread appreciation for the seamless experience of receiving information by simply asking them in the form of text rather than struggling to authenticate the sources. As one participant explained: "*...because with Google you have to scroll through the entire page, you have to read the descriptions of each results, sometimes they don't match what you searched, you get a lot of ads… is super annoying*". This sentiment is supported by the findings of Qawqzeh (2024), where one out of two of the students who use ChatGPT reported faster access to information.

Additionally, one participant mentioned that they actively refuse to use the GenAI technology to prevent the reinforcement of stereotypes and discrimination bias. Several participants also reported refusing to use the chatbot as a copywriter (coping and pasting full pieces of text) due to concerns about the underwhelming quality of the generated text, the fear of getting caught, and other ethical issues on academic integrity that will be addressed more in a later paragraph. Conversely, to the findings of this analysis, Abbas et al. (2024) stated that "sensitivity to quality" did not hold a statistically significant relevance on the decisions of their participants (494 university students) to use the chatbots. The results of the interviews suggest an alternative interpretation to the aspect of "quality" of the output, emphasising originality and ownership of the text as important criteria for students to evaluate the quality of their production. As one participant stated:

"*If I want to write something that's mine, I don't even want to be influenced by how ChatGPT can answer that question. If I wanted to be mine and myself alone, I'm not even asking ChatGPT because you get conditioned by the answer that you receive. [...] maybe I'm being too purist in this sense, but yeah, If I want something that is really mine, I will always go with my instincts, with my creativity*".

This theme presents interesting findings on the amount of trust students place in the answers and contents they receive from GenAI Chatbots. On this topic, the importance of AI literacy emerges once again as a crucial factor: participants emphasised that in order to build trust, it is important for them to know how the tool works in its basic principles. Furthermore, the amount of expertise in a subject also appears to be correlated with the amount of trust in the chatbots. As one participant noted:

"*It comes down to my own intuition and knowledge of the subject. If it's something like coding that I don't know how it works then I kind of have no choice but to trust in the AI and I can try to apply what limited knowledge that I have on the subject to see if the answer is credible or if it works. But if I don't have much knowledge on the subject then I can't really tell*".

The potential for AI to make up information when it lacks certain knowledge is also a major concert, as another student observed: "*The major concern I have is a made-up information: if a chatbot doesn't have certain information about a topic it can... it will lie to you, it will make up something*."

In conclusion, the use of GenAI chatbots among students is influenced by several factors, including the availability of alternative tools, the nature of the task, and the amount of context required for accurate responses. Chatbots are appreciated for their ease of providing information, but the need to authenticate the pieces of information and concerns about the reinforcing stereotypes and biases lead some students to reject the use. Issues of quality, originality, and academic integrity further increase the possibility of rejection. Additionally, the amount of trust students place in chatbot responses is closely tied to their confidence in the technical functions of the technology and their expertise in the subject matter. Informing students about the capabilities and limitations of these tools is crucial to maximise benefits and reduce risks.

Theme 3 - Student's ethical concerns

The third theme collects the ethical issues and worries from the participants; they span various domains, including academic integrity, the potential influence of embedded bias

on society, the potential effects on cognitive abilities like critical thinking and creativity, and privacy concerns.

Academic integrity emerged as a primary issue, reinforcing the diffused concerns reported by the academic community. Muchowe & Kouam (2024). On the topic of AI-generated content, one participant noted:

"*I'm starting to get really concerned about the idea of truth and legitimacy [...] I'm concerned about that being used for malicious reasons in both day-to-day life and greater fields such as politics or sociology and in academics as well*".

The idea is that the generative power of chatbots and similar products can pose a threat to the idea of scientific consensus, having significant secondary consequences on society, politics and the environment.

Most of the participants shared the perception and concerns that extensive use of AI tools can have a negative impact on cognitive abilities and personal and unique characteristics. They expressed fears about people progressively losing creativity and critical thinking skills. One student on the topic of creativity and logical reasoning remarked: "*I do worry a bit about the fact that with more and more time we lose the ability to write, to create logical sentences, to come up with ideas*". On this note, Qawqzeh (2024)suggests that the use of ChatGPT can effectively enhance creativity, critical thinking, and problem-solving skills, offering a counterpoint to these fears: their results reported that almost half of the 319 students participating in the study ”expressed an improved ability to generate creative content due to ChatGPT, highlighting a positive influence on their creative process” (Qawqzeh, 2024, p. 599). As for problem-solving and critical thinking the study identified that chatbot-supported exercises of problem-solving can improve the approach to problems, potentially facilitating critical thinking. On this point, the findings from the interviews and Qawqzeh (2024), overlap, since the same student added to their comment on logical thinking: *“it is an ability you and you have to exercise it - I do link it with creativity in a way and we are lacking that ability, because it is an ability you have to exercise it* ": the convergence between the two studies emphasises the need of practice supported by tailored activities to preserve and enhance cognitive abilities.

Privacy concerns are also significantly present among participants. The fear that one's interactions with GenAI tools can be tracked and used to map out psychological profiles or even to provide knowledge in a manipulative way is prominent. One participant highlighted, "*My concern is that the AI will basically be inside my head. Corporations and governments already have so many tools that they can use to map out your psychological profile based on your regular internet activity*". Precisely the same concern was identified during the focus group presented by Rad & Rad (2023).

In conclusion, the ethical concerns surrounding the use of GenAI chatbots in academic activities are multifaceted. Issues on academic integrity, the potential negative impact on cognitive abilities, and concerns about privacy and capitalistic interests are widespread. Notably, there is also empirical evidence suggesting that AI can enhance creativity and that proposing problem-solving exercises to conduct with the chatbot can positively impact logical thinking skills. It appears that this technology can hinder or enhance critical skills, according to different methods of use. Therefore, the solutions to these concerns are to be found in the approach that students have to the technology.

Theme 4 - Perceived impact on education

The fourth and last theme contains perhaps the most valuable information for this research as it collects the students' perspectives on the future integration of GenAI into educational environments. The collection encompasses a wide range of insights, reflecting on the necessity and the potential consequences of integrating these technologies into educational systems. This theme includes three sub-themes: reasons for integration, effects of integration, and the proposed methods of integration. These sub-themes provide a comprehensive view of how students perceive the influence of GenAI chatbots on the educational landscape.

The first of the sub-themes explores the reasons and needs for the integration of GenAI chatbots into educational systems. It highlights the inevitability of the process of integration and the urgent need for educational institutions to prepare for it. The results from this sub-theme reveal a common sentiment that the deep technological

advancements of our era are inevitably influencing the way that humans interact with knowledge, much like the digital and internet revolution did. As this participant noted:

"*I think it's inevitable. [...] And what I think, is that it will happen relatively more on the student's side: with the recent advancements you will see students really using chatbots for basically everything. Given the information on how we use Google search [...] that will be replaced by chatbots now*"

Such sentiments include both techno-enthusiastic perspectives, which foresee a symbiotic relationship with the technology, and pessimistic ones, which foresee that the new GenAI-powered technologies will be so disruptive that containing measures must be immediately taken. Academia echoes this fragmentation of opinions: Griffiths et al. (2024) invite the educational community to embrace the positive potential and to work for a framework that can potentially enhance learning outcomes. On the other hand, Baidoo-Anu & Ansah (2023, p. 59) suggest that in a very short amount of time products of GenAI technology will become conventional in our life and warns that "it may possibly be too late for educational institutions to rethink their policies and practices to guide and support their students in using ChatGPT safely and constructively". Both perspectives underscore the urgency of actively developing a set of practices to apply in the education context to facilitate the integration of GenAI Chatbots.

The second sub-theme collects all the concrete feelings and expectations (both positive and negative) about the future of education when GenAI Chatbot will be fully integrated into the educational process. Participants mentioned possible threats to the value and meaning of traditional education, increased socio-economic stratification due to unequal access to the tools, and their concerns about the control and punishment associated with the use of chatbots. The issue of chatbots creating a digital divide and contributing to social stratification is particularly noteworthy: in a future where chatbots will be the main channel of access to knowledge, as suggested by Yu (2024), the quality of access to the technology will become an important criterion that can define the social and economical status of a citizen. One participant is particularly wedded to this concern when imagining a future of education:

“*I guess it is completely contextual on the type of education that the kids are receiving and if it's private, if it's public [...] Since we're talking about technology and the use of technological tools, we also consider a digital divide. We cannot assume that these tools will be available for every person that goes to every type of school, because you need access and for that you do need money or you do need infrastructure which ends up being money too. [...] Because it it's all about access*"

Also according to Mishra et al. (2023, p. 237), access is key, and there are several elements that can define the quality of access, social and economic, and the quality of teachers one student may encounter in their path: “learners with access to these tools are likely to have an advantage over those who do not, exacerbating the digital divide and leading to disparities in achievement”. Concern over the equality of opportunities accompanies the sentiment that the fundamental meaning of education as we know it is in jeopardy.. One participant said this about the importance of preserving educational values:

“*Education should be about this: to free people's minds and to give people the ability to think by themselves! And if we encourage or if we allow this sort of standard way of writing and standard way of thinking about a subject, how can we expect innovation? How can we expect that someone comes with a different idea about a subject if you don't actually put a thought on it?!*”.

Moving forward with the integration, it will be then crucial to establish and maintain authentic educational and pedagogical values in the use of the technology and to ensure broad accessibility to the tool and its best practices.

