

Students' Perceptions of AI-based Learning Assistants (AILAs) in Higher Education: A Systematic Review

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Abstract

AI-based learning assistants (AILAs) have transformed traditional ways of learning in higher education through enhanced self-regulation, improved academic engagement, and immediate feedback. Despite the growing body of research on AILA utilization in postsecondary education, few studies have examined how students view these AILAs and their educational effect on learning. To examine students' perceptions of AILAs in higher education, the researchers conducted a systematic literature review of 1,852 peer-reviewed publications from the Scopus database, published between 2015 and 2025. Framed by the Technology Acceptance Model's emphasis on perceived usefulness and perceived ease of use, the final analysis included 54 studies. Publication trends for AILA scholarships were also reported. The analysis uncovered postsecondary students' conflicting opinions about AILAs. While students recognize advancements in writing competence, motivation, and self-regulation, students also express concerns about AILA over-reliance, lack of creativity, and limitations in critical thinking. The analysis also uncovered growing concerns about the negative long-term effects of AILAs on students' independent thinking and creativity. Implications are discussed for pedagogical strategies to emphasize critical engagement with AI in addition to operational use.

Keywords: AI, learning assistant, students' perceptions, higher education

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Artificial intelligence (AI) is transforming the educational landscape through cutting-edge tools that facilitate teaching and learning alike (Hwang et al., 2020; Kayalı et al., 2023; Villatoro Moral & Moreno-Tallón, 2025; Zawacki-Richter et al., 2019). AI-powered solutions such as digital chat systems, intelligent educational assistants, and automatic grading mechanisms are becoming indispensable (Harry & Sayudin, 2023; Zawacki-Richter et al., 2019), particularly at the college-level where independent study and customized academic support are highly valued. AI applications can function as real-time tutors and content generators, aiding learners in their educational processes (Hazaimh & Al-Ansi, 2024). AI educational applications for learning support are categorized into three groups: personal tutoring, intelligent collaborative learning support, and intelligent virtual reality (Luckin et al., 2016). These technological supports offer real-time feedback, flexible support, and individualized learning experiences to both teachers and students (Hazaimh & Al-Ansi, 2024). Because AI tools maximize the precision and effectiveness of feedback systems, they may be particularly effective at promoting learning outcomes, supporting self-directed learning and thus engaging and maintaining learners' attention (Hwang et al., 2020).

AI-based learning assistants (AILAs) are conceptualized in this study as AI-powered tools situated within the broader field of artificial intelligence in education, which integrates technologies designed to support learning through personalization, feedback, and task automation (Holmes et al., 2019; Zawacki-Richter et al., 2019). AILAs are intended to improve students' learning experiences through the provision of immediate feedback, automation of routine cognitive tasks, and support for self-regulated learning processes (Hwang et al., 2020). AILAs can enhance efficiency, decrease cognitive load, and foster autonomous learning (Hwang et al., 2020). AI writing assistants, for instance, deliver iterative feedback to support students' refinement of their texts, whereas chatbots clarify complex course content and support problem-based learning environments (Du et al., 2025). The widespread adoption of AILAs presents challenges concerning academic integrity, dependency, and the decline of advanced cognitive abilities (Bond et al., 2024). These concerns justify an in-depth exploration of the conditions shaping how students accept and use AILAs, underscoring the significance of theoretical frameworks that clarify technology acceptance within educational settings. Further, although AILAs have been shown to improve motivation, support academic achievement, and respond to diverse student needs (Avcı, 2024; Malik et al., 2023), limited research has examined how students actually perceive and experience these tools. From the student perspective, concerns such as overreliance on AILAs, ethical dilemmas, and the inability of these systems to handle more complex academic tasks remain largely unexplored (Zhang et al., 2024). These concerns point to a clear gap in the literature. While AILAs are increasingly promoted as valuable teaching and learning tools, their effectiveness ultimately depends upon whether they align with students' expectations, preferences, and learning styles in higher education.

