



## Review Article

## Systematic review of ChatGPT in higher education: Navigating impact on learning, wellbeing, and collaboration

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## ABSTRACT

The rapid evolution of artificial intelligence (AI)-based chatbots has significantly influenced higher education in the last couple of years, with large language models (LLMs), such as OpenAI's ChatGPT, emerging as transformative tools. ChatGPT is actively and widely adopted for academic applications, including tutoring, essay drafting, content clarification, and feedback generation. While its integration into educational settings offers numerous advantages, from enhancing learning outcomes and reducing test anxiety to fostering engagement and collaboration, it raises concerns regarding academic integrity, critical thinking, and over-reliance on AI-generated content. This paper presents a systematic review of existing literature on using ChatGPT in higher education, following a PRISMA-based methodology to analyze 39 studies published between 2023 and 2024. The review synthesizes findings across five key dimensions: academic performance, mental health, second-language learners, social influence, and inspiration. The results indicate that while ChatGPT improves accessibility to knowledge and provides cognitive and emotional support, its misuse may hinder independent learning and increase technostress. Furthermore, this review explores ethical and policy considerations surrounding ChatGPT's adoption, emphasizing the need for balanced integration strategies. Key recommendations include institutional guidelines, AI literacy initiatives, and frameworks for ethical integration. This review offers critical insights for educators, policymakers, and researchers seeking to navigate the evolving academic landscape shaped by AI.

## 1. Introduction

Generative artificial intelligence (AI) is rapidly transforming education by reshaping how knowledge is delivered, consumed, and understood. Among these tools, large language models (LLMs) like OpenAI's ChatGPT have gained prominence for their advanced natural language processing (NLP) capabilities. LLMs are AI-based models trained on vast datasets, including text, images, and audio using self-supervised learning to perform tasks such as language generation, translation, and information extraction. Generative Pretrained Transformers (GPTs), in particular, remain the most powerful LLMs due to their strength in predicting syntax, semantics, and meaning (AlAfnan et al., 2023).

Since GPT-1's launch in 2018, ChatGPT has improved rapidly, with the latest version (GPT-4, 2024) offering better accuracy, alignment

with user needs, real-time web access, and reduced harmful output (Rawas, 2024). Today, ChatGPT supports a range of academic uses, from tutoring and essay feedback to summarization and personalized study help, redefining traditional learning and promoting inclusive, adaptive education. The platform now exceeds 180 million monthly active users. Its popularity surged within two months of launch, reaching 100 million users, a record-breaking adoption rate (Singh, 2025). This growth reflects its intuitive design, cross-disciplinary value, and the rising demand for accessible AI tools amid digital transformation in education (Michel-Villarreal et al., 2023).

As researchers quickly recognized that the rise of generative AI in education is not merely a technological trend but a transformative movement, several studies have emerged regarding its impact on teaching methodologies, student learning and academic engagement, and institutional policies. For instance, Huang et al. (Huang et al., 2023)

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demonstrated the efficacy of AI-driven personalized interventions in improving learning outcomes and self-regulation among students enrolled in technical courses, while others expressed concern regarding its potential negative impact on the development of critical learning and employability skills in undergraduate students, including problem-solving, critical thinking, reasoning, and creativity (Farrokhnia et al., 2024). Examining a different aspect relevant to education, yet equally critical, several studies found that integrating AI tools into learning environments had a significant emotional influence on undergraduate students, including lessened test anxiety, trust and relief, but also disappointment and anxiety regarding false content, as well as isolation and loneliness (Acosta-Enriquez et al., 2024; Crawford et al., 2024; Gao, 2024). Stadler et al. (Stadler et al., 2024) suggested that while LLMs reduce cognitive load during academic tasks, they may inadvertently promote superficial surface-level learning and reduce the quality of reasoning and argumentation. This raises important questions about whether convenience and efficiency come at the expense of intellectual rigor.

Beyond cognitive impact, ChatGPT's adoption is associated with various behavioral and psychological implications. Liu et al. (Liu, 2024) examined how writing anxiety among English as a Second Language (ESL) learners influenced their use of ChatGPT as an automated writing tool. Their findings revealed that ChatGPT effectively reduced writing anxiety and fostered a positive attitude toward academic writing. However, the same study noted that such perceived ease of use could lead to complacency in skill development, highlighting the risk of over-reliance on AI assistance at the expense of meaningfully acquiring and practicing a language. Similarly, Zogheib et al. (Zogheib & Zogheib, 2024) and Gulati et al. (Gulati et al., 2024) investigated factors influencing the adoption of ChatGPT among students, noting that perceived usefulness, ease of use, and trust significantly shaped behavioral intentions. Gulati et al. (Gulati et al., 2024) further emphasized that habitual usage was a stronger predictor of adoption than perceived risk, suggesting that ChatGPT may become an ingrained part of a student's study habits.

The ethical and equity considerations of ChatGPT adoption must also be addressed. While generative AI has the potential to democratize access to quality education, disparities in digital literacy, access to technology, and the biased nonexclusive data currently used in creating LLMs may exacerbate existing educational inequities. Furthermore, the lack of transparency in AI algorithms and data privacy concerns also present major ethical dilemmas, as students and educators continue to struggle with issues of trust and accountability. Duong et al. (Duong et al., 2024) investigated the "dark side" of ChatGPT usage, concluding that compulsive reliance on the tool was associated with increased psychological distress, loneliness, and social avoidance. This study further identified that technostress exacerbated these effects, acting as a moderating factor.

The implications of ChatGPT adoption extend beyond individual learners to broader pedagogical practices and institutional policies. Sandu et al. (Sandu et al., 2024) conducted a case study in Australian higher education, revealing that while ChatGPT enhanced academic performance and engagement in data analytics courses by assisting students in interpreting complex datasets and generating structured responses, it struggled to address complex queries, underscoring the need for complementary human guidance. Similarly, Kim et al. (Kim, Majdara, & Olson, 2024) explored its use in engineering lab report writing, concluding that while ChatGPT improved genre understanding, it occasionally generated inaccurate or misleading content, necessitating careful supervision.

These findings underscore the complex interplay among the potential benefits and challenges closely intertwined in association with the use of ChatGPT in college students, emphasizing that its foreseen role as a positive educational transformation tool must be carefully and pragmatically examined in the context of current learning agents and environments. Whether AI can address key challenges in education, while

navigating its complex and sometimes conflicting impacts remains largely unanswered.

The overlay visualization in Fig. 1 demonstrates the co-occurrence of keywords from literature concerning ChatGPT's significance in higher education, particularly with learning, well-being, and collaboration during the period 2023–24. The node size denotes the frequency of keyword utilization, the edge thickness signifies the strength of co-occurrence, and the color gradient (2023–2024) illustrates the chronological evolution of study themes. Key concepts such as ChatGPT, students, language models, and higher education underscore primary domains of investigation. Conversely, concepts such as contrastive learning, collaborative learning, and technology adoption are peripheral and more contemporary, indicating nascent or inadequately investigated avenues. This map facilitates the identification of prevailing trends and research deficiencies, guiding future inquiries into the intricate influence of ChatGPT on educational practices and policies.