Finally, the last sub-theme includes propositions that the students view as feasible ways to achieve positive integration of GenAI technology into education. It includes the request for a clear framework, to clarify appropriate usage methods, as it was noted: “*It has to be a framework in which there is clarity of how to use it to don't harm the abilities to write*”; and the need to evolve the technology to provide more curated answers in the future. One participant suggested returning to a classical approach of assessment, a method that refuses any kind of digital technological support, but gets back to the classic pen and paper and time limits in a classroom. However, this approach seems rather impractical

and overlooks the duty of education systems to instruct students on the use of tools and technologies that they will encounter during their professional lives (Chen, 2023). Another participant, reflecting on the previous experience of the internet in educational contexts, felt that the system already failed once to educate students to responsibly and effectively make use of internet sources and will likely fail again, leaving room for an indirect integration by students, eventually exposing them to misuse or misinterpretation. To avoid this failure the participants proposed. As a possible solution, the same participant proposed an "*AI literacy seminar*" in universities and high schools as a formal moment to explore the possibilities and dangers of the use of GenAI chatbots. Chen (2023) firmly supports this idea, calling for a collaboration between educational institutions and AI experts that would ultimately give guidance to teachers and students.

In conclusion of this section, it appears that the integration of GenAI chatbots into educational systems is inevitable, driven by technological advancements that are expected to reshape the relationship with knowledge. To maintain equity in education, it is key to apply an active effort directed to distribute access to chatbots as much as possible, as well as disseminating the best practices to approach the technology. The urgency for educational institutions to adapt is clear, with both enthusiastic and cautious perspectives highlighting the need for a framework to guide this integration. To achieve positive integration, clear guidelines and dedicated AI literacy programs are essential, enabling educators and students to navigate and utilise GenAI technologies effectively.

Conclusions

The findings from this research reveal a multifaceted landscape. Students frequently use chatbots for large assignments and subjects where they lack confidence, appreciating the ease of access to information despite concerns about misinformation and bias. From a social constructivist perspective, this means that the chatbots hold considerable potential to establish themselves as a support for the students to move across their zone of proximal development. While short-term applications seem to yield good results, the question remains on the long-term efficacy of the support from the technology.

The criteria influencing the participant's decision to use chatbots included the availability of alternative tools (most often Google), the nature of the task, and the high amount of context required for accurate responses. According to the TPACK framework, the teacher should offer guidance on the appropriate technological tools to use for the learning activities, effectively guiding the students in their decisions. Teachers should propose the specific tool to use, offer an explanation of the reasons for the decision, provide exercises that are adequate to the characteristics of the technology and promote contextual understanding in their students.

Ethical concerns were prominent, particularly regarding academic integrity, cognitive impact, and privacy. These concerns underscore the need for informed use and solid guidelines that eventually will make the students feel and act safer.

Students' perspectives on the future integration of GenAI chatbots into education highlight the inevitability of this technological shift. They stress the importance of preparing educational institutions to manage this transition, emphasising the need for frameworks that ensure equitable access and preserve educational values. The proposed solutions include clear guidelines, AI literacy programs, and dedicated efforts to address the digital divide. Particularly, the reinforcement of equitable access must be a priority in policies and practices, and the reinforcement of GenAI knowledge and prompt skills appears a good strategy to achieve it.

In conclusion, this research reinforces the urgent need for educational institutions to develop effective strategies for integrating GenAI chatbots. Teachers must take action and equip themselves with the knowledge and skills to guide students in using these tools responsibly. Fostering a balanced approach means leveraging the strength and addressing risks, but the methods to achieve it seem to be not as straightforward, but rather require a collaborative effort to further understand and assess what are the risks and benefits. Once that is done, teachers can start creating new ways of engagement with their students or updating the ones already in use to enhance learning outcomes and prepare students for a future where AI technologies are integral to academic and professional life.

Ultimately, this first exploratory part of the study - besides contributing to the ongoing discourse on GenAI in education - supports the next part of the research, offering foundational information and practical recommendations for kickstarting the design process.

Part Two: Case Study for a Concrete Educational Approach

The rapid proliferation of GenAI chatbots presents both unprecedented opportunities and significant challenges within higher education. The first part of this research highlighted some of the elements that play a relevant role in the outcomes of the interaction. These sophisticated tools have the potential to transform teaching practices by enhancing the interaction with knowledge and streamlining administrative tasks. However, their integration also raises critical questions about academic integrity, hindering cognitive abilities, and equity of access. This second, design-oriented part of the research, addresses the pressing need to prepare teachers in European higher education institutions to effectively incorporate GenAI chatbots into their teaching activities, maximising benefits while mitigating potential hazards.

The objective of this research is to design a comprehensive instructional framework that equips university teachers with the necessary skills and knowledge to leverage GenAI chatbots in their pedagogical practices. The instructional design methodology employed in this study is grounded in the "*Systematic Approximation Model*" (SAM), which emphasises iterative cycles of development and refinement to ensure the practical relevance and effectiveness of the proposed course plan. To achieve its aims, the study collected and analysed qualitative data from a Collaborative ideation Workshop and a focus group, involving participants from diverse academic backgrounds and positions. The data collected through a Collaborative Ideation Workshop and a focus group, supported the iterative design process, ensuring that the final course plan is both comprehensive and feasible.

The outcome of the research process is a blended learning workshop tailored for higher education teachers in humanities. The workshop's first part, delivered online, proposes a curriculum to guide learners' familiarisation with GenAI chatbots' technical and practical concepts. The second part, conducted in person, promotes collaborative learning and co-creation of teaching strategies, enabling educators to design and implement GenAI-powered activities that enhance educational outcomes while maintaining academic integrity. By fostering AI literacy and encouraging collaborative innovation, the proposed

workshop plan aims to support teachers in harnessing the full potential of GenAI chatbots, thereby contributing to a more dynamic, effective, and ethically grounded educational environment.

The rest of the chapter offers first an overview of the methodology, then offers the results of the creative ideation workshop and focus group, and the proposed design for the workshop. Finally, a discussion explains the details of the workshop and how they were justified by the results collected along the way of this research.

Methodology

Instructional Design Methodology

Instructional design is defined as the process of developing and composing educational or training programmes in a way that significantly enhances learning (Wintarti et al., 2019); there is a vast variety of instructional design methodologies that are available to support the creation of learning experiences. According to Rowland (1993) Instructional design is mainly split into two philosophies of approach. Some designers adopt a "rational" perspective and characterise instructional design as a technical process that follows set guidelines, norms, and processes and is done step-by-step. The designer can be compared to a technician or possibly an engineer, and the process is logical, reasonable, and methodical.

On the other hand, others describe it as a creative process that involves iterative cycles and is motivated by opportunities identified. The methods are then rather creative, intuitive, or artistic and apply practical problem-solving above extensive comprehension of a topic. This division of approaches is reflected in the differences between two of the main methods in use today by designers to develop courses: ADDIE and SAM. ADDIE is the acronym for “Analyse, Design, Develop, Implement and Evaluate”. This is one of the founding methodologies of instructional design. It was first developed and applied in the seventies in the context of the USA military training, to ensure “effective, efficient, and relevant than less rigorous approaches to planning instruction” (M. Allen, 2012, p. 14). This five-step approach has been widely applied with various adaptations, but it has been

heavily criticised for being too systematic: practitioners often found the constraint of the 5 steps too rigid, thus limiting the possibility of exploration, and even too time-consuming to execute.

SAM (Successive Approximation Model) is a model codified in 2012 that encourages creativity and experimentation. It is an iterative, collaborative and manageable model of design and the best model to solve complex educational issues through a "trial and error" approach. SAM presents 2 variances, SAM1 and SAM2, which are differentiated by the amount of iteration that the process has to go through before reaching a final product: while SAM1 include development (and thus implementation into practice) in the very early stages of the iteration, in SAM2 "the project moves on to the development phase when design iterations have been completed" (M. Allen, 2012, p. 42). SAM2 is the main design method applied by this research to reach its objective. The following paragraph presents in detail how the structure of SAM2 guided the research to reach its final objective.

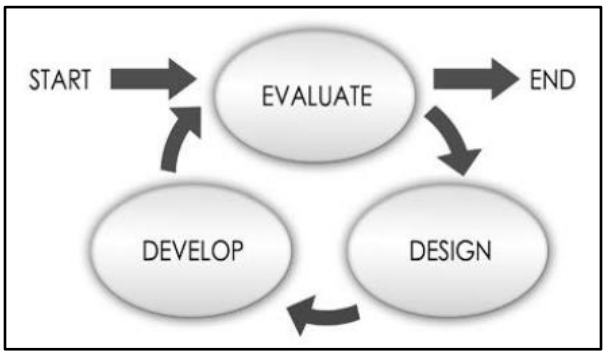

Figure 3- SAM1 Iteration (M. Allen, 2012)

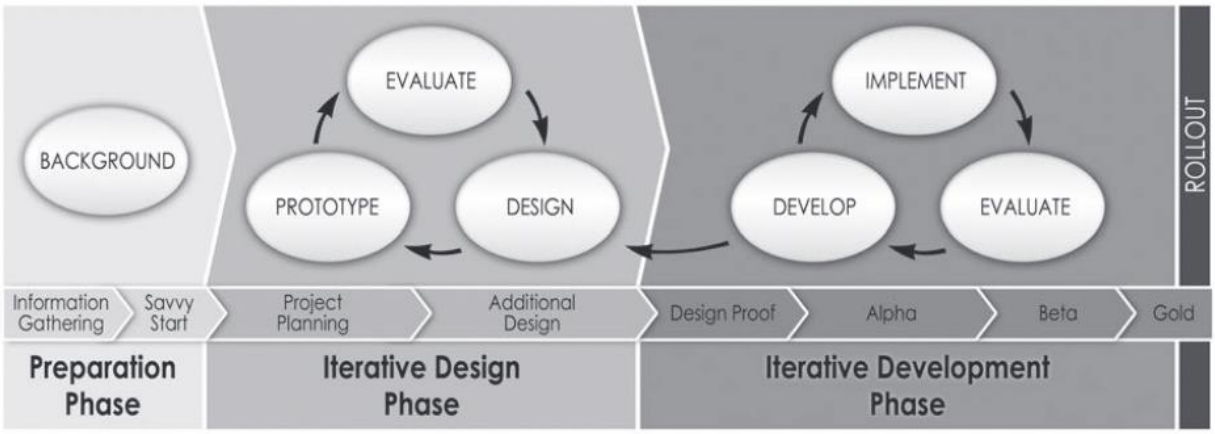

Figure 4 - SAM2 Iteration Process (M. Allen, 2012)

SAM2 and Research Process

This paragraph offers a thorough explanation of how the SAM2 model contributed to guiding the research and the methods of the research.