Addressing this gap requires first synthesizing available literature on the rapidly advancing use of AILAs in postsecondary education. The present systematic review examined existing studies on students' perceptions of AILAs, highlighted common trends, and identified areas that require further investigation. The study was guided by the following research questions:

RQ1: What are the publication trends, geographical distributions, research methodologies, and educational levels of participants in studies on AILAs in higher education reported in the reviewed literature?

RQ2: How have different types of AILAs and their educational effects on students' learning experiences in higher education been addressed in the reviewed literature?

RQ3: How have students' perceptions of AILAs in higher education been addressed in the reviewed literature?

We begin by summarizing the Technology Acceptance Model as our theoretical framework, then describing our methods before reporting the findings, and finally discussing their implications for research and practice.

Technology Acceptance Model (TAM) as a Theoretical Framework

The Technology Acceptance Model (TAM; Davis, 1987) frames our analysis of students' acceptance and utilization of AILAs. Within the TAM framework, two central constructs influence the adoption of technology: perceived usefulness, defined as the degree to which individuals believe the technology enhances academic performance, and perceived ease of use, referring to the level of effort users associate with operating the system (Davis, 1987). Acceptance of a system increases compared to others when users perceive the system as both useful and easy to use (Davis, 1987; Šumak et al., 2011; Venkatesh & Davis, 2000). Furthermore, other scholars have demonstrated how TAM not only explains initial adoption but also offers a lens to explore students' attitudes toward use, such as overreliance or ethical discomfort (Kanont et al., 2024; Zhang et al., 2024). These attitudes are critical to understanding the underexplored challenges surrounding AILAs in higher education. The constructs have undergone extensive validation within higher education contexts, especially in research focused on the adoption of digital learning tools, and e-learning platforms, such as AI-powered platforms (Abdullah & Ward, 2016; Hazaimah & Al-Ansi, 2024; Lai et al., 2023).

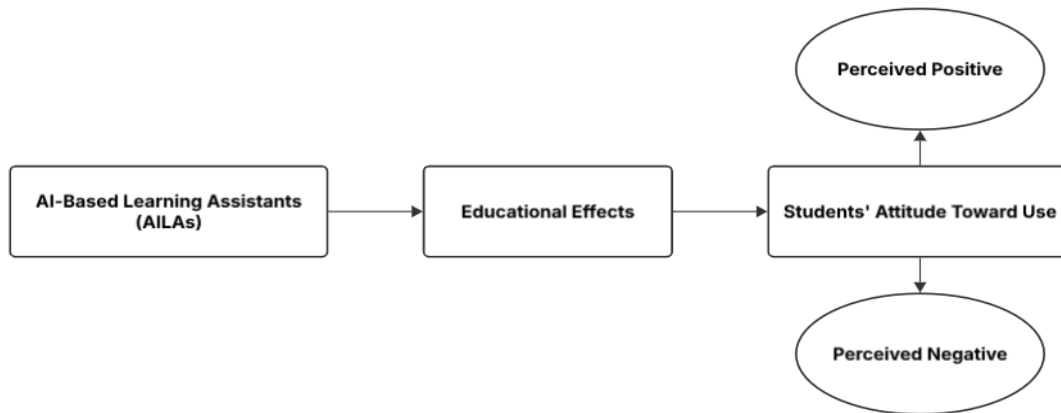
Recent research applying TAM to AI-based learning environments highlights that students' willingness to adopt AILAs is significantly determined by individuals' views on the efficiency and user-friendliness of the tools. For example, Lai et al. (2023) found that perceived usefulness was a key determinant of students' sustained engagement with AI-powered chatbots for academic support. Beliefs in a technology's relevance to the educational context can foster students' learning engagement (Lai et al., 2023). Similarly, Hazaimah and Al-Ansi (2024) and Venkatesh and Davis (2000) reported that perceived ease of use functioned as a mediating factor between initial engagement and long-term satisfaction with AI-driven learning tools in online courses, while Šumak et al. (2011) asserted that both perceived usefulness and perceived ease of use influence shape users' attitude toward adoption of e-learning technologies