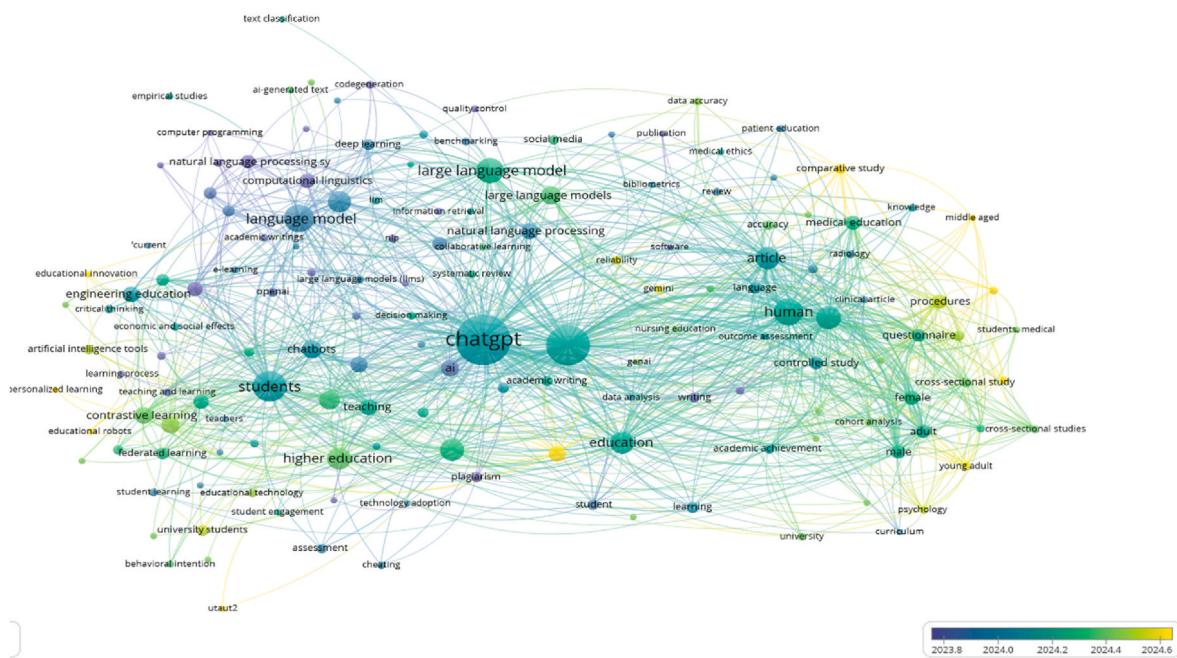
These five themes were identified through thematic synthesis and reflect how ChatGPT impacts students across three broad domains: cognitive (academic performance, second-language users), emotional (mental health), and behavioral (peer pressure, inspiration). This structure aligns with our second objective, which examines cognitive, emotional, and behavioral impacts in higher education.

Given the wide range of perspectives, a systematic review is essential to consolidate research on ChatGPT in education, addressing not only academic outcomes and risks but also the often-overlooked cognitive, emotional, and behavioral impacts. Fig. 2 outlines the contributions and gaps of recent systematic reviews (Baig & Yadegaridehkordi, 2024; Deng et al., 2025; Elbaz et al., 2024; García-López et al., 2025; Garg et al., 2023; Gödde et al., 2023; Imran & Almusharraf, 2023; Levin et al., 2024; Lo, 2023; Lo et al., 2024; Ma et al., 2024; Michel-Villarreal et al., 2023; Salih et al., 2025; Sallam, 2023; Vargas-Murillo et al., 2023; Zamfirou et al., 2023; Zhang & Tur, 2024; İpek et al., 2023).

Notably, Deng et al. (Deng et al., 2025) synthesized 22 systematic reviews and meta-analyses on educational outcomes, while Lo et al. (Lo et al., 2024) analyzed 14 detailed empirical studies. While these reviews focus on isolated themes, our review offers a more integrated perspective by connecting cognitive (learning), emotional (wellbeing), and social (collaboration) aspects. It also highlights interdisciplinary gaps, such as the lack of longitudinal data, variability across disciplines, and the underexplored role of collaboration.

This review addresses that gap through a uniquely integrated lens, synthesizing evidence across three interconnected domains: learning, well-being, and collaboration in higher education. Such a comprehensive approach enables a deeper understanding of how ChatGPT is reshaping teaching practices, learner experiences, and institutional strategies. Importantly, insights from the accompanying bibliometric analysis reveal that despite growing interest in ChatGPT, the dimensions of well-being and collaboration alongside nuanced learning remain significantly underexplored in existing literature. This highlights the pressing need for a systematic synthesis that extends beyond conventional outcome measures. To structure this effort, the review articulates a clear set of research objectives (Fig. 3a), each supported by corresponding research questions (Fig. 3b). Together, they offer a roadmap for examining not just what has been studied, but also what needs to be addressed in future research to inform responsible and effective adoption of ChatGPT in higher education.

The remainder of this article is structured as follows: Section 2 provides a brief overview of the adopted methodology and protocol, including the inclusion and exclusion criteria, search procedure, selection method, quality assessment, and data extraction and synthesis. Section 3 discusses the key findings, highlighting five key dimensions of the impact of ChatGPT in higher education: academic performance, mental health, second-language users, peer pressure, and inspiration, where the unique benefits and challenges are explored for each, as well as a brief description of faculty perspectives in association with these five dimensions. Section 4 compares ChatGPT with traditional study



**Fig. 1.** Keyword co-occurrence network visualization for identifying research gaps in ChatGPT-related higher education studies. Source: Authors.

methods. Section 5 presents the main limitations and key biases, while concluding remarks and future directions are provided in section 6.

## 2. Review methodology

A systematic literature review (SLR) was employed to evaluate and analyze the existing body of research on the application of ChatGPT in higher education. This review was conducted according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses statement (PRISMA). The approach followed the framework outlined by Kitchenham et al. (*Kitchenham & Charters, 2007*), which provides a structured methodology for minimizing bias and synthesizing research findings. The review process included the development of a review protocol, the definition of inclusion and exclusion criteria, the search and selection processes, quality assessment, and data extraction and synthesis. Additionally, the review specifically utilized a thematic qualitative synthesis approach, given the significant diversity in methodologies, outcomes, and contexts across the included studies, which precluded conducting a quantitative meta-analysis.

## *2.1. Review protocol*

The review protocol aimed to reduce potential research bias by establishing predefined criteria and a systematic approach for identifying, evaluating, and synthesizing relevant literature. This protocol guided the entire review process, ensuring transparency and replicability.

### *2.1.1. Inclusion and exclusion criteria*

To ensure the rigor and relevance of the review, well-defined inclusion and exclusion criteria were established and systematically applied during the study selection process. (a) Eligible studies were limited to peer-reviewed research articles published in English between January 2023 and mid-October 2024, (b) containing relevant keywords within the title, abstract, or keyword sections. (c) the review specifically focused on empirical investigations examining the application of ChatGPT in higher education settings, including both undergraduate and postgraduate learning environments. Studies were excluded (a) if they did not represent original research, such as editorials,

commentaries, opinion pieces, meta-analyses, or grey literature. (b) articles published outside the specified timeframe or in languages other than English were also omitted. (c) in addition, studies that focused exclusively on K-12 education or pre-university diploma programs were excluded from consideration, as they fell outside the defined scope of this review.

### 2.1.2. Search procedure

Two authors (NA and RK) independently screened the titles and abstracts of potential studies without employing any automation tools. A comprehensive search was conducted across several relevant databases, including Emerald, ERIC, MDPI, SAGE, Elsevier, SpringerLink, Frontiers, PlosOne, Wiley, and Taylor & Francis. Boolean operators were employed to maximize the retrieval of relevant studies using search strings such as ("ChatGPT") AND ("higher education" OR "university" OR "undergraduate" OR "graduate"). Any disagreements regarding the eligibility of an article were resolved through discussion.

### *2.1.3. Selection process*

The selection process is outlined in Fig. 4. The automated search phase retrieved a total of 209 studies. After applying the inclusion and exclusion criteria, 42 articles remained. A manual search yielded 30 additional studies, resulting in 72 quality assessments. We excluded 33 studies due to their low quality, leaving 39 articles for analysis. We removed duplicates before screening, and a second reviewer independently validated a random subset to reduce bias.

#### *2.1.4. Quality assessment*

The quality of the selected studies (EQ) was evaluated using criteria adapted from Kitchenham and Charters ([Kitchenham & Charters, 2007](#)).

- EQ1: Does the article explicitly discuss ChatGPT?
  - EQ2: Does the article focus on ChatGPT in higher education?
  - EQ3: Is the article a research study?
    - EQ4: Does the article provide a clear research methodology?

Each study was scored on a scale of 0–2 per criterion (0 = not addressed, 1 = partially addressed, 2 = fully addressed), yielding a total possible score of 8. We classified studies scoring below 4 as weak, and

2023

<b>Garg et al. (2023)</b>	Contribution: Explored ChatGPT's potential in patient care and medical research. Limitation: Accuracy, authorship, and bias concerns.
<b>Gödde et al. (2023)</b>	Contribution: Analyzed strengths, weaknesses, opportunities, and threats of ChatGPT in medical literature. Limitation: Majority of findings emphasize weaknesses.
<b>Imran &amp; Almusharraf (2023)</b>	Contribution: Reviewed ChatGPT as a writing assistant in higher education. Limitation: Mixed opinions and inconsistent interaction strategies.
<b>Ipek et al. (2023)</b>	Contribution: Reviewed ChatGPT's potential effects on education. Limitation: Highlights both critical applications and negative impacts.
<b>Levin et al. (2023)</b>	Contribution: Meta-analysis of ChatGPT performance in medical exams—achieves near passing grade. Limitation: Limited number of included studies; performance only near passing.
<b>Lo (2023)</b>	Contribution: Reviewed ChatGPT's use across subject domains in education and potential challenges. Limitation: Performance varied across subjects; usability issues.
<b>Sallam (2023)</b>	Contribution: Studied ChatGPT in healthcare education, research, and practice with cautionary advice. Limitation: Promising but requires cautious adoption.
<b>Vargas-Murillo et al. (2023)</b>	Contribution: Analyzed ChatGPT's role in higher education and ethical implications. Limitation: Raises ethical issues in academic settings.
<b>Zamfirou et al. (2023)</b>	Contribution: Reviewed scenarios of ChatGPT use and limitations for consulting fields. Limitation: Not fully reliable; use must be carefully monitored.
<b>Zhang &amp; Tur (2023)</b>	Contribution: Studied ChatGPT in K-12 education—benefits in planning but raises integrity concerns. Limitation: Integrity and quality concerns in K-12 settings.