As shown in Figure 4, SAM2 is composed of three phases: Preparation, Iterative Design and Iterative Development (Allen & Sites, 2012). Each of them represents one step going from an idea (or a need) to a complete and functional course. Each phase presents key moments that facilitate the process of iteration: the key moments can be viewed as events that provide coordinates and ensure that the instructional designer follows a coherent path. Information Gathering, Savvy Start, Project Planning, and Additional Design, are all key moments that correspond to actions undertaken during the course of this research and presented in this thesis (Allen & Sites, 2012). As for the Iterative Development Phase, implementation of the course is actually outside of the objective of this project, which is to reach a convincing design, ready to be submitted to Higher Education key stakeholders for the key moment of Design Proof. A follow-up research will present the release of the Alpha Version of the course and its development into the Beta Version and Gold Version until the final roll-out.

The Preparation Phase is the part of the project where the designer gathers background information about the problem and its context, effectively setting solid theoretical foundations before attempting to design the solution (M. W. Allen & Sites, 2012).

The literature review (see *Theoretical Foundations of the Research - Literature Review*) and the first explorative part of the research (see *Part One: Exploratory Analysis on the Influence of Generative AI Chatbots in Learning Activities - Conclusions*) served to kickstart the process and they fulfilled the key moment of Information Gathering. This key moment is critically important to base decisions on verified information. Nevertheless, given the explorative nature of the SAM method, it is important to consider that the information gathered during this phase may be contradicted or modified as the project evolves.

Following the moment of Information Gathering, and just before the Iterative Design Phase there is the Savvy Start. This key moment is supposed to kick-start the project: (M. W. Allen & Sites, 2012, p. 41) define an ideal Savvy Start as a “solutions-brainstorming

event in which the design team and key stakeholders review collected background information and generate initial design ideas".

In the context of this research, the Savvy Start key moment is fulfilled with a "Collaborative Ideation Workshop": the design team was composed of the researcher, while the participants were students from the Complexity Science Master's Program "Transition, Innovation and Sustainability Environments - TISE (*TISE Program Description*, 2020). The Collaborative Ideation Workshop lasted a total of 4 hours, during which participants were first presented with the current findings from literature, and the key pedagogical implications of Gen AI listed in the first chapter (see *Theoretical Foundations of the Research - Key Pedagogical Consideration of Generative AI)*of the exploratory phase, to then engage in group discussion and creative storytelling, with the objective of exploring all the nuances of the problem, and it concluded with a collective solution-oriented brainstorming (find more details in a later paragraph).

The outcomes of the Savvy Start opened the way to the next step of the creation process, the Iterative design phase, which started with the creation of a prototype.

The prototype design fulfilled the key moment of Project Planning, it was developed with the objective of testing and communicating ideas (M. W. Allen & Sites, 2012). The first prototype was built on three iterative steps. First, the results of the preparation phase were translated into the first blueprint of the course plan: the instructional goals of the course were set, together with an outline of the critical skill and information that the course needs to transmit to reach the goals and the profiling of the typical participant to the course. The second step included the sketching of 4 learning modules with the respective learning objectives, methods of delivery and assessment. Finally, more details about the planned content and activities of the four modules were added. The first prototype can be found in the Annex 2.

To evaluate the prototype, and fulfil the Additional Design key moment, a semi-structured focus group was conducted among a group of three (3) researchers and one (1) professor at the University for Continuing Education Krems. The objective of the key moment Additional Design is to revise the prototype and adjust its design, according to the feedback of key stakeholders. This key moment was also fulfilled in the research, as the

insights collected during the focus group contributed to a revision of the prototype into the first complete course plan, whose design is presented later in the chapter in the section "*GenAI in the Classroom: Co-Designing the Future of Teaching in Higher Education - A Teacher Empowerment Workshop*".

The rest of the Methodology section is now dedicated to the description of the two data collection and analysis methods used across the project: the Collaborative Ideation Workshop and the focus group.

Collaborative Ideation Workshop

The Collaborative Ideation Workshop corresponded to the key moment of Savvy Start and represented a critical component of this research, designed to bridge the exploratory phase with the iterative design phase. By engaging participants in collaborative activities, the workshop generated insights that directly influenced the initial design of the prototype course plan

The workshop took place at the University for Continuing Education Krems. The objective of the event was to explore issues and brainstorm opportunities evidenced in the first part of the research, and to generate creative ideas and solutions for integrating GenAI chatbots in Higher Education.

Eight (8) participants were selected from the European Master's Degree "Transition, Innovation and Sustainability Environments (TISE)": this program presents a strong emphasis on understanding complex systems and comprehending the influence of new technologies on society. Participants were selected from this course due to their focus on innovation and their ongoing training to understand complex issues. Moreover, the TISE program presents a high variety of social, cultural and professional backgrounds, so that their presence ensured that the core values of creativity and exploration needed for the Savvy Start were respected. These professional and academic backgrounds were present within the participants group: Environmental Sciences, Political Sciences, Chemical Engineering, Management, Health Sciences, Cultural Studies and Accounting. The countries represented were Indonesia, Colombia, Germany, USA, Brazil, Ghana and Syria.

Three out of eight of the participants of this workshop were also interviewed during the first exploratory part of the research. However, the overlap of their presence in two data collection methods was not considered relevant, nor did it invalidate their participation in the Collaborative Ideation Workshop. This is due to the inherent difference in objectives and methods of the exploratory interviews and the workshop: while the first aimed to collect a snapshot of the practices of students with GenAI chatbots, the purpose of the workshop was to establish an environment of collaborative problem and solution-oriented discussion.

The creative solutions and feedback from student participants ensured that the prototype was informed by the perspective of the primary beneficiaries of the educational process. By capturing student concerns and expectations, the research is better positioned to predict general trends and address future needs, ultimately enhancing the relevance and effectiveness of the course plan designed for teachers.

The workshop lasted 4 hours and the time was organised as follows:

Part 1 - Presentation of foundational knowledge: during this first section, the workshop facilitator provided a technical overview of GenAI chatbot technology, background information on the key pedagogical implications of Gen AI listed in the first chapter, and the findings from the literature review. This part of the activities was rather formal, taking the shape of a presentation. Participants were free to raise questions.

Part 2 - Problematization: Once the participants received the basic knowledge about the topic, the scope of the activity moved on to an active exploration of the problem. Participants were randomly divided into two groups and were asked to reflect on the influence of GenAI chatbots on educational activities from the perspective of (group 1) the students and (group 2) the teachers. After 15 minutes of group discussion, participants presented the insights from their group and a collective discussion followed. The objective of the discussion was to reach a consensus on the most pressing issues and define the guiding question for the third part of brainstorming creative solutions. The results of the group presentation and collective discussion have undergone inductive thematic analysis; the outcomes of the analysis of this discussion can be accessed in the results section.

Part 3 - Brainstorming Creative Solutions: this part of the workshop was dedicated to brainstorming examples of creative integration of GenAI chatbots into Higher Education teaching and learning. Before the start of the actual brainstorming, to enhance creative and collaborative thinking, participants took part in a “story circle” activity: they sat in a circle and composed a story, alternately adding a sentence based on the previous stories. After this exercise, the workshop moved on with the brainstorming session: taking on the guiding questions defined at the end of part 2, participants took 15 minutes of individual reflection to write down as many ideas as possible, for then proceeded with an unstructured discussion on the ideas and possible ways to combine them. It resulted in a list of ideas that have been added to the results section, after being clustered and assembled according to the themes of the discussion during the data analysis phase. The list of ideas can be found in the results section.

The entire process was video and audio recorded to conduct the necessary analysis. All the participants agreed to be recorded and standard measures were adopted to ensure the right to privacy of the participants.

Focus Group

Following the prototype design, a focus group was conducted to test the validity and collect insights to adjust the instructional item. The main objective of the focus group was to collect feedback from Higher Education practitioners to conduct an assessment of the overall feasibility of the course and proceed with the iteration of the course design.

The main criterion of selection of participants was the active involvement in Higher Education environments and activities. The focus group involved four (4) researchers from two different universities. From the University of Florence: one PhD student from the Department of Education and Psychology. From the University for Continuing Education Krems: one PhD student from the Centre for Learning Systems Design and Transformation, one senior researcher from the Department for Higher Education Research and one senior researcher from the Department for Migration and Globalisation. This population allowed for a comprehensive overview of the typical

challenges and opportunities that university practitioners face in their day-to-day lives and the interest that they can get from participation in the proposed course plan.

The focus group was conducted in a semi-structured manner: the facilitator presented the prototype (the instructional analysis and four modules - for the prototype see Annex 2) to the participants, and along with the presentation, planned 4 “feedback stations” with guiding questions to facilitate feedback collection.

