


## PAPER

# AI-Powered Teaching: Literature Review of ChatGPT's Impact on University Educators

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## ABSTRACT

The conversational artificial intelligence (AI) model ChatGPT has drawn significant interest from educators, as it opens up opportunities for innovations and provides substantial potential for use by university instructors. Since there is a lack of certainty about the effective application of ChatGPT in university teaching, the research reviews the available scientific studies to address these questions. The systematically analysed data cover two years (30.11.2022–30.11.2024). Based on the tasks set, the research identifies the spheres of university educators' activities in which ChatGPT offers educationally valuable assistance. The ChatGPT-assisted teaching activities are examined and analysed with special attention to the benefits and concerns that the application of ChatGPT may bring to university teaching. ChatGPT's integration into mobile-supported learning settings, highlighting its role in enabling ubiquitous learning, real-time feedback, and adaptive teaching support, is scrutinised. The recommendations for coping with the perceived negative aspects of ChatGPT in university educators' teaching are revealed and highlighted. The distinct role of ChatGPT as a supportive means in university teaching is supported.

## KEYWORDS

ChatGPT application, higher education, teaching, systematic review

## 1 INTRODUCTION

One of the most significant characteristics of the modern world is the rapid development of artificial intelligence (AI) technologies. They encompass nearly every aspect of our lives, showcasing the newest advancements by researchers. They are already generating a mass of digital content – including texts, images, music, videos, and more. The inherent portability and intuitive interfaces of AI applications facilitate their seamless integration with mobile devices, resulting in ubiquitous access and frequent utilisation beyond traditional desktop environments. In education, a special role is acquired by a conversational AI tool known as ChatGPT. It was only launched

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on November 30, 2022, but has already been thoroughly studied by educators as it creates possibilities for innovations, offers immense potential for application by university educators and improves various aspects of teaching and learning [1]. The university academic staff are constantly searching for technologies to enhance their teaching efficiency and address the diverse needs of students, which makes the incorporation of AI tools into teaching at the tertiary level highly welcome. Moreover, AI applications like ChatGPT are particularly well-suited for mobile devices, offering a high degree of accessibility and convenience.

Using conversational AI models in education is considered a promising research direction [2], as it can significantly advance teaching. Since queries arise about how exactly ChatGPT may be effectively aligned with the pedagogical purposes of higher education institutions, it is crucial to conduct a comprehensive literature review of ChatGPT's integration into university educators' teaching. Our investigation aims to shed light on this problem, and a conducted systematic literature review provides a detailed examination of the issue. So, the contribution of this research is that we have collected and analysed a variety of opinions, assessments, conclusions, results of the experiments, and experiences of using ChatGPT by higher education instructors over the two years of its existence, which may help in developing a clear understanding of ChatGPT's pedagogically valuable functionality for university educators in defining its role in higher education teaching and ensuring appropriate support for teachers.

## 2 THEORETICAL BACKGROUND

Artificial intelligence is an approach that allows computers or software to simulate human thought processes. It is accomplished by examining the functions of the human brain and analysing cognitive mechanisms. These studies lead to the creation of intelligent software and systems [3]. In educational settings, AI aligns with pedagogical theories of personalised and adaptive learning, as well as with digital pedagogy models that prioritise learner-centered environments.

### 2.1 Emergence and development of AI

The concept of AI first emerged in the 1950s. Before 1949, computers were missing a crucial component for any form of intelligence: memory. While they could carry out commands, they couldn't store them or keep track of past instructions. Additionally, using these computers was very expensive. As a result, substantial funding was necessary for serious AI research. The first notable outcome was the "Logic Theorist" program, developed by Allen Newell and Herbert Simon in 1955. This program replicated human-like problem-solving strategies, proving 38 out of 52 mathematical theorems and discovering new proofs for some. It was introduced at a scientific conference at Dartmouth College (New Hampshire, USA) in 1956, where computer scientist John McCarthy first used the term "artificial intelligence" [4].

Between 1957 and 1974, AI underwent a period of significant expansion. Computers became capable of storing larger amounts of data, and they also became faster, more affordable, and more widely available, all while machine learning algorithms were being advanced. In 1966, Joseph Weizenbaum created the first chatbot, Eliza, which became the forerunner to today's chatbots and virtual assistants. In 1972, Japan introduced the first intelligent humanoid robot, Wabot-1 [5].

The early achievements of AI algorithms also highlighted numerous challenges on the road to genuine machine intelligence. The most significant barrier was the limited computational power available at the time. Consequently, initial enthusiasm gave way to disappointment, funding declined, and research efforts dwindled, leading to the period from 1974 to the early 1980s known as the first “AI winter” [1]. A brief resurgence of interest in machine learning technologies occurred between 1980 and 1987. In 1980, Stanford hosted the first national conference of the American Association for Artificial Intelligence. Around this time, the first expert systems emerged, enabling machines to mimic the decision-making processes of human experts, while the governments of Japan and the UK began actively investing in these technologies. However, by 1987, a second “AI winter” set in, as high costs and a lack of substantial progress once again led investors and governments to withdraw support from AI research [6].

During the 1990s and 2000s, AI advanced even without substantial government funding or widespread public focus. Large tech companies led the development of machine learning technologies, making significant progress toward creating intelligent machines. Innovations included software for speech recognition and robots capable of recognising human emotions. Computing power also became robust enough to support new milestones in AI [7].

## 2.2 AI in education

On the one hand, approaches to AI programming have not undergone any revolutionary changes in the past 30 years. On the other hand, further development of AI technologies has led to innovative AI programmes that effectively support a range of pedagogical purposes in education. Thus, the *Brainly* [8] electronic platform creates a collaborative teaching environment, which is important for promoting learning. Personalised teaching and assessment in various subjects are suggested by the *Cognii* [9] resource. To help master critical STEM skills, Querium Corporation developed the *StepWise* [10] virtual tutor tool. The program analyses the student's steps in solving educational problems and provides immediate feedback. Another adaptive learning platform that offers students the support they need and when they need it to address knowledge gaps is *Knewton Alta* [11].

These tools exemplify the principles of intelligent tutoring systems (ITS), which stem from the adaptive learning theory and provide scaffolding based on a learner's real-time performance. ITS frameworks are grounded in constructivist learning theory, where learners actively construct knowledge with system-generated prompts and corrective feedback.

Artificial intelligence also supports digital pedagogy models like differentiated instruction, enabling content and assessments to be customised based on learners' prior knowledge, pace, and preferred learning modality.

To enhance students' skills in specific subjects, various AI-based applications designed for convenient use on mobile devices have been developed. For example, for personalised studies in mathematics the following platforms have been designed: *Thinkster* [12] (offers a combination of AI and online tutoring), *MATHia* by Carnegie Learning [13] (based on data on how students learn over time, providing real-time feedback and support), and *ALEKS* [14] (develops combinatorial understanding and a set of topics that the student understands or does not understand based on answers to exam questions). *ALEKS* is also used for personalised study in chemistry.