In this study, the researchers modified the TAM into a simplified conceptual model to address the gap of students' perspectives and experiences of using AILAs, as TAM is appropriate and relevant because this framework helps to understand students' attitudes toward use of AILAs (Kanont et al., 2024; Zhang et al., 2024). The model highlights three key dimensions across the reviewed studies: (1) AILAs as external stimuli, (2) AILAs' educational effects (e.g., improved fluency, increased motivation, reduced creativity), and (3) students' attitudes toward using AILAs, as influenced by their experiences (see Figure 1). Students' perceptions of AILAs were contextualized by discussing both perceived positive and perceived negative perspectives within a comprehensive framework of technology acceptance. The researchers further distinguished TAM's original focus on affective response by adding categorizations for perceived positive attitude towards use and perceived negative attitude

towards use. This distinction was necessary to nuance the examination of students' affective responses.

Figure 1

Modified TAM Framework



Note. This is the modified version of TAM framework.

As shown in Figure 1, AILAs, including tools such as ChatGPT, Grammarly, and AI-driven chatbots, are conceptualized as external technological stimuli that influence educational effects, such as improved fluency, increased motivation, or reduced creativity. These educational effects then shape students' overall attitudes toward using AILAs in academic contexts. From this central attitudinal dimension, students' perceptions are further categorized into two distinct pathways: perceived positive and perceived negative. The model demonstrates that students' attitudes toward AILAs influence their perception of these tools. Perceptions may be positive, emphasizing benefits, or negative, highlighting concerns and limitations.

Method

Systematic review of the literature is a powerful tool for analyzing rapidly advancing knowledge in a novel field or area of study, such as the role of AI in education; previously, scholars have applied systematic review methods to examine AI and inclusive education (Villatoro Moral & Moreno-Tallón, 2025). In this section, we present our research methods.

Research Design

We conducted a review of the relevant literature on the application of AILAs in narrative writing in accordance with the Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) extension for scoping reviews standards (Tricco et al., 2018). The four primary processes of this evaluation were (1) identification, (2) screening, (3) eligibility, and (4) inclusion. The selection of PRISMA criteria was predicated on the recognition of the approach as scientific, methodical, and well-suited to the requirements of this systematic review (Moher et al., 2009). Utilizing PRISMA criteria enables readers to assess the research's conduct and

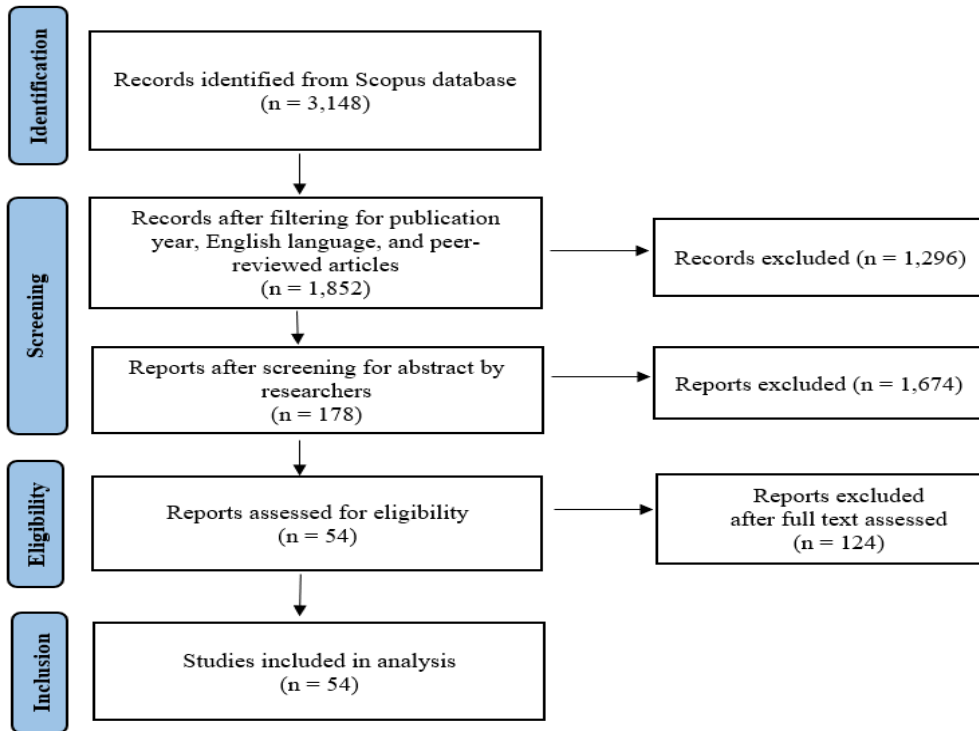
credibility, thereby demonstrating the study's replicability (Moher et al., 2009). The transparent and comprehensive documentation of the review procedure ensures the quality of the study. Importantly, employing PRISMA alongside the TAM model allowed us to connect the systematic evaluation of AILAs with users' perceived usefulness and ease of use. This connection clarified why TAM is an appropriate framework for interpreting the findings of this review.