The entire session was video and audio recorded to make further analysis available for the designer. All the participants agreed to be recorded and standard measures were adopted to ensure the right to privacy of the participants.

After the focus group, the research process continued with a deductive thematic analysis of the recording. Data was approached and processed according to two major themes: comments on the structure and comments on the contents. The chosen themes were selected to ensure comprehensive feedback on the course’s foundational goals, organisational framework, and instructional materials.

The following sections present the results from the Collaborative Ideation Workshop and the focus group

Results

Savvy Start - Collaborative Ideation Workshop

Group discussion

From the analysis of the collective discussion, two major themes emerged.

The first theme revolved around the issue of authority in the classroom, and the possible conflict between teachers and the chatbots. The participants agreed that the introduction of a conversational agent powered by artificial intelligence in the context of learning and teaching could potentially mine the authority of a teacher since it is often “*easier to trust the technology rather than a human*”. This can lead teachers to disregard and refuse to accept chatbots if they feel their position is challenged.

However, some of the participants agreed that challenging the status quo of teachers may be beneficial to the educational process and be a vector for a more horizontal way of teaching in universities. Among this group of participants, there is consensus that "*academia is very rooted in a hierarchical dynamic, where the teacher is the keeper of knowledge*" and they believed that the addition of a "third actor" standing beside the teachers, can open up a wider space for discussions within the classrooms, offering an alternative position than the one of the professors, who is inevitably biassed by their lived experience. On this topic, similarly to the results of the interviews, the participants split between two groups: one more techno-optimist, supporting the idea that new technology can positively change existing dynamics in society, and it should be considered a key stakeholder in the future, while another group rather doubtful about "*relying on technology to solve a problem that is human*" and would rather "*make education more horizontal ourselves*". The groups were unbalanced in numbers, seeing the techno-optimist group having more traction. It appears that the question around the influence of the introduction of an agent in the space of the classroom is a hot topic, which sees the teacher being either overridden by the addition of a new technology or empowered by it to achieve a new form of democratic education.

Apart from this division, participants shared common concerns about the biases, not only the ones that inevitably come from the training datasets of GenAI Chatbots, but also from the agendas of the companies that manufacture chatbots: "*the biases are in the training datasets. But we also have biases created by the pressure of big companies. We have to be aware of all the biases*", and "*They make money out of it and there would be influenced positioning regarding certain topic*" are two excerpts that capture this sentiment of mistrust over the intentions of big tech companies and how their tools can be used to spread misinformation and lead public opinion. These concerns somehow weakened the position of the techno-optimist part of the group as all the participants agreed that, considering these issues, it would be critical to avoid the influence of GenAI Chatbot's bias outside of the learning environment.

The second theme expresses concern about the influences of chatbots on the development of critical thinking skills and applied knowledge. A large part of the

discussion revolved around the dangers of “passive consumer behaviour”: if students apply a lazy approach to the technology, this could hinder critical thinking skills and creativity. Moreover, the over-reliance on chatbots can also contribute to a fragmentation of thoughts and knowledge from the student: since it can quickly ask for a piece of information, the students would be less likely to memorise it, building holes in their knowledge of a topic. One participant described her experience as: “*I read something, and I don’t need to pay too much attention because I can always ask for the answer - it’s very distracting and is always present in the background*”.

The participants stressed the importance of systematic and holistic knowledge, and how chatbots can be disruptive in this regard. Building systematic and holistic knowledge requires the application of knowledge: because we often prefer to assign tedious work to machines, this can lead students to avoid producing something themselves but rather prompt the chatbot to do it for them. Besides critical thinking, creativity, holistic and applied knowledge, the discussion also touched on the topic of interpersonal skills and how it is important to build a sort of emotional connection between students and professors: *“raise your hand to ask a question in class, takes confidence and courage*” “*if you are continuously asking the chatbot, you won’t build a relationship with the professor*”.

The concern for the influence of technology on critical and soft skills is shared across the whole group, who also agreed to the fact that an educated approach to chatbots is necessary for both students and teachers. Thanks to a conscious approach, students can considerably expand their knowledge, and expand their studies outside of conventional education to explore their interests.

The discussion resulted in the definition of a question to guide the third and last part of the workshop dedicated to brainstorming. The final guiding question that has been developed in concert by the participant and the facilitator was: “Which educational practice involving GenAI chatbots can effectively enhance the autonomy of students exercising critical thinking and facilitating horizontal teaching?”

Brainstorming Creative Solutions

Here are presented the results of the brainstorming as a set of the 10 ideas that answer the question during the Problematization part. The ideas have been clustered according to four themes that have been identified during a later analysis of the ideas: chatbots to enhance questioning and communication skills, chatbots to offer personalised learning support, chatbots to foster collaboration and critical thinking, and chatbots to facilitate debate for deep understanding.

Chatbots to enhance questioning and communication skills

- Reverse Chatbot - Students Provide Answers, Chatbot Return the best Questions to get to that answer: This idea was aimed to encourage critical thinking in the students-users by engaging in an interesting exchange of roles between the human and the machine. The user submits a certain element of knowledge and the chatbot returns a set of possible questions that someone unfamiliar with the matter could ask and get that answer in return.
- Pre-Reviewed Questions to Promote Effective Questioning in Class: An exercise for questioning: the teacher leaves time at the end of a lecture for the students to engage with the chatbot with the objective of identifying a lack of understanding of the content provided during the lecture, and to refine the best question to ask to address such a problem.

Chatbots to offer personalised learning support

- Content-Specific Chatbot (e.g., Student Companion for Algebra): A content-specific chatbot that provides tailored help on specific subjects or class problems, so that students can explore subjects at their own pace. It would be useful to increase the motivation of students. The teacher would have control over the settings of the chatbot as well as the content provided
- Chatbot Reports on Students' Doubts and Challenges: A chatbot assigned to a classroom or a teacher can collect the opinions of the classroom through informal conversations, and return to the teacher the overall sentiment of the classroom as well as doubts and other concerns. The social ability of the chatbot can be used to

facilitate the collection of feedback in a safe environment. Some concerns about privacy exist.

- Textbook with Student-Personalised Content: The chatbot poses some questions to the students, about their preferences, interests, and skills. Then the teacher inserts “a knowledge pack” on the contents that need to be learned. The chatbots provide a personalised explanation of the knowledge provided, enhanced by the information that the student decides to share.

Chatbots to facilitate debate for deep understanding

- Use chatbots as a Starting Point for New Topics, Then Dive Deeper Together: The teacher can encourage students to start an autonomous exploration of a topic through a conversation with the chatbot. Students are asked to collect notes during the process. Then students and teachers engage in a semi-structured discussion to see the results of the exploration and kick-start the lecture.
- Simulate Debating Club with Chatbots Tool as One Party: During or at the end of the lecture, the professor engages in a public (on a projector or monitor) debate with the chatbot, that has been previously instructed to hold a certain position, to demonstrate the scientific strength or limitations of a certain topic.
- Chatbots Commenting on Issues from Various Standpoints: to facilitate a holistic integration of multiple points of view during a discussion students can use the chatbot to list the different stakeholders or interests that are involved around the topic of discussion.

Focus Group

The deductive analysis conducted on the recording of the focus group aimed to identify two main themes: comments of the structure of the prototype and comments on the content of the prototype. The results of the analysis of the focus group highlight the benefits of a blended learning approach for the prototyped course because it has the potential to fit into the teacher's schedule and still present an attractive aspect of collaboration and networking. Participants confirmed the importance of providing AI

literacy content and suggested content fragmentation for clearer delivery. To optimise learner engagement it is also needed to modify the assessment methods, in favour of more interactive and coherent solutions, in line with the objectives.

Theme 1 - Comments to the structure of the prototype

The first theme collects the comment that is directed to reshape the structure of the course plan. It includes several mentions on the possibility of delivering part of the course online, the importance of having a structure that facilitates the engagement of learners and the timing organisation for the practical implementation of the workshop. This theme was consensual among the participants on the importance of a structure and delivery that facilitates learner engagement. A wide part of the discussion revolved around the suggestion to divide the course into two parts: one part online and the second part in person. This suggestion is supported by two distinct reasons, the first being related to the presence across the course plan of different “input elements” (directed to the transfer of information) and “output elements” (directed to building competencies and co-design activities), making it worth it to consider different delivery methods and learning environments for the corresponding modules. The second reason is rather organisational and it involves the time constraint that a university teacher (the intended target for the course) usually faces in their schedule: the delivery of the input elements as online resources is seen as beneficial. Because of time constraints, the option of a fully online course was also explored, but it was finally agreed that this method is not in line with the intent of building engagement. Conversely, the participants agreed that having one or more in-person sessions can increase the interest of teachers to participate, not only for the training they would receive, but also as a possibility for networking, which is usually a motivator for academics. Moreover, the implementation of collaborative designing activities would be facilitated by an in-person setting more than an online one, enhancing the interactivity in the course. The analysis of this theme highlights the benefits of a blended learning approach for the prototype course, emphasising its potential for time-saving and enhancing networking and collaboration opportunities among participants.

Theme 2 - Comments on the content of the prototype

The second theme explores the comments on the contents presented within the prototype. Along this theme, the participants agreed that the ease of interaction with the contents must be a priority for the designer, but apart from that, the comments are considerably different from the first part of the prototyped course plan, which contains more instructional elements, to the second part, which includes output elements. In the prototype, the first part of the course plan is dedicated to the transmission of knowledge contributing to improving the AI Literacy levels of the teachers that will take part in the course. The participants of the focus group recognised and agreed with the importance of such objectives. However, they also shared the impression that the content may be too technical. One participant suggested compartmentalising the content to ensure clear delivery of the contents and avoid boredom for the learners. The assessment methods were also mentioned in this discussion, and it was suggested that they should also be planned so that they contribute to learner engagement. One final suggestion regarding this part was the idea to plan and design dissemination material (a sort of “Generative AI Beginner Guide” or “Prompt Toolkit”) for the teachers to hold on to and get back at it during their normal teaching activities.