Numerous electronic platforms have been developed to support learning foreign languages. *Duolingo* [15] is a resource that helps users learn grammar and increase vocabulary through repetition. Talking to a bot is similar to talking to a real person on Messenger. *Memrise* [16] is an educational program that helps students refine their language skills by engaging in creating sentences from selected specific word lists. *Mondly* [17] chatbot adapts to different levels of proficiency in English and provides voice support. The *Andi* [18] app contributes to conversational, writing, and grammar skills. The chatbot can send definitions or examples of unclear words and correct mistakes during communication. *Linguist AI* [19] chatbot uses AI to create personalized lessons. The program adapts to the student's language level and learning goals, provides real-time feedback, and offers interactive tasks. Learning with *Babbel* [20] is based on a communicative approach. The electronic application aims to improve speaking and reading skills with interactive dialogues. The chatbot also offers tasks to study pronunciation, vocabulary, and grammar. *Rosetta Stone* [21] promises fluency in the language through augmented reality, audio, and video materials. Pronunciation, grammar, and vocabulary exercises will promote active language learning. *ChatGPT* [22] can provide translations of words or phrases, explanations of grammar rules, exercises to practise reading, listening, writing, and speaking, and suggest lists of online resources, textbooks, and language learning apps.

The expansion of these AI-based mobile tools aligns with mobile learning theories, particularly ubiquitous learning (u-learning), which emphasizes access to seamless learning anytime and anywhere. Many of the described applications support microlearning strategies, where content is delivered in short, manageable segments suitable for mobile consumption [23].

Furthermore, the Bring Your Own Device (BYOD) model facilitates the integration of AI tools into the classroom and informal settings, increasing learner autonomy and contextualized engagement [24].

From a digital pedagogy perspective, these platforms reinforce learner agency and self-regulated learning, key to developing digital fluency in higher education.

### 2.3 ChatGPT

ChatGPT, which stands for Generative Pre-Trained Transformer, is a chatbot and virtual assistant designed by OpenAI (an American artificial intelligence research organization). This chatbot is built on a large conversational AI model and employs a combination of supervised learning and reinforcement learning, enabling it to engage in conversations in multiple natural languages [25]. ChatGPT is unique because it is able not only to mimic a human-like conversation, generating detailed answers according to the user's request, but also create new content like texts (essays, plays, and fairy tales); produce business ideas; write computer programs; compose music and poems; make images and many more. These broad possibilities of the chatbot brought it high coverage and consumer popularity, and, what is more, launched the AI boom [26].

ChatGPT has several versions. First, it was a GPT-3.5 model. Since March 2023, the more advanced GPT-4 model has been functioning. Today, even faster and more capable variants exist. They can solve more complex tasks, analysing and exploring different strategies. Although ChatGPT sometimes generates incorrect or even fake answers that at the same time look plausible and therefore need to be checked [27], [28], the areas of application or at least significant influence of OpenAI's product are very diverse (financial markets, economics, computer security, etc.) [29].

ChatGPT is considered a valuable resource for the following areas: academic research (ChatGPT was even among co-authors), culture (for example, writing books, plays, and screens for films, creating web content), medicine and health-care (researchers have revealed that ChatGPT demonstrates a level of knowledge and understanding similar to that of third-year medical students, can resolve easy clinical cases and can be used to assist doctors in composing replies to patient inquiries [30]), it can draft laws (was used to help in creating laws, court decisions and legal motions [31]), and be used in education (since the release of the chat teachers have started to experiment with its application for different pedagogical purposes).

In education, ChatGPT functions as a highly flexible tool that supports the principles of connectivism, a digital learning theory that posits that learning occurs through networks and technology-enhanced environments. It helps build learning pathways based on user interest, goal setting, and iterative feedback by facilitating dialogue, content generation, and exploration through natural language interaction.

Its adaptability to mobile platforms positions it as a tool for student-centred, self-directed learning experiences, aligning with contemporary digital pedagogy models that emphasize learner autonomy and interaction over passive content consumption.

### 3 LITERATURE REVIEW

Although ChatGPT has only been in use for two years, numerous investigations have explored its relevance for educational purposes. These studies can be broadly divided into two categories: those that report researchers' experience, ideas about potential implications, concerns, or experimental studies, and those that conduct systematic reviews on integrating ChatGPT into education.

Having studied and analysed the manuscripts dedicated to ChatGPT in education (i.e., studies close to our scientific intention), we identified several directions that the scholars, namely, scrutinized:

1. *Promising prospects and concerns* of the AI tools [1], [32]. As their authors were possibly the first to have examined the phenomenon only some months after its appearance, unlike our study, they could evaluate only the first attempts of ChatGPT integration into the education sphere.
2. *Limitations and opportunities* of the chatbot [33]. Although the authors conducted their investigation using a substantial number of sources on AI usage, they focused primarily on comparing and contrasting its potential applications and associated challenges. Moreover, Cong-Lem et al. [33] consider the utilization of ChatGPT not only in education but also in other areas, while our investigation is completely devoted to education.
3. The *application of generative AI models in teaching and learning languages* [34], specifically in teaching and learning foreign languages. However, our work addresses ChatGPT-assisted teaching without a concentration on certain subjects.
4. *Empirical research* of the AI tool [35], imposing a systematic literature review (from the end of 2022 to April 2023) describing ChatGPT's incorporation into numerous educational environments. Yet our investigation explores empirical research in a higher education setting.
5. The *chatbot's effect on students' skills development*, for example, writing skills [36]. The authors revealed that ChatGPT, on the one hand, is an assistant, and on the other hand, contributes to students' overreliance on it. Our study does not

examine the development of students' skills at the tertiary level when assisted by ChatGPT.

6. ChatGPT in *teaching and learning practice* [37] and its impact on *faculty and students* [38]. The authors asserted the benefits of the AI tool for academic staff (flexibility in creating educational materials, evaluating academic performance, and providing feedback) and students (fostering students' skills development, assisting them with tasks, and serving as a virtual assistant). Although the manuscripts are closely related to our investigation, we prioritise the application of ChatGPT in teaching practice.
7. The generative AI model in the students' *progress assessment* [39]. The authors concentrated on students' motivation and teachers' future strategies, whereas our analysis centres on ChatGPT-based assessment across various aspects of teaching activities.
8. The chatbot in *education and research* [40]. The authors identified discursive problems for educational investigations and gaps in current research. Therefore, their scientific landscape does not align with ours, as our study focuses on exploring the implications of using this generative AI tool in educational settings, particularly emphasising recommendations for its use by university educators.
9. *Integration of ChatGPT into mobile-based teaching tools* [41]. The authors evaluated the applicability of the technology acceptance model (TAM) within educational contexts, specifically by examining the integration of ChatGPT on mobile devices as a tool for ubiquitous learning, giving particular consideration to the psychological pressures, like stress and anxiety, that students encounter when completing academic work. Our research is more focused on educators' concerns.

Thus, despite relevant research, the application of ChatGPT by educators at the tertiary level from November 30, 2022, to November 30, 2024, has not been systematically analysed yet, while the findings may be useful for enhancing effective teaching practice.

Therefore, the purpose of this study is to comprehensively summarise and analyse the utilisation of ChatGPT by tertiary-level educators during the two years following its release (November 30, 2022–November 30, 2024) through a systematic review of scholarly publications.

In order to achieve the purpose, the following tasks were set: 1) to identify the university educator-focused spheres of ChatGPT application; 2) to explore the current researchers' findings on incorporating ChatGPT in higher education teaching; 3) to single out the benefits of ChatGPT use by university educators; 4) to establish concerns the scholars associate with the given AI tool in higher education teaching; and 5) to highlight recommendations scholars insist on when dealing with ChatGPT incorporation by those engaged in higher education teaching.