Search Terms and Process

The Scopus database was chosen for the search because of its vast variety of peer-reviewed articles in technology and education and its features that facilitate focusing and narrowing down search results (Leydesdorff et al., 2015). Other databases, like the Education Resource Information Center (ERIC) and Web of Science (WoS), were taken into consideration but not used because of their similar content and the desire to keep the scope of the analysis modest. Boolean operators and targeted keywords were utilized to identify the most pertinent results through the search string ("AI learning assistants" OR "artificial intelligence in education") AND ("post-secondary education" OR "higher education") AND ("student perspectives" OR "student experiences" OR "student attitudes" OR "student feedback") AND ("effectiveness" OR "impact" OR "benefits" OR "challenges"). The initial search yielded 3,148 articles. The number was lowered to 1,852 after applying filters for peer-reviewed English-language articles published between 2015 and July 2025.

Inclusion and Exclusion Criteria

Each of the 1,852 abstracts was reviewed to determine whether the article met the established inclusion and exclusion criteria. The inclusion requirements included a focus on AILAs, student perspectives, the postsecondary educational context, and empirical investigations. Exclusion criteria targeted studies that were not directly related to AILAs (e.g., Birks & Clare, 2023; Devassy et al., 2023), did not investigate student perspectives on AI as learning assistants (e.g., Huang et al., 2023), or did not focus on postsecondary education. Following the application of the aforementioned criteria, 178 papers were selected for further consideration. After a full-text evaluation based on relevance to higher education, a focus on AILAs rather than general AI tools, and the presence of empirical data, 54 studies were selected for further examination (see Figure 2).

Figure 2*PRISMA Flowchart for Article Selection*

Note. This figure summarizes the study selection process.

Analysis Process

Analysis entailed the extraction, coding, and synthesis of data. To address the first research question, the 54 reviewed studies were examined to explore patterns in publication years, geographical scope, methodological approaches, and participant profiles. The types of AILAs and their educational effects were identified from the reviewed literature and examined to address the second research question. To answer the third research question regarding students' perspectives on the use of AILAs, the two main types of attitudes addressed in the reviewed studies were employed: positive and negative. Following the collection and organization of the data, a thematic analysis approach was employed to identify key implications and insights for further discussion, particularly related to the studies' mention of dependence on AILAs and student perceptions of whether AILAs can handle challenging assignments (Braun & Clarke, 2006). Thematic analysis, which relies on inductively generated themes, is a widely used qualitative method that allows for accessible and systematic interpretation of textual data. The analysis followed Braun and Clarke's (2006) six-phase process: (1) familiarization with the data, (2) generation of initial codes, (3) searching for themes, (4) reviewing themes, (5) defining and naming themes, and (6) producing the report. Initial codes and emerging themes were manually tracked and organized using Microsoft Excel. To enhance coding rigor, the authors independently reviewed and compared their coding notes and resolved discrepancies through iterative discussions until consensus was reached. A modified TAM served as the theoretical framework guiding coding and interpretation steps.