The second part of the prototyped course plan is dedicated to building collaborative discussion among the participants on the introduction of GenAI Chatbots in universities, and to support them in the designing of teaching activities that include this technology, so that they can then apply it in their teaching. The participants appreciated the collaborative and design features of the plan but expressed concerns on the coherence of the method of assessment and the objectives. They proposed a complete reconsideration of the approach to the assessment methods for this part. One participant proposed to add “GenAI Enhanced Curriculum Design” as a possible additional content of the course. Finally, they agreed on the necessity to provide learners with actual and practical examples before and during the co-design activities. In conclusion, the results grouped into this theme highlight that content related to AI Literacy should be fragmented to facilitate spaced learning and that it is necessary to improve the engagement levels of the

assessment methods. Practical co-design activities should enhance the course's effectiveness and participant engagement.

GenAI in the Classroom: Co-Designing the Future of Teaching in Higher Education - A Teacher Empowerment Workshop

This section presents the final result of the research project: a blended format workshop on. Part 1 is designed to be a course on a online platform, while Part is designed to happen in-person in a room.

Workshop Blueprint

Course Overall Goals

To introduce and equip teaching roles in European Higher Universities of Humanities with the necessary knowledge and skills to:

1. Effectively integrate Large Language Models (LLMs) technology into their teaching methods.
2. Foster the resilience of their subject area to the AI revolution by maintaining the unique characteristics of their subject while updating teaching methods.
3. Encourage proficient use of technology among students, particularly in applying critical thinking during interactions with LLMs.
4. Reflect on how LLMs will influence their teaching practices and what to expect in the future.

Learning objectives

At the end of the workshop, the learner will be able to:

1. Understand GenAI chatbots technology: What are Generative AI and Large Laguage Models, including their training, functions and limitations.

2. Analyse user-chatbot interactions: given basic principles of HAX (Human-AI Experience) and prompt engineering, know how to interpret and evaluate interactions with GenAI Chatbots.
3. Examining the impact of GenAI chatbots in educational activities: Discuss both positive and negative consequences of the introduction of LLMs in learning and teaching activities.
4. Design GenAI-powered teaching activities : Know how to design teaching activities that incorporate GenAI Chatbots, considering potential outcomes and expectations.

Learner profile

Learners are:

1. Role: Faculty members and teaching staff within the Humanities departments at European Higher Education Institutions.
2. Level of knowledge: Individuals likely to have basic to intermediate familiarity with general AI concepts but varying levels of understanding regarding specific technologies like Large Language Models.
3. Motivation: Individuals interested in enhancing their teaching methodologies in response to technological advancements of artificial intelligence.

Part 1 - GenAI Chatbots: AI Literacy and HAX essentials

Introduction - Workshop Structure and Learner Assessment

Objective 1: Introduce the learner to the overall structure of the course
Objective 2: Collect useful informations on the participants (level of knowledge, motivation, current concerns)

Method 1: Video
Method 2: Survey

Format	Objective	Content
Video 1	Introduce the learner to the overall structure of the course	First interaction with learner Curse objective and course structure. How to approach the give material
Survey	Collect useful informations on the participants to use for adaptation of Part 2	Knowledge assessment Motivation assessment Current problems and concerns

Module A - Understanding GenAI Chatbots: What are Large Language Models and How do they Function

Objective: Define and describe how GenAI and LLMs work, outlining their core mechanisms and functionalities.

Method: Short video lectures and text summaries

Assessment: Online Interactive Quiz

Contents:

Format	Objective	Content
Video 1	To describe what is Generative AI, how is it different from AI	Introduction to GenAI Chatbots Definition of AI vs Generative AI
Video 2	To explain the underlying technology that powers GenAI Chatbots	Machine Learning and Training Data Neural Networks and Deep Learning Large Language Models
Video 3	To showcase practical applications of Generative AI, focusing on Conversational Agents, Content Creation, and Personalization	Conversational Agents Content Creation Personalization or content
Video 4	To present the limitations and ethical implications of using LLMs.	Bias Contextual Understanding Privacy
Text	To present the same informations from the videos, but in one article to accommodate participant's preferences	Same content as provided in the videos, formatted in a text document for reference.
Activity	To test the understanding of the topics	Interactive quiz

Module B - Introduction to Prompt Engineering and HAX

*Learning Objective***:** Differentiate between proficient and inept methods of interactions between user and chatbots. Evaluating the interactions based on HAX (Human-AI eXperience) and Prompt Engineering criteria. Evaluate the usefulness and correctness of an output and its relationship with the prompt.

*Method***:** Short video lectures and text summaries

*Assessment***:** Hand-on assessment - Review, evaluate and improve prompts, based on the CLEAR Framework

*Contents***:**

Format	Objective	Content
Video 1	To introduce HAX basic guidelines and the importance of prompt quality	What is Prompt Engineering Introduction to HAX (Human-AI eXperience) Importance of prompt quality and interaction dynamics
Video 2	To present and expand CLEAR Framework for prompting (Lo, 2023)	Concise: Keeping prompts brief and to the point Logical: Ensuring prompts follow a clear and rational sequence Explicit: Being specific and clear about the requirements Adaptive: Adjusting prompts based on the context and feedback Reflective: Reviewing and refining prompts based on outcomes

Format	Objective	Content
Video 3	To showcase case studies applying HAX principles and prompt engineering techniques in real-world scenarios	Role Assignment Audience Assignment Style Assignment User Interaction and Engagement Interactive output refinement
Text 1	To present the same informations from the videos, but in one article to accommodate participant's preferences	Same content as provided in the videos, formatted in a text document for reference.
Text 2	To provide a "Teacher Prompt Toolbox" than can be used in academic activities	Schematic organisation of prompt engineering principles and rules adapted for common teachers' tasks.
Activity - Assessment	To test the understanding of HAX and prompt engineering principles and apply the acquired knowledge	Exercises on prompt: 1. Participants receive prompt that they need to modify and optimise 2. Participants get assigned an imaginary task to perform and write the prompt for it.

Part 2 - Teaching with GenAIChatbots: Co-creating Innovative Strategies

Introduction - Information Recall

Objective: to facilitate learners' recall to the informations acquired in part one and introduce the application of those informations in the university teaching activities
Method: Interactive presentation
Content 1: Rundown of content from part 1
Content 2: Presentation of updated findings from literature and the explorative part of this research.

Module C - GenAI Chatbots and University Teaching

Objective: Compare and organise personal and collective opinions over the influence of GenAI Chatbots in teaching and learning activities.
Method: Interactive presentation, Semi structured discussion
Assessment: Establish a common framework of action for the participants.

Activity 1 - Group Discussion:
Objective: Explore personal opinion and compare it to peers' opinion
Description: Participants are divided into groups (max. 4) and take 30 mins to discuss 3 guiding questions.

- How to ensure that the integration of AI in educational settings supports and enhances fundamental educational values like critical thinking, academic integrity, and personal interaction?
- How to maintain a balance between teacher authority and AI assistance to optimise both educational outcomes and student-teacher relationships?
- What safeguards should be set, to prevent ethical issues of GenerativeAI from influencing educational content and student assessments?

They come back and briefly present the results

Activity 2 - Establishing a Framework:

Objective: Create a framework of action and interpretation of recommended actions and expected consequences that is common to the participants of the workshop.

Description: Participants engage in a collaborative discussion to reach a common framework of action. The facilitator act as a moderator to guide the learners to fill the table.

Theme	Domain	Guidelines	Foreseeable challenges
Fundamental Educational Values What are the most fundamental elements that guide HE teaching?	Critical Thinking		
	Creativity		
	Student autonomy		
Social Environments of the Classroom What is the relevance of human interactions during teaching activities?	Peer collaboration		
	Teacher authority and leadership		

Theme	Domain	Guidelines	Foreseeable challenges
Ethical safeguards What are the major ethical concerns that hinder the quality of the educational endeavour?	Ethical Use		
	Bias		
	Transparency		

Module D - Design teaching activities with GenAI Chatbots

Objective: Design, and justify new methods of engagement with LLMs in teaching and learning activities (in the classrooms, for the homeworks or assessment) based on informed understanding of their potential impacts and creative thinking.

Methods: Co-design activity

Description: the activity is oriented to produce personalised tasks for the learner teaching needs that incorporate GenAI Chatbots, tailored to the specific requirements of their subject matter or problem-area. Steps of the activity:

1. Preparation: During introduction of the online module, the participants are invited to write down one (or more) major problems they encounter in their daily teaching. The problems can be organisational, emotional, or content-related. The problems get collected by the facilitator, and anonymously print ed.
2. Problem Selection and Group Formation: At the beginning of Module D the facilitator presents the list of problems to the participants and they pick a problem that they are interested to solve using the knowledge they have gained throughout the workshop. Based on their choices they are divided into groups of 2-3 participants.
3. Ideation Process Kickstarter: The facilitator presents a catalogue of creative solutions (inspired by the ideas generated during Savvy Start - Creative Ideation Workshop) and leave it to the groups to get inspiration.
4. Planning and Justification: Each group receives an instructional design template to guide them to design an educational activity that involves a specific use of AI to solve the chosen problem. During the all process justification of choices at each step of the design process encourages groups to take detailed notes on their discussions and decisions.The template is divided into three parts:

- Clarify and define the problem (“Problem Identification”, “Objective”)
- Describe the idea and how LLMs will be integrated into the activity (“Activity Design” “Assessment”)
- Identify the expected outcomes and benefits (Implementation)

The time allocated for this activity gets divided according to the three parts. The autonomous work of the groups gets alternated by quick breaks where participants can share their results so far, together with doubts and concerns to the facilitator and other learners.