2024

<b>Baig et al. (2024)</b>	Contribution: ChatGPT as tutor/collaborator; disrupts traditional methods; risk of over-reliance. Limitation: Limited diversity, overlooks staff views, uses simple methods.
<b>Elbaz et al. (2024)</b>	Contribution: Acceptance of ChatGPT linked to morality, ethics, and improved academic performance. Limitation: Lack of diversity, subjectivity in ethics, no longitudinal data.
<b>Michel-Vellarreal et al. (2024)</b>	Contribution: Used ethnography to explore ChatGPT's own view; noted personalization and dishonesty risks. Limitation: Limited generalizability, no empirical data.
<b>Lo et al. (2024)</b>	Contribution: Systematic review on ChatGPT's influence on student engagement; proposed future research agenda. Limitation: Need for longitudinal studies and exploration of cross-cultural perspectives on engagement.
<b>Deng et al. (2024)</b>	Contribution: Conducted systematic review and meta-analysis of experimental studies on ChatGPT's effect on student learning. Limitation: Highlights limited diversity in experimental designs and underexplored disciplines in current literature.

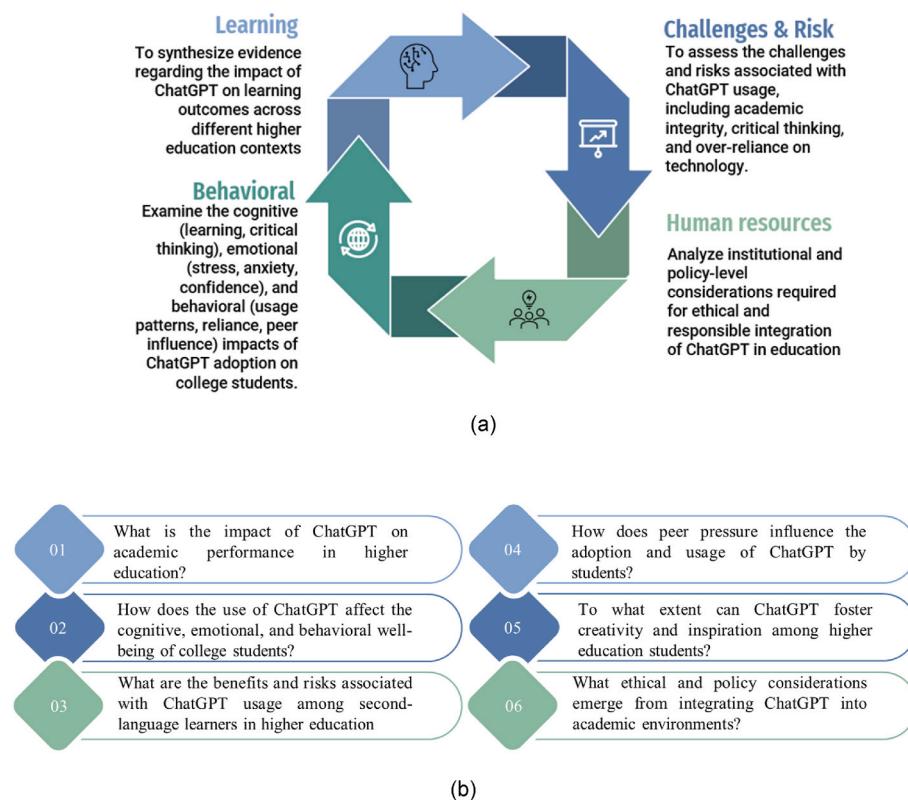
2025

<b>Deng et al. (2025)</b>	Contribution: ChatGPT improved academic performance and higher order thinking, reduced cognitive effort. Limitation: No unified framework, English-only focus, excludes other AIs.
<b>Ma et al. (2025)</b>	Contribution: Trends show rising popularity; excels in lower-order thinking; useful in teaching and research. Limitation: Lacks quantitative analysis, narrow AI focus.
<b>Salih et al. (2025)</b>	Contribution: Examined ChatGPT in writing, assessment, and teaching; found benefits and risks. Limitation: Limited timeframe, subjectivity in comparing effects.
<b>García López et al. (2025)</b>	Contribution: Outlined five challenge areas: ethical, technical, academic, pedagogical, institutional. Limitation: Focuses on disadvantages only, relies on published literature.

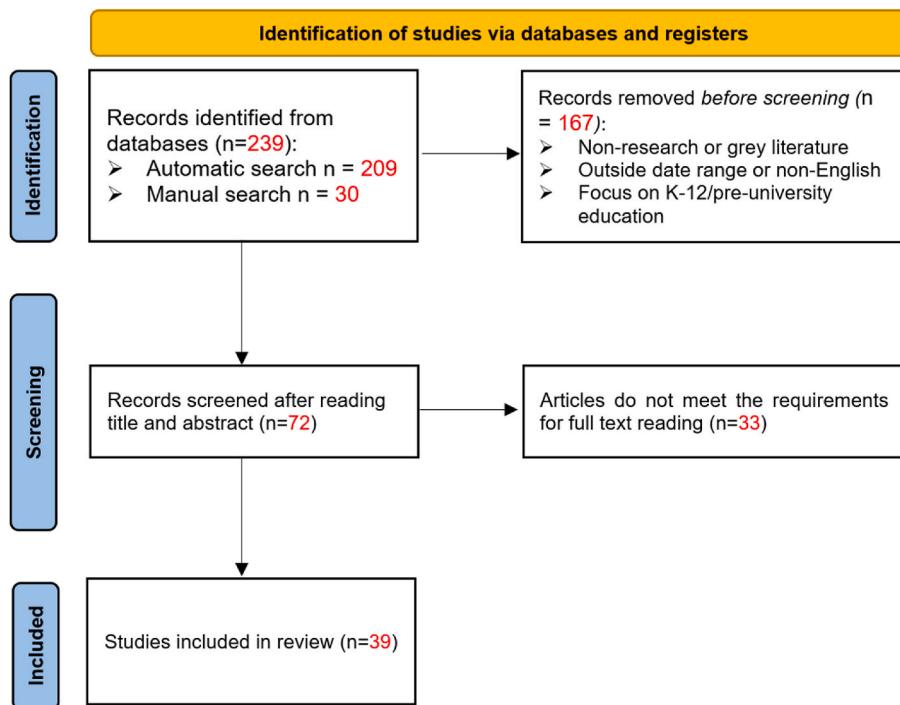
**Fig. 2.** Chronological overview of systematic reviews and studies on ChatGPT in higher education (2023–2025). Source: (Deng et al., 2025; Lo et al., 2024).

those scoring above 4 as medium or high, while scores above 4 were categorized as medium or high. The reviewers independently assessed all 72 initially eligible studies. Discrepancies were discussed and resolved jointly, ensuring consistency and minimizing bias in the inclusion process. As a result of this process, 33 studies were excluded due to failing to meet minimum quality standards. The most common issues among excluded papers were:

1. Lack of clearly stated research objectives (EQ1 = 0)
2. Vague or missing methodological descriptions (EQ2 = 0 or 1)
3. Absence of evaluation metrics or outcome data (EQ3 = 0)
4. Editorial or anecdotal commentary without empirical basis (EQ4 = 0)



**Fig. 3.** Overview of research design: (a) objectives formulation and (b) research questions. Source: Authors.



**Fig. 4.** Diagram illustrating the PRISMA article selection process. Source: Authors.

#### 2.1.5. Data extraction and synthesis

The final stage involved extracting data from the remaining 39 studies. Key information, such as research objectives, methods, results, and limitations, was systematically retrieved and tabulated. This process facilitated a detailed synthesis, enabling the identification of recurring

themes, emerging trends, and significant gaps in the literature. **Table I** presents a detailed summary of the studies, which includes objectives, methodologies, and key findings.