## 4 MATERIALS AND METHODS

Since our research is a systematic literature review, it involves well-defined methods including identification, selection, and critical evaluation of relevant studies, followed by the exploration and analysis of the collected data, guided by the preferred reporting items for systematic reviews and meta-analyses (PRISMA) 2020 framework [42]. First, we explain the rationale for our review, grounded in the current knowledge available on the study's theme, as well as the specific purpose and objectives the review seeks to address.

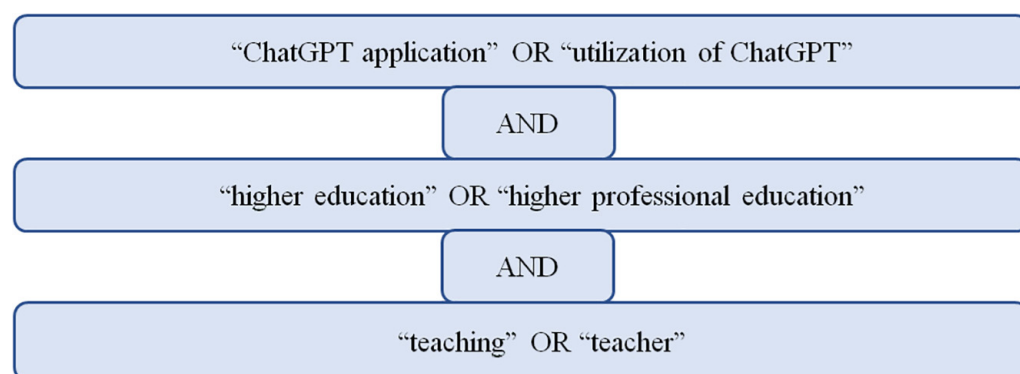
#### 4.1 Literature search phase

Before starting the literature search process, we formulated the criteria that the selected material must meet. Table 1 demonstrates the chosen inclusion and exclusion criteria.

**Table 1.** Inclusion and exclusion criteria for material selection

Inclusion	Exclusion
<b>External Signs</b>	
Journal open-access articles	Other sources (books, conference papers, preprints, closed journal articles)
Articles in English	Articles in other languages
Social sciences	Other sciences
<b>Articles' Content</b>	
Experiments and cases	Review articles
Focus on the teaching process	Focus on the learning process
Focus on the tertiary level	Focus on other educational levels
Focus on the application of ChatGPT	Focus on the application of other AI tools

Therefore, as part of our research, we conducted further analysis of openly accessible journal articles written in English and focused on the application of ChatGPT in the teaching process at the tertiary level. Then we thoughtfully selected keywords (See Figure 1).



**Fig. 1.** The keywords for the searching process

Our decision as for the keywords was dictated by the following: firstly, we have chosen “ChatGPT” as it is the main object of our investigation and since we are interested in its application, it is natural that we have formulated the keywords as “ChatGPT application” and its synonym “utilization of ChatGPT”; secondly, we have concentrated on the sphere of ChatGPT application, in our case it is education and higher education in particular, so, we have identified it as the second keyword and as its alternative we have taken “higher professional education”; thirdly, it was necessary to point out the actor of the educational process and we have chosen “teacher” or “teaching” respectively.

The period from November 30, 2022 (ChatGPT's emergence), to November 30, 2024 (the cut-off for data collection), was agreed upon as the study's timeframe.

We specified the classic academic Scopus database and Google Scholar, one of the most extensive web search engines, as the databases to search for sources for further analysis. Initially, the authors intended to focus solely on the Scopus database, widely recognised as one of the most influential and powerful academic research sources, encompassing over 34,000 journals from more than 5,000 publishers [43]. However, after using the selected keywords (99 sources were identified) and applying exclusion criteria based on external indicators using filters proposed by the service (sources other than journal open-access articles, languages, and other sciences), we identified 24 relevant articles. Then we thoroughly examined their titles and abstracts according to the specified criteria. The articles selected were required to focus on the subject of our investigation (the application of ChatGPT in the teaching process at the tertiary level, based on experimental studies or case studies, rather than reviews). Following this filtering process, nine articles remained for further analysis.

Consequently, the authors decided to turn to Google Scholar, often referred to as the largest academic search engine, encompassing approximately 200 million titles. The keyword search through this engine gave us a list of 550 sources. The authors first eliminated duplicate articles (90) and then selected articles that met the exclusion criteria and excluded them (408). Since the filters available in Google Scholar could not exclude irrelevant sources, the authors had to use a manual search to ensure the relevance and appropriateness of the selected studies. In the next step, we meticulously analysed the titles and abstracts of the left articles (52) to ensure that these articles met the specified inclusion criteria. Consequently, we got seven articles from the web search engine Google Scholar and nine articles from the Scopus database for the study. The study selection process corresponded to the PRISMA 2020 guidelines. 649 records were initially identified (99 from Scopus and 550 from Google Scholar). After removing 90 duplicates and excluding 633 records based on the inclusion and exclusion criteria, 16 eligible journal articles remained for in-depth analysis.

Thus, in general, we identified 16 open-access journal articles written in English studying the application of ChatGPT in the teaching process at the tertiary level. Figure 2 illustrates the PRISMA review process.

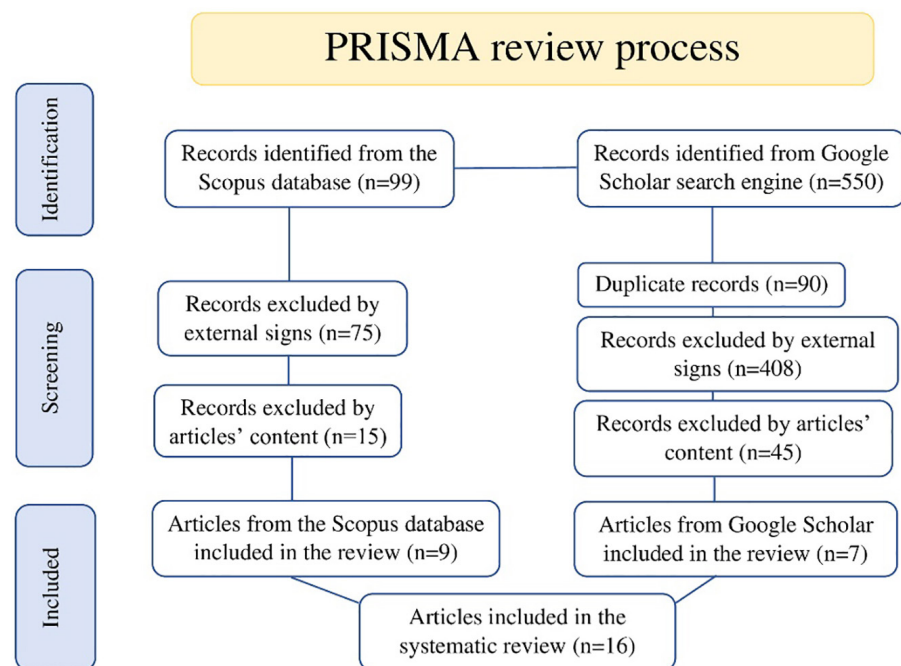


Fig. 2. PRISMA review process

## 4.2 Methodological limitations and considerations

Although the criteria to select material for our systematic review were identified and accurately applied, the research has faced certain methodological limitations. The main limitation is connected with using Google Scholar as one of the search engines. As Google Scholar's indexing system is not as thoroughly controlled as Scopus' indexing system, another search platform applied in our research, the quality and relevance of data received through Google Scholar may vary. This approach may have introduced certain inconsistencies in the reliability of the sources. Furthermore, because the authors conducted a manual search due to the lack of advanced filtering tools in this web search engine, there is a possibility of human error in the article selection process. Another limitation may be due to the exclusive inclusion of only open-access journal articles, published in English. Articles published in other languages or subscription-based journals could contain relevant information that is not included in our review. Thus, due to these limitations, our results may not encompass all valuable perspectives on the use of ChatGPT by university educators.