Results

Drawing on evidence from 54 reviewed articles, the findings are organized around the three research questions, offering a comprehensive overview of current scholarships on AILAs.

Publication Trends, Geographical Distributions, Research Methodologies, and Educational Levels of Participants in Studies on AILAs in the Reviewed Literature (RQ1)

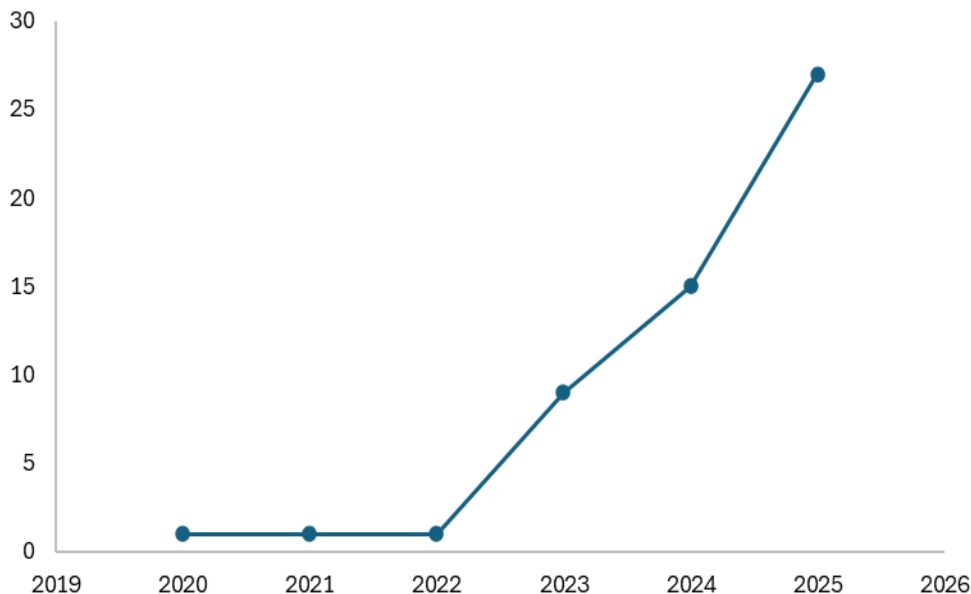
Analyzing publication trends in recent research on AILAs can offer insights about the scholars and scholarship exploring AILAs as well as the types of students who are presumed to utilize AILAs. The characteristics of the selected papers, including the year of publication, the countries represented in the reviewed studies, the research methodology employed, and the educational backgrounds of the study participants, are presented below.

Publication Trends

Figure 3 presents the distribution of the included articles by publication year. The data indicates a sharp increase in publications in 2025, with 27 articles (50%) published that year. This represents a significant rise compared to 2024 with 15 articles (27.9%) and 2023 with 9 articles (16.7%). In contrast, only one article (1.8%) was published in each of the years 2020, 2021, and 2022. This upward trend highlights the growing interest in AILAs in higher education, likely driven by the increasing presence and influence of AI technology in recent years.