**Table 1**

Summary of recent studies on ChatGPT in higher education.

Ref	Year	Objective	Methods	Results
Stadler et al. (2024)	2024	Studied cognitive load and learning with LLMs in university students.	Students used either ChatGPT or Google to research nanoparticles in sunscreen.	LLM users had lower cognitive load but weaker reasoning and argumentation.
Huang et al. (2023)	2023	Created an AI-based personalized intervention for at-risk students.	Students took an 8-week Python course, with one group receiving intervention and the other not.	The intervention improved learning performance, self-regulation, effort regulation, and peer learning.
Johnson et al. (2024)	2024	Compared novice Arduino programmers who wrote their own code (self-programming) with those who used ChatGPT 3.5 (ChatGPT programming) on task scores, interest, self-efficacy, ability, and errors.	Analyzed 33 students in an agricultural technology course at the University of Arkansas (Fall 2023), randomly assigned to self-programming ( $n = 17$ ) or ChatGPT-programming ( $n = 16$ ).	Both groups scored above 90 % on programming tasks with no significant difference in mean scores. The ChatGPT group had more perfect scores (68.8 % vs. 41.2 %), but errors stemmed from incorrect or incomplete queries.
Gao (2024)	2024	Addresses the effects of undergraduate students' test anxiety and academic emotions.	Randomly selected 180 undergraduates from Zhejiang Industry & Trade Vocational College in 2023 to study test anxiety and academic emotions. Eighty students attended a 4-hour workshop on using ChatGPT in education.	By semester's end, the AI group showed significantly lower test anxiety, despite no initial differences between groups.
Sandu et al. (2024)	2024	Examined ChatGPT's impact on pedagogy, student engagement, and academic performance in higher education.	Surveyed 74 data analytics students in Australia, analyzing usage, benefits, and challenges.	ChatGPT showed medium effects on perceived benefits ( $\eta^2 = 0.173$ ) and challenges ( $\eta^2 = 0.289$ ). Frequent users saw academic gains, but limitations included handling complex queries and lack of human interaction.
Sayed et al. (2024)	2024	Examined ChatGPT's impact on EFL learners' speaking skills, well-being, autonomy, and academic buoyancy.	Studied 28 upper-intermediate EFL students in Ethiopia using a mixed-methods approach. Speaking skills were tested with TOEFL iBT scoring, and psychological factors were assessed through narrative frames.	Results showed significant improvements in speaking, well-being, autonomy, and academic buoyancy. ChatGPT provided personalized feedback, enhanced skill development, and supported emotional needs.
Lee et al. (2022)	2022	Measured and enhanced interaction quality in online forums using ML to promote cognitive presence and higher-order thinking.	Analyzed discussion data from an edX MOOC (CS1301) and a graduate AI course (CS6601) using the Community of Inquiry framework. A BERT model, fine-tuned for classification, achieved 92.5 % accuracy.	Analyzed discussion data from an edX MOOC (CS1301) and a graduate AI course (CS6601) using the Community of Inquiry framework. A BERT model, fine-tuned for classification, achieved 92.5 % accuracy.
Zogheib and Zogheib (2024)	2024	Investigated factors influencing students' adoption of ChatGPT using TAM, SDT, trust, social influence, and personal innovativeness.	Surveyed 150 engineering students on perceptions of usefulness, ease of use, motivation, trust, and readiness. Analyzed data with SPSS 26 and Smart-PLS4.	Findings showed usefulness, ease of use, external motivation, and social influence significantly influenced adoption, with trust playing a key role. Intrinsic motivation had no effect, while personal innovativeness strongly impacted intention and use. Behavioral intention was the strongest predictor of adoption.
Chambers and Owen (2024)	2024	Evaluated the impact of GenAI chatbots on learning outcomes and test anxiety in postsecondary students.	Forty psychology students used chatbots for exam prep and essay grading. Surveys measured their perceptions of comprehension, writing, and anxiety.	Students reported improved understanding and essay structuring, but no significant reduction in test anxiety.
Ardiansyah et al. (2024)	2024	Examined Indonesian university students' perspectives on using GPTs for chemistry learning, focusing on motives, benefits, challenges, and ethics.	Used questionnaires, interviews, and usage logs in a case study approach, analyzing data thematically.	Students valued GPTs for clarity, speed, and usefulness but raised concerns about accuracy and ethics. They evaluated responses through thought stimulation, confirmation, integration, paraphrasing, or direct copying.
D. Kim, Nayak, et al. (2024)	2024	This pilot study explored ChatGPT's impact on undergraduate engineering students' lab report writing, focusing on rhetorical knowledge, critical thinking, conventions, and writing processes.	Seven students revised their lab reports using ChatGPT. A comparative analysis evaluated report quality, while a focus group captured their experiences.	Findings highlighted improvements in writing quality and structure, with students noting both benefits and challenges in using ChatGPT for revision.
Serhan and Welcome (2024)	2024	Examined undergraduate students' perceptions of ChatGPT as a learning tool for Calculus, focusing on advantages, disadvantages, and classroom engagement.	Sixty-four students participated, providing data through a Likert-scale questionnaire and open-ended responses. Quantitative and qualitative analyses were conducted.	Most students viewed ChatGPT positively, reporting improved understanding of concepts and increased classroom participation and engagement.
Hammoda (2024)	2024	Explored ChatGPT's role in an entrepreneurship course, assisting students in forming venture teams.	Three teams used ChatGPT to define roles, essential members, and equity splits based on prompts, with findings discussed in class. Post-intervention surveys assessed perceptions.	Students overwhelmingly favored ChatGPT, seeing it as a convenient and resourceful tool that supported entrepreneurial learning and venture creation.
Ngo et al. (2024)	2024	Examined factors influencing students' satisfaction and continued use of ChatGPT in education using the Expectation-Confirmation Model (ECM).	Collected survey data from 435 students across eight Vietnamese universities, analyzing four variables using CFA and SEM with SPSS 26 and AMOS 24.	Expectation confirmation and perceived usefulness positively impacted satisfaction and continued use. However, perceived usefulness did not directly influence satisfaction, suggesting trust and quality play a role. Students who found ChatGPT beneficial were more likely to keep using it.
Yin et al. (2024)	2024	Investigated emotional responses and intrinsic motivation in micro-learning chatbots, comparing metacognitive versus neutral feedback.	Sixty-two college students were randomly assigned to a Metacognitive EC (reflective feedback) or Neutral EC (general feedback) group. Chatbots guided them through greetings, biology content, self-evaluation, and feedback.	Both groups experienced mostly positive emotions, but the Metacognitive EC group reported fewer negative emotions and weaker interest-related motivation, suggesting metacognitive feedback may not fully enhance intrinsic motivation.