Moreover, our findings concerning the application of ChatGPT in the teaching process at the tertiary level may be limited by the relatively small number of sources analysed for this study (16 articles), although they were carefully selected. Our review has made some useful conclusions, but it cannot be considered final, and our findings should be interpreted in light of the limited dataset.

We should acknowledge that neither a meta-analytic approach was employed in our research, nor was a formal quality assessment of the selected sources conducted using the PRISMA risk of bias tools. This methodological limitation refers to the heterogeneity of manuscript types (case studies, experiments, qualitative reviews) and the tasks set. Consequently, this review is not a quantitative aggregation of evidence but rather a narrative synthesis, which may lead to limitations in the accuracy and soundness of our conclusions. Future studies may benefit from the application of standardised critical appraisal tools to enhance the methodological accuracy of the synthesis.

## 4.3 Data for analysis

To further clarify the methodological diversity and depth of the selected sources as well as to resolve the tasks of the research, Table 2 presents an overview of the research types, methods used, participant characteristics and the aspects the scholars addressed in their investigations, the direct focus of which is the application of ChatGPT by university educators within their professional pedagogical activity across the 16 studies included in our synthesis.

**Table 2.** Focus and methodological characteristics of selected studies on ChatGPT in university teaching

No	Authors	Country/Region	Study Type	Method Used	Methodological Rigor	Study Focus
1	Malik [44]	Saudi Arabia	Empirical	Quantitative questionnaire	Descriptive, limited generalizability, potential response bias	The teacher's attitude to applying ChatGPT in higher education
2	Combrinck [45]	South Africa	Case study	Mixed methods	In-depth examination, triangulation research design	Ethically responsible and scientifically sound use of ChatGPT. Reliability of ChatGPT's output and guidelines for improving it.

(Continued)

**Table 2.** Focus and methodological characteristics of selected studies on ChatGPT in university teaching (*Continued*)

No	Authors	Country/Region	Study Type	Method Used	Methodological Rigor	Study Focus
3	Shahriar et al. [46]	USA	Experimental	Mixed methods	Validated instruments, sufficient data diversity	Evaluating multimodal capabilities of GPT-4 at standardized assessment
4	Kostka and Toncelli [47]	USA	Case study	Qualitative	Clear research design	ChatGPT-based support of teachers and teaching, highlighting the teacher's role and professional development
5	Kılınc [48]	Turkey	Experimental	Qualitative, exploratory	Reliable data, clear insights	The need for university educators to adapt their teaching methods and practices to take advantage of technology and available digital resources to keep pace with technological advancements
6	Kostikova et al. [49]	Ukraine	Case study	Curriculum design project	Reference to a specific curriculum area, clear research design	Working out curriculum discipline teaching materials (methodical complex)
7	Essien et al. [50]	Nigeria	Quasi-experimental	Qualitative, exploratory	Justifiable conclusions, inferring cause and effect	The evolving nature of the teacher's role from traditional information deliverer to a guide, facilitating responsible AI (ChatGPT) use
8	Grájeda et al. [51]	Mexico	Case study	Mixed methods	Credible, clear data collection methods, and a comprehensive dataset	Underscoring teachers' (and students') proficiency in utilizing AI technologies effectively in higher education
9	Nikoçević-Kurti and Bërdynaj-Syla [52]	Kosovo	Case study	Qualitative exploratory	Clear research design	The integration of ChatGPT into lecture and lesson planning by faculty members
10	Aboalela [53]	Egypt	Experimental	Exploratory, survey-based	Evidence-based, rigorous data analysis	Leveraging generative AI, particularly ChatGPT, to improve the quality of test questions in an academic setting
11	Strzelecki et al. [54]	Poland	Experimental	Quantitative and qualitative survey based on UTAUT2 model	Rigorous data analysis, generalizable	The attitudes of higher education faculty members toward the use of ChatGPT
12	Kanbul et al. [55]	Cyprus	Experimental	Exploratory, survey-based	Credible, informative, machine learning techniques applied (XGBoost, RF, SVM, GBDT, and ANN)	A strategy to investigate educators' (and students') opinions regarding the potential benefits and obstacles of ChatGPT utilization in contemporary education
13	Nguyen and Dinh [56]	Vietnam	Case	Exploratory, mixed methods	Theoretical and practical sufficiency	The utilisation of ChatGPT for the creation of instructional materials and evaluation methods offering practical insights
14	Guo and Lee [57]	Hong Kong	Experimental	Mixed methods	Clear research design, generalizable	The importance of comprehensive training for educators and access to reliable resources
15	Alrishan [58]	Jordan	Experimental	TAM-based (Technology Acceptance Model)	Validated instruments, random sampling	The perceived utility and ease of use of ChatGPT in shaping the intention of pre-service teachers to embrace this AI-powered tool for their professional development
16	Oktavian [59]	Indonesia	Experimental	Mixed methods	Transparent, generalizable	The value of combining ChatGPT with conventional teaching methods for the best outcomes in a classroom

## 5 RESULTS

The selected experimental publications cover a range of ChatGPT's usage spheres relevant to and incorporated by university teachers in higher education. Although the researchers did not specify the exact platforms used for ChatGPT, it is reasonable to assume that mobile devices were frequently utilised, given the inherent portability and user-friendly design of such AI applications. Having summarised, classified, and analysed the scholarly articles in Table 2, we have generalised the acquired data and determined ChatGPT's spheres of application specific to university educators (see Figure 3).

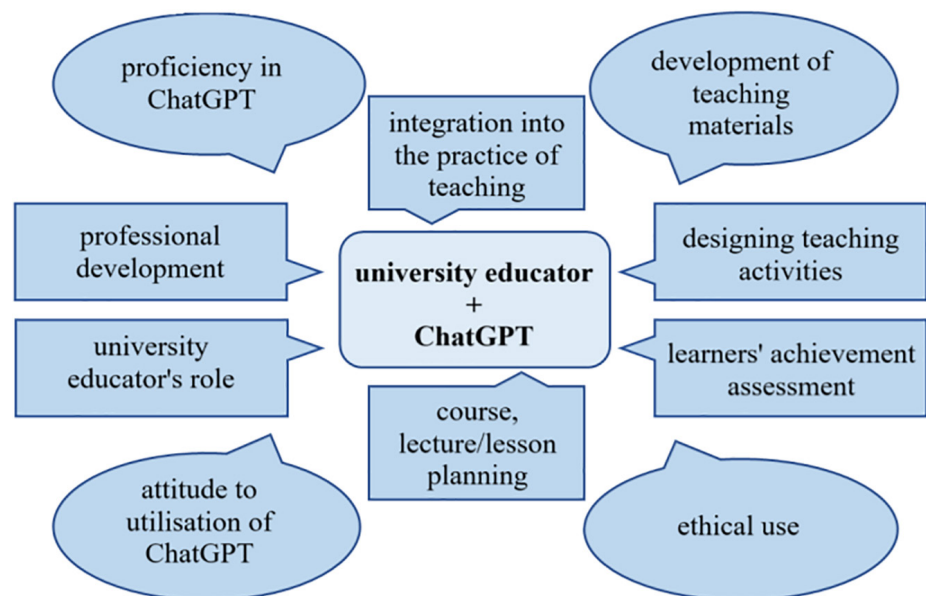


Fig. 3. University educator-focused spheres of ChatGPT's application

Thus, the thematic and contextual analysis guided our identification of the essential aspects of ChatGPT's usage by university educators addressed in the selected experimental articles. We have defined them as follows: attitude toward utilisation of ChatGPT; proficiency in ChatGPT; course, lecture, and lesson planning; integration into teaching practice; designing teaching activities; development of teaching materials; assessment of student achievement; the university educator's role; professional development; and ethical use.