Figure 3

Reviewed Article Distribution by Year



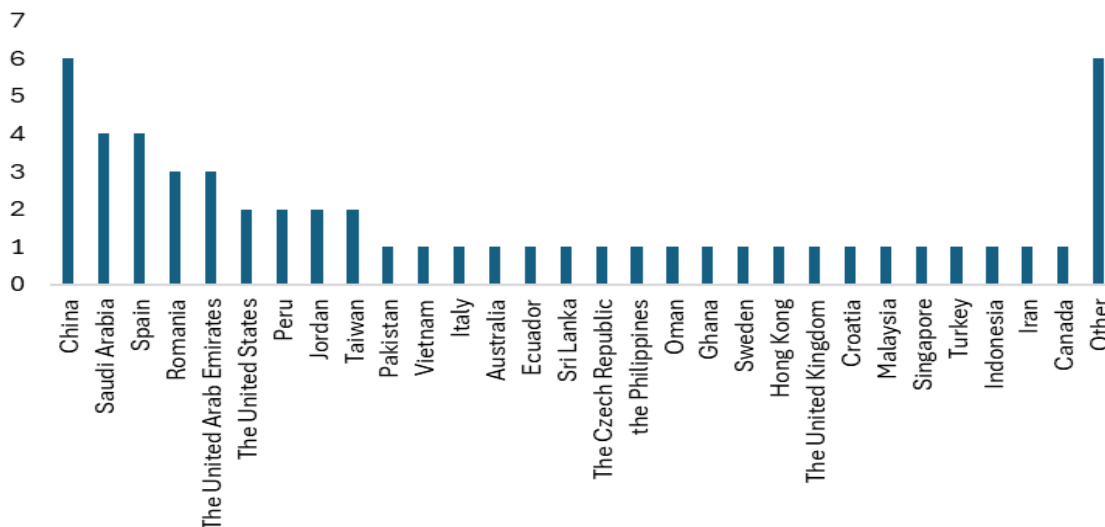
Note. The figure includes only the articles selected for the final review.

Geographical Distributions

As shown in Figure 4, the included articles represented a wide geographical distribution. China contributed the highest number with 6 articles (11.2%), followed by Saudi Arabia and Spain with 4 articles each (7.5%). Romania and the United Arab Emirates produced 3 articles each (5.7%). The United States (USA), Peru, Jordan, and Taiwan each contributed 2 articles (3.8%). A wide range of countries, including Pakistan, Vietnam, Italy, Australia, Ecuador, Sri Lanka, the Czech Republic, the Philippines, Oman, Ghana, Sweden, Hong Kong, the United Kingdom, Croatia, Malaysia, Singapore, Turkey, Indonesia, Iran, and Canada were each represented by 1 article (1.8%). The Other category, which comprises multi-country and global studies, accounted for 6 articles (11.2%).

Figure 4

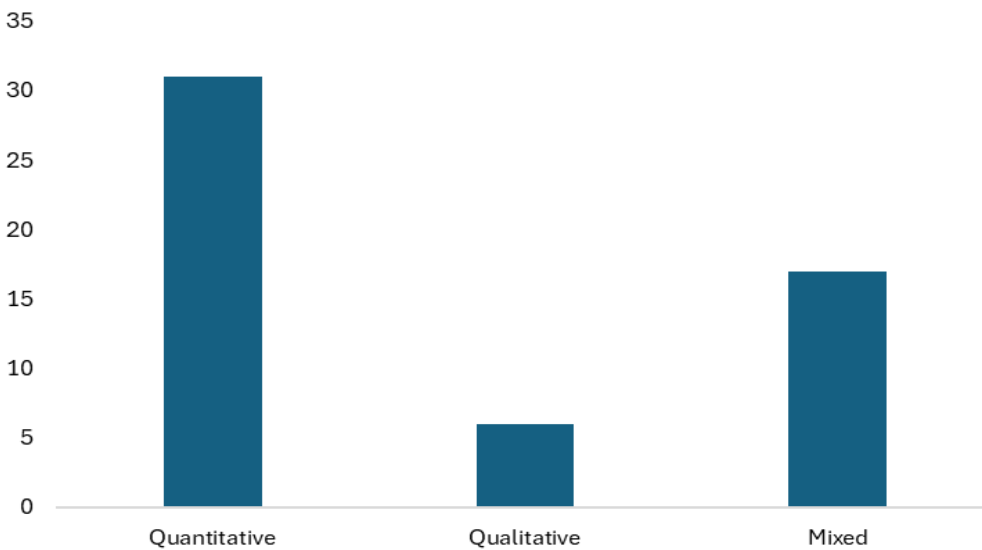
Reviewed Article Distribution by Nation



Note. The “Other” category includes multi-country and global studies such as Latin America and Europe (10 countries), Australia and China, the United Arab Emirates and Saudi Arabia, Egypt–Iraq–Jordan–Kuwait–Lebanon, and Global (109 countries).