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**Table 1 (continued)**

Ref	Year	Objective	Methods	Results
Gulati et al. (2024)	2024	Explored factors influencing marketing students' acceptance of ChatGPT, integrating system flexibility into the UTAUT model	Surveyed 309 marketing students, analyzing habit, performance expectancy, effort expectancy, and perceived risk using statistical methods.	Habit was the strongest predictor of ChatGPT adoption, followed by performance and effort expectancy. Perceived risk had no significant impact, as students felt in control of their online behavior.
Baidoo-Anu et al. (2024)	2024	Examined Ghanaian higher education students' perspectives on ChatGPT, focusing on benefits and concerns as a learning tool.	Developed and validated the Students' ChatGPT Experiences Scale (SCES) with data from 277 students using exploratory and confirmatory factor analysis.	Students highlighted academic benefits but raised concerns about originality, security, over-reliance, and lack of formal training. Usage was primarily for assignments and non-academic purposes.
Tu (2024)	2024	Explored undergraduates' conceptions of ChatGPT's roles, functionalities, and interactions based on their growth mindsets	Used the draw-a-picture technique to analyze perceptions, interaction skills, question types, learning achievements, and critical thinking tendencies.	Students with different growth mindsets showed significant differences in conceptions of learning contexts, interaction patterns, and outcomes, with distinct variations in engagement and critical thinking approaches.
Shim et al. (2023)	2024	Evaluated an experiential chatbot workshop's effectiveness in engagement, competency development, and satisfaction among undergraduates.	Conducted in <i>Doing Business with A.I.</i> at Singapore Management University, non-STEM students used Dialog flow to design chatbot prototypes with a user-centric approach.	Results showed 90.7 % satisfaction, 81.4 % engagement, and 81.3 % reporting moderate to high competency. Nearly all (97.7 %) felt the workshop met its learning objectives.
Öncel et al. (2021)	2021	Examined whether vocabulary knowledge can be modeled through linguistic analysis of source-based essays to enhance Automated Writing Evaluation.	Essays from 106 undergraduates were analyzed at descriptive, lexical, syntactic, and cohesive levels using NLP tools. Machine learning models predicted vocabulary scores based on linguistic features.	Models explained 29 % of the variance in vocabulary scores, highlighting a link between essay characteristics and individual vocabulary differences.
Taniguchi et al. (2019)	2019	Investigated a language-independent text tokenization algorithm to enhance multilingual support for the CoI framework.	Compared the performance of a language-independent tokenizer with a language-dependent one using a real-world dataset, assessing classification accuracy for CoI indicators.	Results showed comparable performance between both tokenizers, supporting the feasibility of data-driven tokenization for multilingual CoI analysis and setting a foundation for future research.
Neo (2022)	2022	Developed and evaluated the MERLIN Project, an AI-driven virtual learning assistant for Malaysian university students during COVID-19.	MERLIN used NLP to facilitate humanlike interactions, aligning course content with Mayer's 12 Multimedia Learning Principles. Data from 102 students assessed its effectiveness.	40 Students found the chatbot helpful for learning and comprehension, reporting improved engagement and retention in online education.
Chen et al. (2024)	2024	Developed and evaluated MsCAEWL, a computer-assisted EFL writing system providing detailed, semantic-based multi-trait feedback.	Utilized neural networks and NLP to align with writing feedback theory, ensuring continuous, timely, and interactive feedback. Effectiveness was tested against AWE models and human raters using t-tests.	MsCAEWL outperformed baseline AWE models and closely matched human raters in feedback accuracy. Results showed significant improvements in students' EFL writing proficiency.
Gammoh (2024)	2024	Explored academics' perspectives on the risks of integrating ChatGPT into university assignments and proposed mitigation strategies.	Conducted semi-structured interviews with 25 academics from Jordanian universities, using thematic analysis to identify key concerns and solutions.	Findings highlighted risks such as plagiarism, overdependence on AI, reduced critical thinking, and lower assignment quality. Suggested mitigation strategies included plagiarism detection, disciplinary measures, awareness campaigns, and clear usage guidelines.
Wang et al. (2022)	2022	Developed and evaluated Alteach, a virtual case learning system using real hospital records and NLP to enhance medical students' clinical thinking.	Alteach processed hospital case data to create realistic simulations, allowing students to engage in consultations, exams, and data analysis. A multi-dimensional evaluation system assessed rigor, logic, systematization, agility, and knowledge expansion.	Fifteen graduate medical students showed significant clinical thinking improvement, with test scores increasing from 69.87 to 85.6 ( $P < 0.01$ ). Alteach effectively replicated traditional clinical training while overcoming real-world constraints.
Dana and Gavril (2023)	2023	Examined the psychological implications of chatbots through discussions with 10 psychology students who had prior chatbot experiences.	Students shared emotional responses, attitudes, behaviors, and ethical concerns related to chatbot interactions.	Findings highlighted chatbots' convenience and efficiency but also frustration when needs were unmet. Participants reported social and emotional connections with chatbots while raising concerns about data privacy and the potential replacement of human interaction.
Acosta-Enriquez et al. (2024)	2024	Analyzed university students' attitudes toward using ChatGPT in academic activities through a quantitative, nonexperimental study.	Surveyed 499 participants, examining factors influencing their perspectives.	Results showed responsible use, frequent intention, and acceptance as strong predictors of a positive attitude, while boredom and perceived risk were linked to negative attitudes.
Ajlouni et al. (2023)	2023	This study aimed to explore undergraduate students' perceptions of the benefits and challenges of using ChatGPT in counseling and mental health education, focusing on its potential to support learning and achieve sustainable development goals.	A descriptive quantitative approach was used with a purposive sample of 210 students enrolled in the counseling and mental health program at the University of Jordan, who had experience using ChatGPT in their learning.	The study found that 81.9 % of respondents perceived ChatGPT as a beneficial learning tool, particularly in supporting primary counseling skills and therapeutic conditions, while students reported moderate challenges and concerns in utilizing the technology.
Ngo (2023)	2023	Explored university students' perceptions of ChatGPT for learning, focusing on benefits, barriers, and potential solutions.	Collected data from 200 survey responses and 30 semi-structured interviews	Students had a positive attitude toward ChatGPT, citing time savings, diverse information access, personalized tutoring, and writing support. Key concerns included difficulties in assessing source reliability and inaccurate citation capabilities.

(continued on next page)

**Table 1 (continued)**

Ref	Year	Objective	Methods	Results
Liu (2024)	2024	Examined the relationship between writing anxiety and ESL students' intention to use ChatGPT as an automated writing evaluation tool through the Technology Acceptance Model (TAM).	Conducted a cross-sectional study with 639 undergraduates, analyzing data using Structural Equation Modeling (SEM) with Partial Least Squares (PLS).	Findings showed that writing anxiety significantly influenced perceived ease of use and attitude toward ChatGPT, which in turn affected students' intention to adopt it for writing evaluation. 4o
Duong et al. (2024)	2024	Investigated the negative impacts of compulsive ChatGPT use in higher education, examining stressors like loneliness and social avoidance, their effect on psychological distress, and the moderating role of technostress.	Collected data from 2709 students across 16 Vietnamese universities using a stratified random sampling approach and analyzed relationships through the stressor-strain-outcome model.	Compulsive ChatGPT use was linked to increased loneliness, social avoidance, and psychological distress, which negatively affected life satisfaction and academic performance. Technostress worsened psychological distress while further diminishing students' well-being and academic success.
Budhathoki et al. (2024)	2023	'Investigated the negative impacts of compulsive ChatGPT use in higher education, examining stressors like loneliness and social avoidance, their effect on psychological distress, and the moderating role of technostress.	Collected data from 2709 students across 16 Vietnamese universities using a stratified random sampling approach and analyzed relationships through the stressor-strain-outcome model.	Compulsive ChatGPT use was linked to increased loneliness, social avoidance, and psychological distress, which negatively affected life satisfaction and academic performance. Technostress worsened psychological distress while further diminishing students' well-being and academic success.
Salah et al. (2024)	2023	Explored university students' dependency on generative AI chatbots, focusing on intrinsic motivations, risk perceptions, and the risk of over-reliance.	Analyzed interactions and motivations, with hypotheses tested against actual user behaviors. This is a preprint, not peer reviewed.	Findings suggest growing reliance on chatbots, fueled by intrinsic motivations like competence and relatedness. Risk perceptions seemed to increase reliance, indicating a potential over-dependence and highlighting AI's unpredictable impact on education.
Abbas et al. (2024)	2024	Investigated the causes and consequences of ChatGPT usage among university students, focusing on academic performance and behavioral outcomes.	Study 1 developed and validated an 8-item ChatGPT usage scale ( $N = 165$ ). Study 2 employed a three-wave time-lagged design ( $N = 494$ ) to examine workload, time pressure, and reward sensitivity as causes, and procrastination, memory loss, and academic performance as consequences.	Findings showed that higher academic workload and time pressure increased ChatGPT use, while sensitivity to rewards reduced it. Usage was associated with greater procrastination and memory loss, leading to lower academic performance. Indirect effects linked workload, time pressure, and reward sensitivity to these outcomes via ChatGPT usage. 4o
Koltovskaia et al. (2024)	2024	Explored how Iranian graduate ESL students in STEM fields engaged with ChatGPT for revising academic research proposals across behavioral, cognitive, and affective dimensions.	Analyzed screencasts, stimulated recall, semi-structured interviews, and follow-up surveys with six students.	Findings: <ul style="list-style-type: none"><li>● Behavioral: Students prioritized lower-order text concerns, often using a training prompt for revisions.</li><li>● Cognitive: They noticed and understood ChatGPT's feedback but questioned its accuracy.</li><li>● Affective: High satisfaction, particularly with ChatGPT's paraphrasing to enhance professionalism.</li></ul> Findings showed IG, AW, and SI increased ChatGPT use, with positive reinforcement (PR) partially mediating these effects. Technological literacy (TL) moderated these relationships, amplifying the impact of IG, AW, and SI on PR.
Sajjad (2024)	2024	Investigated whether excessive ChatGPT use in academia is beneficial or harmful, using the Uses and Gratification Theory to identify predictors and moderators.	Surveyed 617 business and management students in southern Punjab, Pakistan, analyzing the impact of instant gratification (IG), academic workload (AW), and social isolation (SI) on usage.	Findings: <ul style="list-style-type: none"><li>● Confirmed factors: Hedonic motivation, usability, perceived benefits, system responsiveness, and relative advantage.</li><li>● Mixed effects: Social influence, privacy, security, and facilitating conditions.</li><li>● Unconfirmed predictors: Technology readiness and extrinsic motivation.</li></ul> Findings showed IG, AW, and SI increased ChatGPT use, with positive reinforcement (PR) partially mediating these effects. Technological literacy (TL) moderated these relationships, amplifying the impact of IG, AW, and SI on PR.
Al-kfairy (2024)	2024	Synthesized empirical studies on ChatGPT adoption in higher education, identifying key influencing factors and research gaps.	Conducted a narrative review of 40 peer-reviewed studies, applying thematic analysis grounded in TAM, UTAUT, DoI, TOE, and the Theory of Planned Behavior.	Findings: <ul style="list-style-type: none"><li>● Confirmed factors: Hedonic motivation, usability, perceived benefits, system responsiveness, and relative advantage.</li><li>● Mixed effects: Social influence, privacy, security, and facilitating conditions.</li><li>● Unconfirmed predictors: Technology readiness and extrinsic motivation.</li></ul> Findings suggest ChatGPT is a double-edged sword—enhancing learning accessibility but leading to diminished self-control and increased burnout when overused. Advocates for balanced usage and strategies to strengthen self-control in education.
Feng et al. (2023)	2024	Examined the relationship between ChatGPT usage and online learning burnout, with self-control as a mediating factor.	Analyzed data from 505 Chinese college students, assessing correlations between ChatGPT use, self-control, and burnout levels.	Findings suggest ChatGPT is a double-edged sword—enhancing learning accessibility but leading to diminished self-control and increased burnout when overused. Advocates for balanced usage and strategies to strengthen self-control in education.
Farhi et al. (2023)	2023	To examine students' views, concerns, and perceived ethical considerations regarding ChatGPT usage in education.	Survey data collected from 388 students at two universities in Al Ain, UAE, using Yamane's formula; path analysis to test hypotheses.	Students perceive ChatGPT as a revolutionary tool that significantly impacts their views, concerns, and perceived ethics. While it offers substantial benefits, concerns about educational integrity persist.