Below, we focus on the findings on each of the identified aspects of ChatGPT's application by university educators.

**Attitude toward the utilisation of ChatGPT.** Bearing in mind the recent incorporation of ChatGPT into education, scholars find it logical to explore academics' attitudes toward applying ChatGPT in higher education [44], [54], [55], [58], [59].

The researchers assert that, on the one hand, educators have a positive attitude toward using ChatGPT in higher education teaching. On the other hand, they reveal the academics' concern about the challenges it poses. Moreover, the data suggest that while expressing the intention to integrate ChatGPT into their teaching, many have not used it for teaching purposes [44], [59].

The researchers have ascertained the factors having an impact on university educators' willingness to utilise ChatGPT in their teaching, pointing to "habit" and "performance expectancy" [54], instructor support, personal innovativeness,

and learning value [58] as the essential reasons for the educators' eagerness to use ChatGPT.

The university educators' positive attitude to the utilisation of ChatGPT in their teaching-orientated activities is justified by its perceived potential to significantly enhance pedagogical practices, foster the generation of innovative concepts, facilitate the easy creation of learning assessments, and streamline teaching materials [55].

**Proficiency in ChatGPT.** Instructors' digital literacy [45], technological proficiency [48], and proficiency in AI [51] are crucial for the effective use of ChatGPT in educational contexts. Technological skills, adaptability to new teaching tools, and willingness to integrate AI into instructional strategies [52] are the prerequisites of university educators' adaptability in an evolving technological landscape [45]. They need to understand the intelligent model's ability to perform a wide range of functions, like generating, interpreting, and interacting with content to achieve intended pedagogical purposes [46]. Besides, proficiency in ChatGPT underpins its impact on lecturers who seek innovative ideas to enhance their teaching [59].

**Integration into teaching practice.** The studies indicate a growing trend among university educators to expand ChatGPT's utilisation in traditional classrooms, as well as in online and distance teaching enabled by mobile learning technology, supporting both formal and informal educational settings. It is grounded in its impact on developing cognitive and critical thinking skills [50], [57]. The tool's ability to generate and ask questions, encouraging students to think critically about what they read and how they write, ensures the development of their skills in understanding, analysing, interpreting, and applying presented educational information [49], [50].

Furthermore, its ability to function as a virtual teaching assistant, answering questions, providing feedback, and facilitating communication between students and the teacher, enabling a more effective and interactive learning environment [48], makes it an inalienable element of higher education teaching.

**Designing teaching activities.** The studies provide data on ChatGPT's use in classroom activities in higher education [47], [59] to create different types of exercises, generate reading assignments [52], worksheets, or provide explanations of difficult texts [47], produce discussion prompts to encourage active participation, contributing to more dynamic and interactive lectures [52]. The scholars affirm that ChatGPT creates more engaging tasks and activities [48] and provides personalised guidance to students, assisting educators in concentrating on students' varying difficulty levels, their individual needs, and interests [52]. ChatGPT is seen as essential in suggesting teaching techniques [45], capable of providing detailed instructions and demonstrations [57].

**Course, lecture, and lesson planning.** In higher education, ChatGPT strongly facilitates the development of course and curriculum outlines for curriculum courses and research activities [49], [44], course content [55], lecture and lesson planning [47], and subject content ideas [52]. Based on students' performance, ChatGPT helps adapt the learning plan by adjusting the difficulty level, introducing new topics, or explaining concepts that require further clarification, aligned with curriculum standards and educational goals [48].

**Assessment of student achievement.** ChatGPT demonstrates efficiency in developing multiple types of assessment tasks in teaching curriculum subjects at various stages of teaching [44], [47], [56]. The experimental studies prove that ChatGPT, due to its ability to generate questions and assessment tasks immediately, is capable of correcting preformulated questions and guiding instructors in creating high-quality questions that meet the requirements of the teaching goals and academic accreditation standards [46], [47], [53].

**Development of teaching materials.** ChatGPT helps in developing curricula, syllabi, and textbooks [49],[53]. It provides information and creates necessary texts, tasks, and tests. The application suggests relevant ideas and produces explanations, videos, pre-recorded video lectures, slides, or reading materials by prompting topics, resources, and learning activities. Its use enables instructors to cater for specific learning needs and styles [48].

It serves as a valuable resource for university educators, assisting in the creation of teaching materials offering explanations for course content [47]. Moreover, by providing teaching materials tailored to differing educational contexts, ChatGPT offers suggestions and best practices for incorporating innovative teaching methods and technologies into university teaching [48].

**The university educator's role.** With the growing integration of ChatGPT use into higher education, differing opinions appear on the role of educators. Concerns are expressed about the potential of AI tools to replace human instructors and provoke job loss in higher education. However, the realisation that AI tools present opportunities to elevate the teacher's role, allowing educators to focus on developing students' essential competencies, balances such apprehensions [48]. At the same time, the studies confirm that educators' role is likely to shift from being traditional transmitters of knowledge to becoming facilitators who guide students in the responsible and ethical incorporation of AI tools in their learning [50].

ChatGPT is a valuable assistant in diverse university teaching-associated spheres [45]. Used as an ally, ChatGPT is a complement rather than a substitute in teacher-guided educational communication [47]. Its use enables educators and students to achieve more personalised and effective teaching and learning tailored to diverse needs and learning styles in higher education [48].

**Professional development.** The strong need for developing and launching ChatGPT-based and ChatGPT expert-use-orientated professional development programmes in higher education, fostering an adaptive and practical professional development experience, is emphasised. The researchers assert that such programmes are essential for supporting and enriching the teaching process, exploring new pedagogical approaches, teaching strategies, and classroom management techniques [48], as well as developing technical skills and educators' awareness of ethical challenges [52]. The studies underscore the importance of comprehensive training for educators to let them provide appropriate guidance to students and access to reliable resources [57], [59].

**Ethical use.** All studies highlight ethical challenges associated with ChatGPT use in higher education. They include the importance of not disclosing private or sensitive information when interacting with ChatGPT [48], [57], the requirement for transparent and responsible use of the tool [45], and academic integrity issues to avoid plagiarism and cheating [47].

The calls for clear and strict guidelines for those engaged in university teaching on ChatGPT ethical use [45], as well as the generally supported belief in the necessity of raising academic staff's expertise in ChatGPT's applications in the university setting, are evident. Detection programmes for higher education settings are being developed [47], [49]. Higher education institutions introduce special rules for using ChatGPT, sometimes even banning its use. At the same time, researchers assert the need for college administrators to take further steps to ensure adherence to AI ethical practices [55].