Template for activity design.

Section	**Description**	**Justification - Why LLMs?**
Problem Identification		
Context	Describe the specific problem chosen to address. Include details about its nature.	Why this problem? What is the initial intuition that made you think “LLMs that can help me with this problem”? Do you have any previous experience with LLMs and this problem?
Problem statement	Add any useful background information on the teaching environment where the problem occurs (Type of students, subject matter, situational factors..)	
Objective		
Learning Objectives	Clearly state the main intended learning goal. What should be the final outcome of this activity?	

Section	Description	Justification - Why LLMs?
	If needed, proceed and break it down into smaller objectives.	How do these objectives align with the strengths of chatbots in education?
Activity Design		
Activity Descriptive Narration	Outline the “Students and Teacher Journey” with a descriptive narration of your solution.	What makes you think that this is a good idea?
Integration of LLMs	Describe the details of how LLMs will be incorporated into the activity to enhance learning and address the identified problem.	What specific aspect of LLMs are you leveraging with the proposed activity?
Materials and Resources	List the materials and resources the teacher needs. You can include technological tools, software, or any platforms existing or un-existing (describe the necessary features).	Why do you need chatbots?

Section	Description	Justification - Why LLMs?
Assessment		
Assessment Methods	Describe the possible methods to assess: student learning and effectiveness of the activity	Does this assessment include the use of a chatbot or not? Why? Can you reach these outcomes without chatbots? Why?
Expected Outcomes	Describe the outcomes you expect that this activity could have on your problem	
Implementation		
Roles and Responsibilities	Define the expected roles and responsibilities of both teacher and students during the activity.	What specific part of this activity requires attention by the teacher and what part would focus on students' autonomous work? How does this division of roles ensure a safe use of chatbots?
Troubleshooting	Describe potential problems that could occur when implementing this activity in a real world scenario?	

Discussion

This section of the thesis delves into the details of the proposed workshop plan, together with the role of the data collection methods to justify the instructional choices that were made.

According to the Cambridge Dictionary of English language, the term workshop has two meanings: workshop as “a meeting in which people discuss and show how to do a job or perform an activity, so that everyone can learn” and workshop as “a space in a building equipped with tools and often machines for making or repairing things” (Cambridge Academic Content Dictionary, 2024). Neither definition alone is sufficient to describe the proper nature of the proposed course plan: while the first definition outlines the collaborative nature of a workshop and the objective to learn something, the second one focuses on the importance of crafting something within a workshop. Both elements are present in the proposed course plan: the first part of the workshop is dedicated to learning the basic knowledge of theory and techniques necessary to use GenAI Chatbots (the tools), and the second part is collaborative in nature, where discussions aim at crafting new ways of teaching. In this sense, the educational item designed as the result of this research is hereby defined as a workshop, and titled "GenAI in the Classroom: Co-Designing the Future of Teaching in Higher Education". The proposed workshop aims to equip teaching roles in European Higher Universities with the essential knowledge to navigate the evolving landscape of GenAI, and to provide them with the skills and guidance they need to autonomously integrate the efficient use of GenAI Chatbots into their teaching activities. The target audience includes the teaching staff within Humanities departments who have basic to intermediate familiarity with AI concepts. The ideal participant is a teacher who is motivated to enhance their teaching methodologies in response to technological advancements. This specific group is chosen as the primary target because, according to social constructivist theory and the TPACK framework, teachers are pivotal in facilitating the learning process in a classroom and guiding the introduction of technology into the educational process (Amineh & Asl, 2015; Mishra & Koehler, 2008). Universities and Higher Education institutions are the pinnacle of

education systems and are in the position to influence primary and secondary levels of education (Michaelowa, 2007), while humanities are identified as one of the categories of knowledge most influenced by the advent of GenAI chatbots in education (Rane, 2023). Thus the proposed workshop aspires to foster a seamless blend of tradition and innovation, updating teaching strategies while preserving the unique characteristics of disciplines within humanities. Through the modules of this workshop, teachers can learn how to use technology proficiently, apply critical thinking during interactions with GenAI chatbots, and discuss how these technologies will influence their future teaching practices. In conclusion, a secondary desired effect is to encourage the proficient use of technology among students through the training of teachers. The details of the objectives, contents and assessment of the four modules that compose the design of the workshop are discussed in the course of this section.

Part 1 - GenAI Chatbots: AI Literacy and HAX Essentials

The first part of the workshop is dedicated to instruct learners on the basic notions of the technology that powers GenAI Chatbots, in order to prepare learners for the subsequent interactive sessions. The overall objective is to drive teachers to reach a proficient level in AI Literacy and chatbot usage. Thanks to the knowledge of Large Language Models, and the techniques of prompt formulation and Human-AI Interaction, the learners are empowered to optimise their use of GenAI Chatbots in teaching activities. A teacher that is skilled with the tool can set a positive example in the classroom, thus effectively facilitating a positive integration in the education environments. Moreover, the results from Savvy Start indicated that the chatbots can hinder the position of leadership of the teachers in the classroom, but this phenomenon can be avoided if the teacher knows the functions and limitations of the technology, and embraces it as an ally in their teaching methods.

To build a skilled approach in the learners, one must provide both theoretical knowledge of the functioning systems of the technology, as well as practical instructions to use the chatbots. Hence the learners need to receive information on the peculiarities of GenAI Chatbots, and basic notions of prompt formulation for optimised Human-AI Experience.

The majority of the contents found in this part of the workshop are “input elements”: the modules are designed so that they can efficiently transmit the foundational information.
This part of the workshop is planned to be held online, and the content is shared through videos and text. The idea of providing foundational knowledge on an e-learning platform comes as a result of the focus group discussions: one of the major themes that emerged was the necessity to consider university teachers' time constraints and facilitate spaced learning. The content is provided in the form of short and focused videos: fragmentation of content can enhance learners' commitment gain their attention and avoid confusion (Gagne et al., 2005). The videos are accompanied by extensive text summaries, to respond to the different media preferences of learners.
The workshop begins with an introduction that provides guidance to the learners, presenting and outlining the structure of the course, a necessary step to gain the attention of the learner (Gagne et al. 2005). During the introduction, an initial online-survey assesses the participants' AI literacy levels, motivations to take part to the course, and concerns about GenAI's impact on their teaching; the information collected are used by the facilitator to fine-tune the interactive part of the workshop.
This part of the workshop includes 2 modules.
During *Module A - Understanding GenAI Chatbots: What are Large Language Models and how do they function* learners get in touch with the basic knowledge of GenAI and how it differentiates from other types of AI, what are Large Language Models and how do they power chatbots technology.
The importance of AI literacy emerged as a major element throughout this research. Both the results from the Exploratory Research and Savvy Start discussion highlight that it is radical to have an educated approach to the technology to avoid most of the dangers of using GenAI Chatbots. Learners are also presented with peculiar case studies of the practical applications as well as the limitations of the technology.
The assessment method of this module is a quiz to test the knowledge of learners at the end of the module with a series of interactive questions: every time learners answer correctly, they will be provided with additional information on the topic, as a hook to stimulate autonomous research on the topic (during the focus group the participants

suggested to offer learners the possibility to autonomously explore the topics); conversely, when the answer is wrong, learners are provided with a brief explanation on the topic and an indication of which of the videos contain that piece of information on, to facilitate self-correction.

Similarly to Module A, *Module B - Introduction to Prompt Engineering and Human-AI eXperience (HAX)* is dedicated to displaying the best practices to follow when interacting with GenAIChatbots, so that learners can optimise their results from the interaction with the chatbots, as well as evaluate their students' proficiency of use according to the criteria that are taught in this module. According to the results of the interviews, there is a shared understanding of the importance of specific prompt designing and strategies of interaction with chatbots, but users often miss the initiative or time to inform autonomously on the topic. To fill this gap, the workshop proposes the "CLEAR Prompting Framework" (Lo, 2023), a set of guidelines that is particularly adequate for both beginners and academics. The framework invites users to follow 5 principles in their prompt: Concise, Logical, Explicit, Adaptive, and Reflective (Lo, 2023) making it easy to understand, memorise and apply. The HAX contents are an adaptation of the content of the Microsoft Toolkit for HAX (*Microsoft HAX Toolkit*, n.d.). Besides the video and the text summary of information, the contents are also disseminated in the form of a "Teacher Prompt Toolkit", as suggested during the focus group discussion.

Finally, similarly to Module A, learners are provided with practical case study to facilitate the application of theoretical knowledge in real-world scenarios. Also, a final assessment is conducted, where the learners are provided with a group of prompts to analyse, correct and optimise according to the CLEAR Framework.

Part 2 - Teaching with GenAIChatbots: Co-creating Innovative Strategies

The second part of the workshop happens in person, and it invites learners to apply the knowledge acquired during the first instructional part of the workshop to their Higher Education teaching activities. The overall objective is to establish confidence in teachers to discuss and practise the application of GenAI Chatbots in education environments. The activities planned for this part are directed to establish a co-creative space, where the

learners can explore the possibilities of the integration, and collaborate with their peers to create new ways of teaching. Throughout this research process, it emerges the theme of the dangers that GenAI technology poses to critical thinking and creativity (literature review, interviews and Savvy Start). This research proposes a collaborative approach among practitioners as a viable solution to limiting the damages and enhancing the opportunities. Moreover, the result of the focus group highlighted how networking opportunities can be a motivator for academics to take an active part in the workshop.