### 2.1.6. Potential biases

Potential biases are inherent in reviewing articles and need to be mentioned here. For instance, selection bias was introduced here through the exclusion of non-English studies, which may limit the generalizability of our findings. Publication bias is another inherent

factor. Studies reporting positive impacts of ChatGPT may have a higher likelihood of publication. Technological bias consists of any bias due to differences in internet access and technological familiarity of students and institutions, as well as bias in current data sets used to train AI tools. Finally, there is certainly a bias with respect to institutional policies due

to variability in academic policies across different countries and cultures. Fig. 5 shows a bar chart of paper distribution by country.

#### 2.1.7. Risk of bias assessment

To further ensure the reliability of our findings, a structured risk of bias assessment was conducted on the included studies. We evaluated each article for potential selection, performance, and reporting biases, adapting a simplified framework from the Cochrane Risk of Bias tool. We examined studies for clarity in research questions, transparency in methodology, presence of control/comparison groups, and completeness in reporting outcomes. While most studies provided sufficient detail to assess Some studies exhibited potential biases due to small sample sizes, lack of randomization, or insufficient control of confounding variables. These limitations were considered when interpreting the overall strength and consistency of the evidence.

### 3. Discussion

This systematic review identifies five key dimensions of the impact of ChatGPT in higher education: academic performance, mental health, second-language users, peer pressure, and inspiration. Table II shows how many studies fall into each of these categories, and Table III analyzes how often each theme appears in the studies, showing which areas are most common. Each theme reflects unique benefits and challenges, offering a comprehensive perspective on the role of ChatGPT in transforming educational practices. Specifically, this thematic structure captures three primary types of impacts: cognitive impacts are reflected in academic performance and second-language users, addressing how ChatGPT influences learning, comprehension, and critical thinking; emotional impacts are explored in mental health, highlighting effects on stress, anxiety, and confidence; and behavioral impacts are examined through peer pressure and inspiration, focusing on usage patterns, peer influence, and creative engagement. This section elaborates on each of these dimensions, highlighting the literature's perspectives on associated advantages and shortcomings.

#### 3.1. Academic performance

This theme primarily represents the cognitive impacts of ChatGPT, including enhancements in comprehension, problem-solving, and learning efficiency, as well as concerns about reduced critical thinking

and analytical depth. A clear majority of the reviewed papers (56.4 %) report measurable academic gains associated with ChatGPT adoption. Multiple studies across engineering, programming and data-analytics courses document higher task scores, improved solution accuracy and richer formative feedback when students use the tool for step-by-step explanations or debugging assistance (Huang et al., 2023; Johnson et al., 2024; Sandu et al., 2024; Serhan & Welcome, 2024). These benefits appear strong when ChatGPT is deployed as a supplementary tutor that provides personalized support and frees up classroom time for deeper discussion. Yet a consistent cautionary thread emerges over-reliance on AI-generated answers can erode critical-thinking and argument-construction skills (Farrokhnia et al., 2024; Gammoh, 2024; Stadler et al., 2024). Several authors note that although cognitive load is reduced, students may default to surface-level reasoning or accept unverified output, thereby compromising learning depth. Overall, the evidence shows that teaching methods, like having students review or fix ChatGPT answers, are important to improve performance while still keeping strong thinking skills.

#### 3.2. Mental health

This theme reflects the emotional dimension of ChatGPT use, capturing both positive effects like reduced anxiety and increased self-efficacy, and negative effects such as technostress and emotional fatigue in cases of overreliance. Roughly one quarter of the corpus (15 %) links ChatGPT use to reduced test anxiety, increased academic buoyancy and greater self-efficacy (Chambers & Owen, 2024; Gao, 2024; Sayed et al., 2024). Immediate feedback and on-demand clarification appear to lower stress, especially in high-stakes or time-pressured settings. This aligns with findings by Elbaz et al. (Elbaz et al., 2024), who explored students' emotional and ethical responses to ChatGPT, reporting that its use in Omani higher education contexts influenced not only academic confidence but also raised concerns related to morality and stress. Conversely, a smaller but noteworthy set of studies highlights a "dark side": compulsive or habitual use correlates with technostress, social avoidance and diminished life satisfaction when the tool displaces peer or instructor interaction (Duong et al., 2024; Feng et al., 2023; Yin et al., 2024). The balance of evidence therefore positions ChatGPT as a potential emotional buffer, provided institutions couple access with digital-wellbeing guidance, emphasizing moderation and encouraging human support networks.

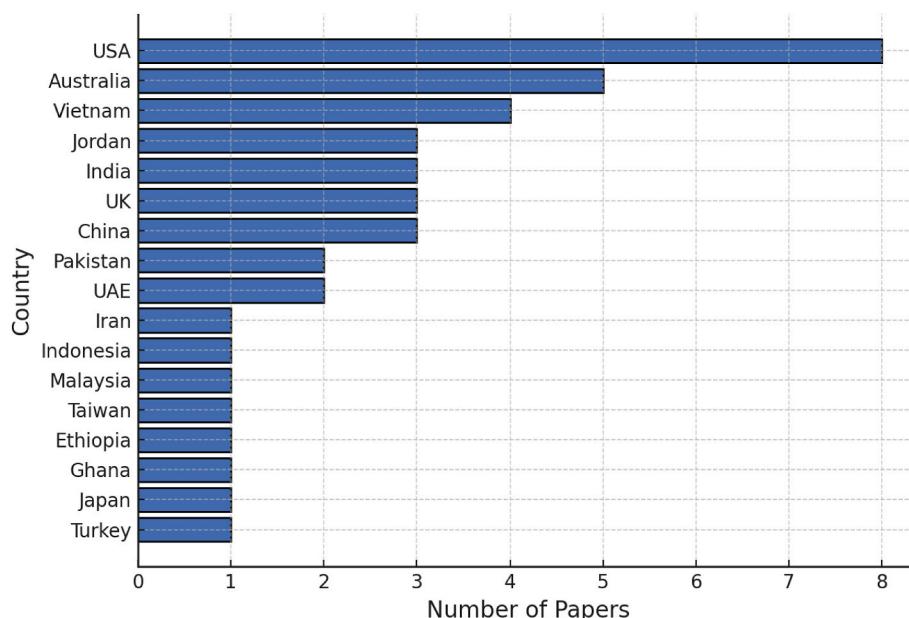


Fig. 5. The global distribution of scientific articles on ChatGPT in higher education is based on the 39 studies (2023–2024). Source: Authors.