Thus, the studies emphasise the need for academics' ongoing training in ChatGPT proficiency and promoting collaboration among educators to share their best practices on the tool's ethical application in higher education teaching [52].

## 5.1 Benefits and concerns of ChatGPT application by university educators

Generally, the studies demonstrate that ChatGPT brings essential benefits for university educators in all aspects of their teaching in higher education:

- Enhancing the competence in technological, language, vision, and speech capabilities of ChatGPT significantly improves its use in complex multimodal tasks and cross-domain interactions. Current methods of utilising ChatGPT are refined through acquiring knowledge about its advanced multimodal techniques [46];
- ChatGPT supports innovative teaching if used with critical intentionality, caution, and care [47], [50]. Other ChatGPT's strengths encompass its ability to adapt to various educational contexts, making it a versatile tool for educators. It provides instant personalised feedback, fosters learner autonomy, intensifies student learning and motivation [48], and enables students to engage more deeply with complex scenarios, thereby enhancing their analytical and evaluative skills [50];
- ChatGPT quickly produces and corrects questions, designs assessment task formats, can be instructed to follow any specific assessment validation criteria, allows for monitoring students' progress, and thus allows for necessary modifications in the teaching process [47], [53]. ChatGPT's ability to evaluate and give feedback strongly assists teaching [44];
- ChatGPT's use for designing teaching materials saves time, enriches educators with ideas, provides relevant resources, and adds to their creative efforts [45], [49]. It also enriches those engaged in developing teaching materials, acting like a peer [45];
- ChatGPT not only enables university educators to save time in devising lectures and lessons [44] but also provides a more engaging educational setting with higher interactivity and contemporary design, tailored to teachers' preferences and students' needs [56];
- ChatGPT itself may function as a coach, providing users with quick tutorials on its usage for specific purposes required at any convenient time and on any available platform, including mobile ones with internet access [45];
- The ethical use of ChatGPT by university educators facilitates academic honesty, ensures the quality of higher education, and provides a fair and reliable educational setting [56].

Many lecturers agree that this technology significantly simplifies their workload and promotes educators' focus on improving multiple teaching-related responsibilities [59]. In summary, ChatGPT serves as a valuable, supportive, multifunctional means, providing university educators with additional pedagogically valuable insights [44].

However, this technological invention completely changes the traditional assumptions on education, and higher education in particular. It poses new specific challenges and requires that university educators fully acknowledge them and consider how to avoid and overcome likely difficulties. The concerns and limitations identified in the studies are attributed to:

- The importance of exercising caution with AI-generated content and the need to verify it before using it [54]. Moreover, the research findings report that the quality of ChatGPT' responses can vary dramatically based on the quality and specificity of prompts, underscoring the importance of prompt clarity for the tool's effective output [57]. Moreover, ChatGPT's limitations, like the lack of human interaction, constrained comprehension, and inability to assess some

skills students are expected to acquire, require careful consideration in higher education settings [55], [56], [59].

- ChatGPT-related technical difficulties [45], revealing variability and limitations in handling complex and ambiguous inputs [46]. Furthermore, ChatGPT's inaccessibility to external databases, limited creativity, and critical thinking lead to likely constraints on credibility [46], [50], [57].
- The existing imbalance between academics' theoretical knowledge and skills in the tool's practical application in varying educational formats – in traditional classrooms, online, and distance teaching [52]. Insufficient educators' proficiency in using ChatGPT for teaching purposes may lead to inconsistencies [46], [47]. The teaching activities offered by ChatGPT may mostly consist of teacher-led lectures and repetitive educational exercises, creating an unappealing classroom atmosphere, and may exhibit bias and inconsistency, necessitating thorough evaluation and adaptation by human teachers [56].
- The likely overreliance on the ChatGPT application, based on the obsession with its multiple capabilities [59]. Challenges related to the ethical and morally pure use of ChatGPT's potential in higher education necessitate deliberate strategies to prevent and overcome copying, overreliance on ChatGPT, plagiarism, the potential risks of disseminating inaccurate information, and other likely abuses [47], [48], [49], [51]. Moreover, the 24/7 availability of ChatGPT on mobile platforms introduces educational and ethical dilemmas. Unmoderated access to AI-generated feedback without educator oversight may encourage dependency, misunderstanding, or overreliance. Lack of an instructor's guidance or critical support risks strengthening misconceptions or undermining learning objectives.

To provide a more structured synthesis and reduce narrative repetition, the key findings across pedagogical domains were summarised and critically compared in Table 3. This comparative overview highlights how ChatGPT functions within lesson planning, assessment, professional development, and other teaching-related practices, outlining benefits while acknowledging domain-specific risks.

**Table 3.** Comparative synthesis of ChatGPT's applications in university educator's pedagogical domains

Pedagogical Domain	Application of ChatGPT	Benefits	Risks/Limitations
Attitudes and Readiness	Exploring intentions, perceptions, and acceptance	Positive perception; openness to AI integration	Limited actual use, lack of experience, trust issues
Proficiency in ChatGPT	Training and digital literacy, AI functionality awareness	Greater efficiency in AI use; support for innovation	Technical difficulties, low skill levels, and the complexity of multimodal tools
Lesson/Course Planning	Generating syllabi, content ideas, and adapting materials to students' levels	Time-saving, curriculum enhancement, improved interactivity	Potential inaccuracy; overreliance on AI-generated plans
Teaching Activities	Creating exercises, discussion prompts, and personalized content	Learner engagement; instructional differentiation	Low content quality if prompts are vague, lack of creativity, and limited databases
Classroom Integration	Virtual assistant roles, flipped classroom model, and feedback provision	Personalization, enhanced student autonomy, and motivation	Instructor's low technological skills, implementation gaps
Assessment	Generating, adapting, and correcting test items and tasks	Fast content creation, feedback generation, and standard alignment	Misalignment with learning outcomes, misinformation, and weak performance in complex exams

(Continued)

**Table 3.** Comparative synthesis of ChatGPT’s applications in university educator’s pedagogical domains (Continued)

Pedagogical Domain	Application of ChatGPT	Benefits	Risks/Limitations
Development of teaching materials	Creating slides, videos, handouts, and infographics	Enrichment of teaching resources, peer-like support, and a creativity boost	Overdependence, lack of source variety, surface-level material
Professional Development	AI-focused and AI-generated PD programs; ethics training	Informed, intentional teaching and increased competence	Risk of outdated or generalized training, variability in training access
Ethical Use	Privacy management, academic integrity, and 24/7 AI use on mobile	Academic fairness, policy development, and AI-conscious literacy	Plagiarism, cheating, students’ overreliance, and unmoderated feedback

Moreover, the authors have established certain connections between the theoretical exposition presented in “Theoretical Background” and the findings of the literature review. The insights into the application of digital pedagogical theories in actual GPT-based teaching in higher education are presented in Table 4. This mapping connects the conceptual underpinnings of ChatGPT integration with its observed uses in empirical educational research.