To build an environment that facilitates interaction among learners and co-creation of learning activities, the input elements are reduced to the minimum, in favour of output elements. This means that during the activities the facilitator is supposed to act more as a moderator, and a guide for the learners, rather than a lecturer, offering support and knowledge during group discussions and designing sessions.

The second part also starts with an introduction, to briefly present the information from part one, and the results from a literature review on the potential benefits and threats of the use of GenAI on learning endeavours. This organisation of the introduction is due to an effort to facilitate the recall of knowledge acquired during “Part One - GenAI Chatbots: AI Literacy and HAX Essentials” and to prompt the learners to apply the acquired knowledge on the topic of teaching.

The second part is also divided into two modules.

Module C - GenAI Chatbots and University Teaching sets the “ground rules” for the collaboration among participants of the workshop: the objective of the module is to reach a set of guidelines that are shared among the participants, to advance to the design phase.

An iteration of semi-structured discussion guides the participants to establish a common framework that answers three fundamental questions, that all teachers should ask themselves before including GenAI Chatbots in their teaching activities:

How do chatbots affect or enhance fundamental educational elements - such as critical thinking, autonomy and creativity?

How do chatbots affect the personal interactions within the class, in terms of collaboration among peers and teacher leadership?

What ethical safeguards should be set in advance, to avoid misinformation, and enhance academic integrity and transparency?

These three questions are the result of the work conducted throughout the research, which identified the main vulnerabilities and strengths of learning with chatbots. The importance of open discussions and collaborating under a common framework has emerged during the Savvy Start discussion, and the literature review highlighted how the institutional frameworks are rather blind to the everyday reality of a teacher. Moreover, as noted during the focus group, each university in Europe has different guidelines (if they have it), and this makes it even more important for teachers to be cohesive in their decisions on this topic. The established framework can eventually become the foundation for a larger endeavour of the faculty or the university to regulate teaching and learning with GenAI chatbots.

The last of the four is *Module D - Design teaching activities that include GenAI Chatbots*, and it is dedicated to co-construct actionable strategies that integrate GenAI Chatbots into teaching activities. This module invites the participants to put into practice all the skills and the reflection they acquired throughout the course into practice on a concrete educational issue that they experienced. The activity within this module enhances the retention of information outside of the boundaries of the workshop and facilitates the transfer of the skill acquired straight into the learner's everyday teaching life. In this module it reflects the entire purpose of this research project, which is to support higher education teachers to integrate GenAI Chatbots into their teaching activities, enhancing benefits and mitigating threats.

Limitations and Future Directions

This research is subject to several limitations that must be acknowledged to provide a comprehensive understanding of the study's findings and implications.

Sample Size and Composition

One of the primary limitations of this study is its small sample size and the specific context of the TISE program, which may not be representative of all higher education settings. The participants were international students from a single master's program, which limits the general validity of the findings to other educational contexts or student populations. Moreover the focus group in the second part of the research was composed of researchers rather than teachers, therefore relevant insights from teachers might change the features of the design.

Methodological Constraints

The qualitative nature of the research, which relied on thematic analysis of semi-structured interviews and focus groups , may introduce subjectivity and bias in the data collection and analysis processes. While these methods are valuable for in-depth exploration, they inherently lack the statistical rigour and generalizability associated with quantitative approaches. Additionally, relying on data self-reported from participants may be influenced by “social desirability bias”, which can influence participants to provide answers that they believe are expected or favourable rather than sharing their acurate feelings and behaviours (Tullis & Albert, 2013).

Temporal Limitations

The research was conducted over a limited time frame, which restricted the ability to observe the long-term impacts of GenAI chatbot integration in educational settings.

Technological Constraints

The study focused on a specific set of GenAI chatbot technologies available at the time of research. Given the rapid advancements in technology, future technologies may exhibit

different capabilities and limitations. As a result, the findings related to the current generation of GenAI chatbots may not fully apply to future iterations of these technologies. Continuous research is required to keep the pace with fast developing technological tools publicly available and their broad and narrow inferences on education.

Lack of Practical Application and Testing of the Workshop

A significant limitation of this study is the lack of practical application and testing of the designed workshop. While the workshop was developed based on theoretical foundations and qualitative data, it has not been implemented or tested in a real-world educational setting. This limitation means that the effectiveness, feasibility, and practical challenges of the workshop remain speculative. Future research should involve pilot testing and practical application of the workshop to gather empirical data on its impact, refine its design, and ensure it meets the needs of educators effectively.

Future directions

For the future evolutions of this research, the direction to take will be to expand sample diversity by including participants from various educational levels to enhance the generalizability of the findings, thus understanding the broader applicability of GenAI chatbots in different educational contexts. Incorporating quantitative methods, such as surveys, experiments, and statistical analyses, will provide a balanced and comprehensive view of the impact of GenAI chatbots, complementing qualitative insights with more generalizable conclusions. Conducting longitudinal studies will be necessary to observe the sustained effects of GenAI chatbot integration, helping to identify long-term trends, benefits, and potential issues that may not be evident in short-term studies. Additionally, implementing and testing the designed workshop in actual educational settings through pilot studies and practical applications will provide valuable insights into its effectiveness, highlight practical challenges, and offer data for further refinement. This step will ensure that the workshop is not only theoretically sound but also practically viable and beneficial for Higher Education Institutions.

By addressing these limitations and pursuing these future research directions, the field can develop more robust and comprehensive strategies for integrating GenAI chatbots into higher education, ultimately enhancing teaching and learning outcomes while mitigating potential risks.

Conclusion

The findings of the first part of this research highlighted the transformative potential of GenAI chatbots in higher education, balanced by significant challenges such as academic integrity, cognitive development, and equitable access. The study outlines the dual nature of GenAI chatbots, emphasising their ability to enhance teaching practices and streamline administrative tasks while also presenting critical concerns. The instructional framework developed aims to equip European Higher Education educators with the necessary capabilities and comprehension of the technology to effectively operate within this fast-developing landscape.

This thesis proposes the implementation of a practical workshop "*GenAI in the Classroom: Co-Designing the Future of Teaching in Higher Education*" to empower teachers with AI literacy and practical competencies. It uses a blended learning approach, combining online theoretical modules and in-person collaborative sessions, to meet the diverse needs of higher education faculty. This workshop aims to transform teaching methodologies while preserving educational traditions.

In conclusion, this research underscores the urgent need for effective strategies to integrate GenAI chatbots into pedagogical practices. Teachers need to become knowledgeable and skilled in order to help pupils use these tools properly.. A balanced approach, leveraging the strengths of GenAI while addressing its risks, requires collaborative efforts. The workshop developed for this study is a first step toward improving learning outcomes and getting students ready for a future in which artificial intelligence (AI) technology will be essential to both academic and professional life. By fostering informed and ethical use of GenAI chatbots, educational institutions can ensure these technologies contribute positively to the educational experience.

Dedications

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Annex

1. Questions for exploratory interviews

- In the last year, how frequently have you used an AI chatbot as a support for your academic activity?
- If you've never used an AI chatbot for academic purposes, can you elaborate on the reasons behind your choice not to use them?
- Can you please list the specific activities for which you utilise chatbots in your academic work?
- Now can you please list activities for which you would NOT use an AI chatbot in your academic work?
- How do you differentiate what type of tasks to use or when not to use AI chatbots?
- Do you know what prompt engineering is? What more do you know about it?
- Do you always use the same AI chatbots or do you differentiate according to the required task?
- Do you know what an AI-Generated text detector is? Do you ever use it?
- To what extent do you trust the answers provided by chatbots in your academic endeavours?
- Are there any concerns or reservations you have about depending on chatbots for academic assistance?
- Considering the rapid advancements in AI technology, how do you see the future of education and the introduction of AI Chatbots?

2. Course-Plan Prototype

Analysis of goals, contents and learners

Primary Goal:

"to introduce and equip teaching roles in European Higher Universities of Humanities with the necessary knowledge and skills to:

1. Effectively integrate Large Language Models (LLMs) technology into their teaching methods.
2. Foster the resilience of their subject area to the AI revolution by maintaining the unique characteristics of their subject while updating teaching methods.
3. Encourage proficient use of technology among students, particularly in applying critical thinking during interactions with LLMs.
4. Reflect on how LLMs will influence their teaching practices and what to expect in the future."

Instructional Analysis

Content to be covered includes:

- **Understanding LLMs**: What are LLMs, including their training, functions and limitations.
- **Interpreting Interactions and Outcomes**: Discussing both positive and negative consequences of the introduction of LLMs in education.
- **Interaction Analysis**: Given basic principles of HAX (Human-AI Experience) and prompt engineering, learning how to interpret and evaluate interactions with LLMs.
- **Activity and Assessment Design**: How to design activities and assessments that incorporate LLMs, considering potential outcomes and expectations.
- **Future Reflections**: Reflections on the prospective influence of LLMs in teaching and the evolving educational landscape.

Learner Analysis

Learners are:

Role: Faculty members and teaching staff within the Humanities departments at European Higher Education Institutions.

Level of knowledge: Individuals likely to have basic to intermediate familiarity with general AI concepts but varying levels of understanding regarding specific technologies like LLMs.

Spirit - Motivation: Educators-Teachers interested in enhancing their teaching methodologies in response to technological advancements in AI.