**Table 2**

Categorization of studies on ChatGPT in higher education based on key themes.

Ref	Academic Performance	Mental Health	Second Language Users	Peer Pressure	Inspiration
Stadler et al. (2024)	✓				
Huang et al. (2023)	✓				
Johnson et al. (2024)	✓				
Gao (2024)		✓			
Sandu et al. (2024)	✓			✓	
Sayed et al. (2024)					
Lee et al. (2022)	✓				
Zogheib and Zogheib (2024)				✓	
Chambers and Owen (2024)					✓
Ardyansyah et al. (2024)	✓				
D. Kim, Nayak, et al. (2024)	✓				
Serhan and Welcome (2024)	✓				
Hammoda (2024)					✓
Ngo et al. (2024)				✓	
Yin et al. (2024)		✓			
Gulati et al. (2024)	✓				
Baidoo-Anu et al. (2024)	✓				
Tu (2024)			✓		
Shim et al. (2023)					✓
Öncel et al. (2021)	✓				
Taniguchi et al. (2019)	✓				
Neo (2022)	✓				
Chen et al. (2024)			✓		
Gammoh (2024)	✓				
Acosta-Enriquez et al. (2024)	✓				
Ajlouni et al. (2023)				✓	
Ngo (2023)	✓			✓	
Liu (2024)					
Salah et al. (2024)		✓			
Abbas et al. (2024)	✓				
Koltovskaia et al. (2024)	✓			✓	
Sajjad (2024)	✓		✓		
Al-kfairy (2024)	✓				✓
Feng et al. (2023)	✓		✓		
Farhi et al. (2023)	✓				

**Table 3**

Frequency and percentage of included studies categorized by key themes related to ChatGPT's impact in higher education.

Theme	Number of Studies	Percentage (%)
Academic Performance	22	56.4 %
Mental Health	6	15.4 %
Second-Language Users	5	12.8 %
Peer Pressure	2	5.1 %
Inspiration & Creativity	4	10.3 %

### 3.3. Second-language users

The cognitive impact is particularly notable in this theme, as ChatGPT supports language comprehension, vocabulary development, and communication skills for second-language learners, helping to bridge gaps in understanding. About 13 % of studies focus on English-as-a-Second-Language (ESL) populations. Most report improvements in writing structure, vocabulary range and speaking proficiency when learners employ ChatGPT for real-time paraphrasing or pronunciation tips (Koltovskaia et al., 2024; Liu, 2024; Sayed et al., 2024). Students appreciate the “24/7 language partner” role and the ability to request multiple rephrasing until meaning is clear. However, two recurring concerns surface: (i) inaccurate or culturally insensitive outputs in languages with smaller training corpora (Houston & Corrado, 2023), and (ii) the risk that continual AI correction blunts autonomous language development. Effective instructional designs therefore blend ChatGPT with active production tasks in which learners compare their original drafts against AI suggestions and justify acceptance or rejection of each change.

### 3.4. Peer pressure

This theme captures a clear behavioral impact, where the decision to adopt or heavily rely on ChatGPT is influenced by peer dynamics, competition, and the pressure to keep pace with others. Although only 5 % of papers center explicitly on peer dynamics, social influence consistently emerges as a powerful adoption driver. Students report feeling compelled to use ChatGPT to keep pace with classmates who leverage it for speed or grade advantage (Gulati et al., 2024; Zogheib & Zogheib, 2024). This is consistent with findings from Strzelecki et al. (Strzelecki, 2024), who highlights that students' acceptance and use of ChatGPT are significantly shaped by perceived usefulness, ease of use, and social norms, including the influence of peers in academic settings. This competitive uptake amplifies equity gaps where connectivity or device access is uneven. Institutional responses cited in the literature include campus-wide licenses, mandatory AI-literacy workshops, and collaborative assignments that reward transparent sharing of prompt-engineering strategies, all aimed at diffusing pressure and promoting equitable participation.

### 3.5. Inspiration and creativity

This theme represents both a behavioral impact, as students use ChatGPT to initiate and guide their creative processes, and a cognitive shift, where idea generation and problem-solving are influenced by AI-driven suggestions. Roughly one in ten studies investigate ChatGPT as a creativity catalyst. Learners credit the tool with breaking writer's block, expanding idea space and offering fresh analogies (Hammoda, 2024; Salah et al., 2024). Yet the same papers warn that effortless idea generation can dampen originality and reduce confidence in self-generated concepts. Investigations comparing divergent- and convergent-question prompts show that creative gains are greatest when

students iteratively refine AI suggestions rather than accepting first-pass outputs (Leung & Lo, 2024). Effective practice therefore frames ChatGPT as a brainstorming partner whose contributions must be critiqued, remixed and properly attributed.

### 3.6. Integrated insights and research gaps

In summary, cognitive impacts include enhanced comprehension, faster learning, and concerns about reduced critical thinking. Emotional impacts are reflected in reduced anxiety, stress management, and confidence boosts, balanced by the risk of technostress. Behavioral impacts are seen in usage patterns shaped by peer influence, reliance habits, and AI-driven creative workflows. Across themes, two broad patterns converge.

- Value-add through personalization and immediacy, ChatGPT excels at micro-scaffolded guidance, anxiety reduction, and multilingual support.
- Risk of skill atrophy through over-reliance, critical thinking, deep reading and original ideation can suffer when AI responses are taken at face value.

Notably absent are longitudinal studies tracking sustained learning habits and controlled comparisons that isolate ChatGPT's incremental effect over existing digital tools. Future work should also examine differential impacts across disciplines with distinct epistemic practices (e.g., humanities vs. STEM) and investigate institutional policies that balance innovation with integrity.

Collectively, the evidence positions ChatGPT as a double-edged pedagogical innovation: a potent enhancer of accessibility, feedback and learner confidence when embedded within reflective, ethically grounded curricula; a potential detractor when used as a shortcut that circumvents cognitive effort. Educators, technologists and policymakers must therefore co-design guidelines that harness their strengths while safeguarding core academic values.

### 3.7. Ethical and policy considerations

Several studies in this review briefly acknowledge the ethical and policy implications of ChatGPT's integration into higher education, although few address them in depth. The main worries often mentioned are about academic integrity, where using AI-generated answers could harm the fairness of assessments if they are misused for cheating or getting help without giving credit (as Elbaz et al. (Elbaz et al., 2024)). Others highlight data privacy and surveillance, particularly in institutional contexts where AI tools are embedded into learning platforms that collect student inputs.

The model may show algorithmic bias, especially in places that are not English-speaking or are culturally diverse, by a lack of representation or produce stereotypical results (Michel-Villarreal et al. (Michel-Villarreal et al., 2023)). Furthermore, digital equity is discussed in studies focused on global South contexts, where disparities in access and digital literacy may lead to unequal academic outcomes.

To address these issues, a few papers propose guidelines such as promoting AI literacy, setting transparent usage policies, and encouraging critical engagement with AI outputs (Michel-Villarreal et al., 2023; Strzelecki, 2024). However, most authors agree that clearer institutional frameworks are needed to balance innovation with fairness, privacy, and academic standards (Elbaz et al., 2024). A more robust ethical discussion in future studies is essential to help educators and policymakers ensure the responsible use of AI in higher education.

## 4. ChatGPT versus traditional study methods

The integration of ChatGPT in higher education has introduced new dynamics in student learning, faculty strategies, and the experience of

second-language learners. This section explores how ChatGPT compares to traditional study methods, its multifaceted roles for students, strategies for faculty to address critical thinking challenges, and its impact on second-language students. The adoption of ChatGPT has transformed traditional study methods, offering students immediate access to information and personalized assistance (Johnson et al., 2024). Unlike conventional methods that rely heavily on textbooks, lectures, and peer discussions, ChatGPT provides instant explanations and clarifications, improving the learning process. However, this convenience may come at the cost of reduced engagement with material and diminished critical thinking. Over-reliance on AI tools might hinder deep comprehension and problem-solving skills (H. K. Kim, Nayak, et al., 2024).