**Table 4.** Mapping theoretical constructs to ChatGPT applications in reviewed case studies

Theoretical Framework	Core Concept	Operationalization in the Reviewed Studies
Ubiquitous Learning (u-learning)	Learning anywhere or anytime via mobile technology	Students access ChatGPT on smartphones or tablets to review content and ask questions outside formal class [48], [56]. It also supports study during commutes, breaks, or outside traditional schedules, especially where LMS access is limited [52].
Microlearning	Short, focused learning bursts on mobile devices	ChatGPT is used for delivering bite-sized content and immediate help with writing tasks or test questions [44], [53]. Instructors use it to generate quick exercises, grammar tips, or short concept explanations on demand [52], [57].
Bring Your Own Device (BYOD)	Learning via personally owned mobile devices	Pre-planned use of ChatGPT on students’ smartphones for feedback, flipped classroom engagement, and resource access [48], [50]. Instructors design tasks that require students to use ChatGPT on their devices for homework assistance and real-time feedback [44], [56].
Connectivism	Learning through technology-enhanced networks and interaction	Students engage with ChatGPT for real-time dialogue, prompt exploration, and resource navigation based on particular interests [52], [57]. Instructors encourage collaborative ChatGPT use in discussion forums and peer-review tasks, allowing learning through networked exploration [50].
ITS	Adaptive, real-time support tailored to learner progress	ChatGPT is used for feedback and diagnostic assessment to guide instructional design and adapt to learners’ needs [47], [48], [53]. Some studies show instructors using it to identify knowledge gaps through generated quizzes and tailoring subsequent content accordingly [53], [56].
Digital Pedagogy/ Self-Regulated Learning	Learner agency, autonomy, and just-in-time instructional support	ChatGPT enables students to independently access resources, revise drafts, and self-assess progress [44], [55], [59]. It is also used for supporting reflective practices, enabling students to review their work and engage in iterative improvement cycles outside class [50], [52].

### 5.2 Practical insights prompted by case studies under review

The selected criteria guided the choice of experimental and case studies for the scholarly review corresponding to the specific purpose and tasks of the research. To align with current definitions of mobile learning, this section interprets “mobile-supported teaching” as pedagogical activity facilitated specifically through

mobile devices (e.g., smartphones, tablets) that offer anytime-anywhere access, on-the-go interaction, real-time feedback, and flexible communication beyond traditional classroom or desktop-based systems [60]. The distinction between general online and digital learning lies in the portability, immediacy, and constant accessibility of AI-powered support tools. The reviewed empirical case studies add experimentally validated insights illustrating how ChatGPT can be functionally helpful in tertiary-level, mobile-supported teaching. For example, they examine:

- ChatGPT's functioning via mobile devices, especially smartphones and tablets, as an assistant and just-in-time coach across university educators' teaching domains (e.g., in developing course outlines and structures, lesson planning, working out teaching materials, assessment procedures, the choice of teaching activities, university educators' professional development, etc.), ensuring that they align with learning objectives and are well-organised [47], [48], [52].
- How technological potential and advancements of updated ChatGPT versions enlarge its prospects in teaching, pointing to ChatGPT-4o higher accuracy and efficiency across multiple domains in language and reasoning capabilities, excelling in tasks that require few-shot learning in comparison with GPT-3, ChatGPT-3.5 and GPT-4 and providing notable improvements in multimodal tasks compared to its predecessors [46].
- The value of collaboration of the teaching staff incorporating ChatGPT into teaching curriculum subjects to share best practices and understanding of using ChatGPT as well as the importance of making the teaching staff realise the priority of teaching students its ethical use and avoiding cheating, guiding them to responsible AI use [47], [50], [52].
- Promising changes in lecture-presenting models (the "flipped classroom model" presupposing students' on-the-go access to pre-recorded lectures and multimedia materials on mobile devices before attending in-person or online class sessions, which are then devoted to discussions and problem-solving activities) and updating their content, explaining scientific concepts, providing real-time feedback on assignments [48].
- ChatGPT's adaptability in mobile environments includes support for a more inclusive and accessible learning experience, especially important for students without regular desktop access or in under-resourced regions by adjusting the difficulty level, introducing new topics, bridging the distance between students from diverse backgrounds, ability to enhance personalised and adaptive learning experiences, ability to provide real-time support and feedback [48]. Another highlighted aspect refers to the evidence proving that by utilising the ChatGPT platform, students have the flexibility to engage in learning from any location using mobile platforms, enabling location-independent access to content, feedback, and communication [56].
- The role of ChatGPT in working out the ChatGPT-assisted complex of teaching materials for university students (in defining skills students need to acquire after doing a particular course, course structure, literature lists, prompting valuable ideas for consideration by the developers of courses for university students) [49].
- Two experimental studies based on Bloom's taxonomy: 1) the role of ChatGPT in students' critical thinking skills development [50] and 2) the ability of the AI tool to validate test question correspondence to existing officially identified academic standards and academic accreditations [53]. The first research provides the experimentally proven data on ChatGPT's impact on students' abilities to remember facts, comprehend concepts, and apply knowledge (associated with Bloom's

taxonomy basic level), implying a relatively milder impact on creative thinking skills (relevant to Bloom's taxonomy advanced level) related to such categories as evaluating and analysing, which is crucial for educators and curriculum developers tailoring their pedagogical strategies. The second study presents a custom application named "Question Checker" to validate and improve questions in alignment with the existing accreditation standards. The study introduces a mechanism for using ChatGPT to assist teachers in generating high-quality questions, thereby saving time and providing an effective means of assessing student learning outcomes.

- The importance of academic staff proficiency in ChatGPT guided by the university authority directives and institutional initiatives to promote its efficient use and study its potential in the university teaching process (creating teams of educators to work on the task, organising workshops, short courses that outline the basics of ChatGPT, and targeted training courses, encouraging the faculty to use the tool) [51], [57]. Participation in free online ChatGPT-orientated professional development courses and online discussions with colleagues highlighting the significance of comprehensive training for educators and access to reliable resources is advocated [52]. One of the studies illuminates the utilisation of ChatGPT for professional development within the TAM framework, revealing that ChatGPT's usefulness for teaching purposes is the most significant determinant for professional development [58].
- ChatGPT incorporation into classroom activities (for generating ideas to organise discussions while teaching and teaching students to formulate prompts) and organizing fair assessment (insisting on face-to-face oral assessment appropriateness instead of relying only on its written form) [59].
- Assessment-related issues: ChatGPT-assisted diagnostic assessment (to identify students' needs and create personalised learning plans tailored to each student's needs), generated by ChatGPT formative and summative assessment tasks [48], monitoring progress and planning improvement [47], [48]. Of special significance are the valuable recommendations on the tool's usage for assessment and grading [52].

The case studies mentioned predominantly approve of ChatGPT's incorporation into university teaching. However, one of the experimental studies devoted to teaching Chinese characters to non-Chinese students highlights the tool's drawbacks revealed when incorporating ChatGPT into teaching them [56]. ChatGPT failed to comprehensively represent students' learning outcomes, as the evaluation method it devised checked only students' writing skills, neglecting pronunciation and comprehension of the meanings associated with the Chinese characters. Besides, the study asserts that the tool cannot provide emotional (praising students' achievements with specific affirmations) and cognitive elements in instructional design, which strongly suggests the necessity of human-machine collaboration, integrating human expertise with AI capabilities to enhance learning results.

ChatGPT's portability and constant availability on smartphones and tablets have significantly contributed to its role in mobile learning environments. Table 5 demonstrates the identified correlation between educational cases of ChatGPT use and mobile learning functionalities. Collectively, these findings confirm the pedagogical value of ChatGPT not merely as a digital tool but as a mobile-first learning companion. Its affordances (portability, real-time access, personalisation on the move, and microlearning via conversational UI) reshape how teaching and learning occur beyond the static classroom or desktop environments.