Learning Objectives

By the end of the course, learners should be able to:

1. **Define and describe** how GenAI and LLMs work, outlining their basic mechanisms and functionalities.
2. **List** the three major domains of psychology of learning affected by the use of LLMs, articulating their impacts on students' learning experiences.
3. **Recognize** and **demonstrate** both positive and negative interactions between students and chatbots, evaluating these interactions based on four criteria: communication, engagement, content accuracy, and emotional response.
4. **Experiment** with the integration of LLMs into their teaching practices, exploring innovative ways to enhance their teaching.
5. **Judge** and **argue** for or against proposed methods of engagement with LLMs in their classrooms, based on an informed understanding of their potential impacts.
6. **Design** personalised tasks for their teaching needs that effectively incorporate LLMs, tailored to the specific requirements of their subject matter.

Design and development 4 modules

Module A. Introduction to LLMs and Generative AI Chatbots

Learning Objective: Define and describe how GenAI and LLMs work, outlining their core mechanisms and functionalities.

Sources: Literature

Methods: Interactive Lecture**:** Slide presentations and videos to explain the fundamentals of LLMs and Generative AI, including key terms and concepts.

Assessment: Quiz**:** Test knowledge with close-ended questions

Contents

Basic definition and functionalities:

Objective: Describe what is Generative AI, how is it different from AI. Describe what are Generative AI Chatbots and Large Language Models (LLMs).

- GenAI: #definition
- Chatbot: #definition
- Use Cases: Conversational Agents, Content Creation, Personalization (adaptation).

Core Technical Components:

Objective: Understand the underlying technology that powers LLMs and Generative AI, and how they contribute to the functionalities of LLMs

- Machine Learning (core tech.and training data)
- Neural Networks and Deep Learning (Architecture and Parameters)
- Large Language Models

Limitations and Ethical Concerns:

Objective: Articulate on the limitations and ethical implications of using LLMs.

- Bias
- Contextual understanding
- Privacy

Assessment: Quiz → 12 questions (4 x section)

Module B. LLMs and University Teaching and Learning Experience

Learning Objective: List the three major domains of learning affected by the use of LLMs, articulating their impacts on students' learning experiences.

Sources:

- Interview
- WS themes
- Literature

Methods:

- Interactive Lecture: Slide presentations and videos to explain the information from literature, together with case studies

- Guided group discussion**:** learners share experiences and observations from their own or others' teaching practices involving LLMs. 3 questions to answer

Assessment: Group presentation**:** Learners present the result of their discussion to the rest of the class

Domain 1: Social and interpersonal relations

Positive Impact

Reduced Social Pressure - Comfortable Interaction Bai et al., 2023

- "The danger for people to forget how to ask questions- the way you speak with a human is different from the way to talk with a chatbot." This observation suggests that while chatbots can reduce social pressure and make interactions more comfortable, they might also impact conversational skills.

Student Emotional Support - Lower Anxiety Atiyah 2023

- **“**The presence of AI in learning environments can act as an emotional buffer for students who may feel less intimidated asking a chatbot for help than a human teacher”

Negative impact

Impact on Soft Skills Baidoo-Anu & Ansah, 2023 - "Decrease people skills: having confidence with public speaking + teamwork... The use of the tool make you avoid the ability of public speaking - avoid and replace human interactions."

Reduced Peer Interaction Bai et al., 2023 - "Limits the necessary engagement with peers, reducing opportunities for developing interpersonal skills through group activities."

Domain 2: Unlimited teaching support

Positive Impact

Organisational and planning support for teachers Gökçearslan et al., 2024, Popescu, 2024 - "How can we make it more horizontal ourselves - AI can be taken as a stakeholder and see how it changes existing dynamics using this new technology."

24/7 Support for students, spaced learning and memory retention Bai et al., 2023

Negative Impact

Superficial Learning Engagement Baidoo-Anu & Ansah, 2023 - “Laziness: regarding critical thinking and creativity... Standardisation of expressivity. - is this really being our goal?” - “Passive behaviour consumer application..”

Reduced quality and control of information reliability Gökçearslan et al., 2024; Baidoo-Anu & Ansah, 2023 - "More westernised sources rather than Asian or African sources... biases are in the training data sets."

Excessive use - Information Overload R. Wu & Yu, 2024 - “Lack of attention: you read and you don’t need to pay too much attention if I can always ask for the answer - it’s very distracting and is always there in the background”

Domain 3: Personalisation of learning

Positive Impact

Enhanced Student Engagement and Motivation Gökçearslan et al., 2024

Increased Self-Efficacy and Perceived Value of Learning Wu & Yu, 2024 - “If you can understand better student’s problems then you cna personalise intervention”

Student-Content Interaction Bai et al., 2023 - “AI can support and provide multiple perspectives of a topic, and can make a piece of text interactive”

LLMs Role as Learning Consultants Yu, 2024 - “Coordinate students to enjoy using AI to further explore their interests”

Negative Impact

Overreliance and Superficial Engagement - Hinder High-Level Thinking Skills (Abdullah & Zaid, 2023) - “Applied knowledge is very important: not only know what, but also how in the real world”

Procrastination and Memory Loss (Abbas et al., 2024) - “Lack of attention: you read and you don’t need to pay too much attention if I can always ask for the answer - it’s very distracting and is always there in the background.”

Assessment: Presentation of the results of the discussion of their personal opinions and thinking. Answer to 3 questions:

1. How to ensure that the integration of AI in educational settings supports and enhances traditional educational values like critical thinking, academic integrity, and personal interaction?
2. How to maintain a balance between teacher authority and AI assistance to optimize both educational outcomes and student-teacher relationships?
3. What ethical frameworks and safeguards to prevent biases in AI from influencing educational content and student assessments would you like to see established?

Module C. Introduction to Prompt Engineering

Learning Objective:

Recognize and demonstrate both positive and negative interactions between students and chatbots, evaluating these interactions based on four criteria: communication, engagement, content accuracy, and emotional response

Sources: Literature

Methods:

- Interactive Lecture: Slide presentations and videos to explain the basics of prompt engineering
- Case studies/Collaborative prompting**:** Under the guidance of the facilitator, the class analyse construct and de-construct prompts.

Assessment:

- Prompt evaluation**:** Learners are given prompts and they should evaluate the efficacy of the prompt. (can also work with whole conversation)

- Peer-reviewed prompt generation: Learners are asked to generate prompt for a certain task. Once the prompt is developed, it is submitted to the peers for critique and improvement suggestions.

Evaluate *the quality of a prompt and its relationship with an output.*

List of contents:

CLEAR Framework Leo, 2023

HAX (Human-AI eXperience) Interaction:

- Assign a role, Assign an audience, Assign a style
- User interaction and engagement: "Allow the model to elicit precise details and requirements from you by asking you questions until it has enough information to provide the needed output -"From now on, I would like you to ask me questions to..."
- Chain of thoughts

Temperature, Top_p and Delimiters.

Assessment: Peer-reviewed prompt generation. Learners are asked to generate prompt for a certain task. Once the prompt is developed, it is submitted to the peers for evaluation. Evaluation is based on "Clear Framework". A sort of roleplay where learners are the chatbots and imagine how well they can perform with suche tasks.

Module D. Design learning activities with LLMs - Workshop, Literature.

Learning Objective:

A. Judge and argue for or against proposed methods of engagement with LLMs in their classrooms, based on an informed understanding of their potential impacts
B. Design personalised tasks for their teaching needs that effectively incorporate LLMs, tailored to the specific requirements of their subject matter.

Sources:

- WS themes
- Literature

Methods:

Collaborative design session: Learners get into group of 2-3 and choose to design an activity that integrates with their teaching. They can pick from some basics ideas (collected in the workshop). Following a template and their own discussion, they will reach with an activity

Assessment: Presentation: the idea gets presented to the classrooms (along with justification for decisions) and peer-reviewed feedback

Present the ideas from the workshop as idea starters

Activity: Design personalised tasks for their teaching needs that effectively incorporate LLMs, tailored to the specific requirements of their subject matter.

Steps:

1. **Reflective Writing**: Before Module 1 have participants write down one or more major problems they encounter in their daily teaching on index cards. These problems can be organisational, emotional-relational, or content-related.Collect the written problems, place them in an envelope, and seal it. This envelope will be opened only at this point of the session. This is to avoid “creating the problem for the solution”.
2. **Problem Selection**: Open the envelope and read the problems aloud one by one. As each problem is read, participants should reflect on how the knowledge they have gained about LLMs could help address these issues.
3. **Group Formation**: Ask participants to choose a problem they are interested in solving. Based on their choices, divide them into small groups, each group focusing on a different problem. Or it can also happen that multiple groups work on the same problem. Groups of 2-3 participants.
4. **Activity Development**: Provide each group with an instructional design template (*see appendix 2)*. This template will guide them in developing an educational activity that involves a specific use of AI to solve the chosen problem.
5. **Planning and Justification**: Each group should use the template to:
    - Define the educational activity

- Outline how LLMs will be integrated into the activity
- Identify the expected outcomes and benefits
- Justify their choices at each step of the design process Encourage groups to take detailed notes on their discussions and decisions.

6. **Presentation Preparation**: Allocate time for each group to prepare a presentation of their educational activity. Ensure they cover the problem, the proposed solution, and the rationale behind their design choices.

7. **Group Presentations**: Have each group present their educational activity to the class. Encourage clear and concise explanations, and ensure each group addresses the key points from the template.

8. **Class Discussion**: After each presentation, facilitate a class discussion. Encourage participants to ask questions, provide feedback, and suggest improvements. Highlight the diversity of solutions and the creative use of LLMs in different contexts.

9. **Reflection and Feedback**: Conclude the session with a reflective discussion. Ask participants to share their thoughts on the exercise, what they learned, and how they might apply these insights to their teaching practice. Collect feedback to improve future workshops.