### 4.1. ChatGPT as a personalized tutor, counselor, interpreter, mentor, and friend

Beyond serving as an academic assistant, ChatGPT has been used in a variety of supportive roles for students, including acting as a tutor by offering explanations and guidance on academic subjects, a counselor by providing stress-relief strategies and time-management tips, an interpreter by assisting non-native speakers in understanding and translating content, a mentor by guiding career planning and personal development, and even as a friend through casual conversation and companionship (Acosta-Enriquez et al., 2024; Taniguchi et al., 2019). This multifaceted functionality can enhance the student experience by offering support across both academic and personal domains; however, it may also increase students' over-reliance on emotional support, potentially impacting their social development.

### 4.2. Critical thinking and academic resilience

The ease of access to information through ChatGPT may discourage students from deep engagement and critical analysis. To mitigate this, faculty can adopt several strategies. One approach is to promote active learning by encouraging methods that require students to analyze, evaluate, and create, thereby fostering deeper understanding. Another strategy involves integrating assignments that ask students to critique the accuracy and reliability of ChatGPT-generated content, which helps sharpen their evaluative skills (Stadler et al., 2024; D. Kim, Nayak, et al., 2024). Additionally, setting clear guidelines on the appropriate use of AI, emphasizing its role as a supplementary aid rather than a primary source, can help frame its purpose more effectively. Finally, offering workshops on digital literacy can educate students about both the strengths and limitations of AI tools, encouraging informed and responsible use.

### 4.3. ChatGPT's role and second-language students

For students learning in a non-native language, ChatGPT serves as a valuable resource by assisting with language clarification, helping them understand complex terminology and idiomatic expressions. It also supports writing improvement through grammar and style suggestions, aiding in the development of stronger writing skills. Additionally, it offers pronunciation guidance, providing phonetic assistance to enhance spoken language proficiency. While these features can significantly support language acquisition, it is crucial for students to balance AI assistance with active language practice to ensure comprehensive skill development.

### 4.4. Key research findings

Aligned with the six research questions (RQ1–RQ6) shown in Fig. 3b, key findings from the reviewed studies are summarized in Fig. 6. For RQ1 (Academic Performance), multiple studies report that ChatGPT supports learning by offering personalized feedback, clarifying complex topics, and improving writing and reading skills. However, some studies

**RQ01**

- Huang et al. (2023) demonstrated that students who received AI-based personalized interventions during an 8-week Python course showed notable improvements in learning outcomes, effort regulation, and peer learning.
- Johnson et al. (2024) found that students using ChatGPT for Arduino programming performed comparably to those who self-programmed, with the ChatGPT group achieving a higher proportion of perfect scores.
- Chen et al. (2024) reported significant gains in EFL writing proficiency using the MsCAEWL system.
- Ngo et al. (2024) observed that perceived usefulness and satisfaction were strong predictors of continued academic use.

**RQ02**

- Stadler et al. (2024) found that while ChatGPT reduced cognitive load during learning tasks, it also led to weaker reasoning and argumentation.
- Gao (2024) showed a substantial decrease in test anxiety among students who attended a workshop on educational uses of ChatGPT.
- Sayed et al. (2024) documented improvements in emotional well-being, autonomy, and academic buoyancy among EFL learners.
- Duong et al. (2024) cautioned against compulsive ChatGPT use, which was associated with increased loneliness, social withdrawal, and psychological distress.
- Yin et al. (2024) added nuance, reporting that reflective feedback via chatbots reduced negative emotions but did not significantly boost intrinsic motivation.

**RQ03**

Sayed et al. (2024) reported significant gains in speaking ability, emotional well-being, and learner autonomy among EFL students using ChatGPT for personalized feedback.

- Chen et al. (2024) found that the MsCAEWL writing system, powered by ChatGPT, improved EFL writing quality through semantic-based feedback.
- Liu (2024) examined how writing anxiety influenced ESL learners' attitudes toward ChatGPT, finding a strong link between anxiety levels and tool adoption.
- Koltovskaya et al. (2024) found that while ESL students appreciated ChatGPT's paraphrasing capabilities, they were skeptical of its feedback accuracy, pointing to a need for guidance in critical use.

**RQ04**

- Zogheib and Zogheib (2024) found that perceived usefulness, ease of use, and social influence significantly shaped students' intention to adopt ChatGPT, with trust acting as a key mediator.
- Gulati et al. (2024) noted that habit and performance expectancy were the strongest predictors of adoption, whereas perceived risk did not deter usage.
- Ngo et al. (2024) further emphasized that students who reported high satisfaction with ChatGPT were more likely to continue using it, suggesting peer validation reinforces adoption behavior.

**RQ05**

- Hammoda (2024) illustrated how students used ChatGPT to form venture teams in an entrepreneurship course, demonstrating creative problem-solving in role definition and equity distribution.
- D. Kim et al. (2024) found that ChatGPT enhanced lab report writing, helping students improve rhetorical quality and structure.
- Tu (2024) observed that students' engagement and critical thinking varied with their growth mindsets, indicating ChatGPT's role in stimulating reflection and ideation depending on individual learner traits.

**RQ06**

- Farhi et al. (2023) found that while students recognized ChatGPT's value, they also expressed apprehensions about its impact on academic integrity.
- Gammoh (2024) echoed these concerns from the faculty perspective, citing risks such as plagiarism, overdependence, and reduced critical thinking.
- Ajlouni et al. (2023) highlighted both the promise and challenges of using ChatGPT in counseling education, calling for responsible use.
- Salah et al. (2024) warned of increasing student reliance on ChatGPT, potentially driven by intrinsic motivations.
- Al-kfairy (2024), in a narrative review, emphasized the need for clear institutional guidelines and ethical policies to govern the responsible use of generative AI tools in academic contexts.

**Fig. 6.** Key Findings based on Research Questions. Source: Authors.

warn that unguided use may encourage surface-level learning and reduce critical thinking (Huang et al., 2023; Sandu et al., 2024). These mixed results likely reflect differences in usage strategies, learner profiles, and context.

Regarding RQ2 (well-being), ChatGPT can ease academic anxiety but raises concerns about overdependence and reduced motivation, especially under stress. Likewise, RQ3 (second -language learners) shows ChatGPT helps improve academic voice and engagement through better grammar, content refinement, and writing fluency. For RQ4 (Peer Pressure), peer influence plays a major role in adoption. Students often

follow peer trends more than institutional rules. Moreover, RQ5 (Creativity and Inspiration) highlights ChatGPT's value as a brainstorming tool that supports divergent thinking and creative exploration when used interactively. Finally, RQ6 (Ethical and Policy Implications) raises concerns about academic integrity, authorship, and access equity. Most studies recommend clear institutional guidelines and digital literacy training to ensure responsible use.

## 5. Conclusions and future directions

Our review underscores ChatGPT's growing influence in higher education, offering clear benefits such as enhanced learning, reduced anxiety, and fast personalized feedback. Its popularity among students positions it as a powerful academic tool. However, concerns remain around over-reliance, reduced critical thinking, academic integrity, and equity issues. These challenges highlight the need for thoughtful integration supported by ethical guidelines, AI literacy, and multidisciplinary collaboration. Institutions must adopt balanced strategies that promote ChatGPT's strengths while addressing its risks. This includes training educators and students on ethical use, developing culturally sensitive AI frameworks, and tailoring adoption across academic disciplines. The global scope of reviewed studies adds valuable insights but also introduces limitations due to varying methods, contexts, and languages.

Future research should include longitudinal studies to assess long-term impacts on learning and critical thinking. Greater focus is also needed on underrepresented regions, emotional well-being, and discipline-specific applications. Robust, transparent frameworks are essential to ensure responsible use that prioritizes academic integrity and inclusivity. As AI continues to shape education, ongoing research and policy development will be key to ensuring that tools like ChatGPT enhance, not replace, the core values of higher education.

## CRediT authorship contribution statement

**Naya Abdallah:** Writing – original draft, Conceptualization. **Rateb Katmah:** Writing – review & editing, Investigation. **Kinda Khalaf:** Writing – review & editing, Supervision. **Herbert F. Jelinek:** Writing – review & editing, Supervision.

## Data availability statement

This is a review article. All data analyzed in this study are from previously published studies, which are cited in the references. No new data were generated.

## Declaration of the use of AI assisted technologies

During the preparation of this work the authors used ChatGPT for proof reading and spell checking. The authors reviewed and edited the content as needed and take full responsibility for the content of the publication.

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## Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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