**Table 5.** ChatGPT core utilizations and their relevance in mobile-supported contexts

No	Educational Cases of ChatGPT's Use	Mobile Learning Functionality
1	AI-generated real-time feedback on student questions [47] [48]	Real-time feedback on mobile platforms
2	24/7 access to ChatGPT via mobile devices [56]	Ubiquitous learning support and flexible study schedules
3	Personalized learning and feedback based on student profiles and goals [48], [50], [52], [55]	Adaptive learning tailored to individual needs
4	Mobile writing assistants for academic assignments [44]	Just-in-time support for academic writing on smartphones or tablets
5	ChatGPT as a mobile LMS platform [48]	Seamless access within mobile learning settings
6	Mobile-friendly chatbots for tutoring or guidance [57]	On-demand tutor support in mobile-enabled blended learning
7	Unsupervised feedback from ChatGPT outside of class [44]	Self-paced microlearning sessions and research

### 5.3 Recommendations

The multiple aspects of university educators' teaching-orientated activities can be enhanced with ChatGPT's multifunctionality. However, to be effective, such incorporation should take into account theoretical and practical considerations revealed by the scholarly research. The recommendations include the need for a strict policy for ChatGPT's use [44]; academics' proficiency in using ChatGPT accounting for the frequency and quality of integrating it into their teaching [54]; harnessing ChatGPT technology and encouraging educators to pursue continual professional development [48]; and educators' awareness of ChatGPT's potential for pedagogically sensible teaching and higher education quality advancement [45], [47].

Pondering over the ChatGPT-incorporated higher education teaching, the analysed experimental and case studies suggest that its functioning capabilities provide for adapting to various educational contexts and settings, designing and modifying personalised learning resources, operating as a virtual teaching assistant, allowing for diverse learning models and styles (adjusting content difficulty, preferences, and teaching formats to students' needs and pace), ensuring personalised and prompt feedback, and mobile learning opportunities in higher education [44], [48], [52], [57], [59].

Another important inference most scholars advocate addresses determining the role of ChatGPT in higher education teaching as a tool with a distinct positioning as a supportive means. It cannot replace a qualified human educator and substitute for an instructor's ability to understand the unique needs of each student, provide motivation, and cultivate a nurturing teaching environment. However, it can serve only as a perfect complement [45], [47]. By harnessing the advantages of both human and machine intelligence, educators can create a learning setting that is more comprehensive and efficient. They may reconsider their teaching methodologies and activate their innovative thinking in practical instruction [56], [57].

The researchers assert that a teacher's professional pedagogical expertise in offering encouragement, creating a supportive educational atmosphere, and interaction cannot be substituted by the advantages and benefits ChatGPT offers [47]. They claim that ChatGPT should be adopted as a complement to human intelligence and creativity, capable of fostering the human potential for promoting teaching in higher education.

While ChatGPT presents notable strengths in mobile-enhanced university teaching (including real-time feedback, scalability, and support for diverse learning styles), it reveals certain limitations. The tool lacks human emotional intelligence, contextual sensitivity, and pedagogical judgement. Moreover, mobile-first access to ChatGPT increases the risk of unsupervised use, potential misuse in assessments, and overreliance by students. Ethical implications include exposure to misinformation, reinforcement of existing biases in training data, and insufficient educator oversight during AI interactions. Therefore, ChatGPT should be positioned not as a replacement but as a pedagogical supplement, requiring clear policies, human moderation, and continuous training to ensure alignment with academic values.

## 6 CONCLUSION

Thus, having summarised and analysed the utilisation of ChatGPT by university educators between November 30, 2022, and November 30, 2024, we have revealed that:

1. University educator-focused spheres of ChatGPT application are the following: attitude to the utilization of ChatGPT; proficiency in ChatGPT; course, lecture, and lesson planning; integration into teaching practice; designing teaching activities; development of teaching materials; assessment of student achievement; the university educator's role; professional development; and ethical use.
2. The current researchers' findings on incorporating ChatGPT in higher education teaching prove to be valuable for: course, lecture and lesson planning (offering ideas, adjusting the content to the required difficulty level); generating and developing teaching materials oriented at specific educational contexts (both ChatGPT-designed and ChatGPT-edited); designing teaching activities, offering suggestions and best practices for incorporating innovative teaching methods; students' achievement assessment (providing different types of assessment tasks to be used at differing stages of teaching and educational settings, and meeting the requirements of the goals of teaching and academic accreditation standards); lecturers' professional development focused on both their proficiency in ChatGPT multi-functionality and their ChatGPT-assisted pedagogical competency development.
3. The benefits researchers associate with ChatGPT incorporation in university educators' teaching cover:
  - “technical” aspects of university educators' teaching-focused activities (saving their time and workload);
  - enriching and promoting teaching-focused activities (designing, generating, editing, adjusting, teaching materials and activities and promoting assessment practice);
  - enhancing teaching quality by developing students' cognitive and critical thinking skills, fostering their motivation and learning and creating an encouraging educational setting.
4. The concerns mainly highlight:
  - the likely increase of academic dishonesty and overreliance on the technological tool on both instructors' and students' parts;
  - university educators' insufficient technological skills in ChatGPT's use for effective teaching;
  - the caution required when using ChatGPT-generated output because of its likely susceptibility to content biases and inaccuracies.

5. While the selected publications do not focus specifically on ChatGPT's role in mobile learning environments, we can assume to a high degree that their ideas, dealing with the changes ChatGPT's incorporation into university educators teaching introduces, are applicable and powerfully relevant to mobile learning settings and enlarge the data on the technological support it provides to instructors in a variety of teaching formats (offline, online, distant, individual, real-time tutoring, etc.) due to ChatGPT's capability to function as a feedback tool and mobile-based learning assistant as well as an instrument providing prompt personalised support/
6. When providing their recommendations, the scholars underscore:
  - the extreme significance of the ethical use of ChatGPT and thus its cautious application in teaching;
  - the need for lecturers' competency in using the technological tool;
  - university educators' distinct awareness of ChatGPT's potential for pedagogically sensible teaching and higher education quality promotion;
  - strict acknowledgement of the tool's inability to substitute a university educator and viewing it as a valuable supportive means.

The widespread availability of ChatGPT across various platforms, contexts, and devices (via smartphones, tablets, and web browsers) ensures easy access to the tool for educators and students in and out of class, significantly enlarging students' formal and informal learning opportunities.

Potential directions for future research may include investigating AI-generated pedagogical materials on student engagement and learning outcomes, evaluating ChatGPT's efficacy within mobile-assisted teacher training initiatives, and exploring an ethical framework for integrating artificial intelligence into tertiary education.

## 7 ETHICAL APPROVAL STATEMENT

This study is a systematic literature review analysing published research on incorporating ChatGPT into higher education teaching by university educators. Formal institutional ethical approval was not required since the study did not involve direct interaction with human subjects or the collection of primary data. Nevertheless, we conducted this review in line with the principles of academic integrity and responsible research conduct. We have strived for objectivity and transparency throughout the research process, especially while selecting and analysing the scholarly publications. Ethical considerations related to the use of AI in education, like algorithmic bias, data privacy, and academic integrity, were carefully considered. The authors declare that there are no conflicts of interest.

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