Research Methodologies

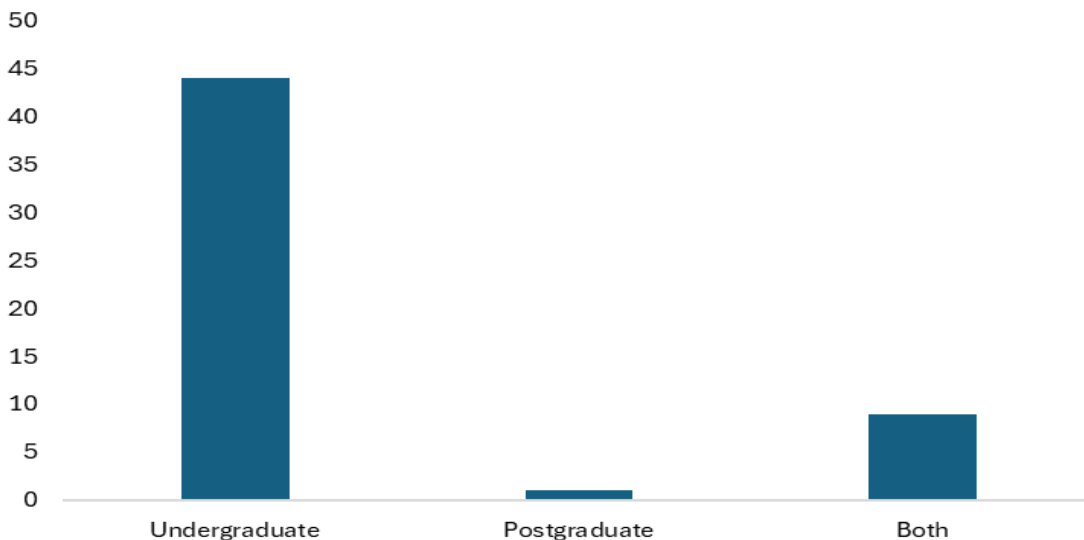
Figure 5 illustrates the distribution of methodologies employed in the reviewed studies. A majority of the studies, 31 articles (57.4%), employed quantitative methods. Mixed methods, which integrate both quantitative and qualitative approaches, were used in 17 studies (31.4%). In contrast, qualitative methods appeared in only 6 studies (11.2%). This distribution indicates a strong preference for quantitative and mixed-method designs, reflecting an emphasis on statistical analysis and integrative approaches to evaluate the role and effectiveness of AILAs in higher education. The relatively limited use of qualitative research suggests that fewer studies engaged in in-depth, exploratory analyses of students’ perceptions, such as ethical considerations, concerns about reliance on AILAs, or the capacity of these tools to support complex academic tasks.

Figure 5*Research Methodologies*

Note. This figure shows the research methodologies used in the reviewed literature.

Educational Levels of Study Participants

Figure 6 illustrates the educational backgrounds of the participants in the reviewed studies. A large majority of the studies, 44 (81.5%), focused exclusively on undergraduate students. Nine studies (16.7%) involved both undergraduate and graduate participants, while only one study (1.8%) concentrated solely on postgraduate students. This strong emphasis on undergraduates indicates that most research on AILAs has prioritized their impact on the undergraduate population, with comparatively limited attention to graduate-level contexts.

Figure 6*Participants' Educational Levels*

Note. This chart illustrates the educational level of the participants in the reviewed articles.

AILA tools and Their Educational Effects Addressed in Reviewed Studies (RQ2)

The second research question sought to illuminate observable changes in students' learning outcomes and academic behaviors, rather than on students' attitudes or perceptions, resulting from the use of AILAs. Across the 54 reviewed studies, AILAs have been utilized in various educational contexts (see Appendix). Researchers report that writing support tools, such as Grammarly, ChatGPT, and Turnitin, assist with grammar correction, paraphrasing, plagiarism detection, and writing structure improvements (Črček & Patekar, 2023; Du et al., 2025; Malik et al., 2023; Nazari et al., 2021; Nelson et al., 2025; Nishshanka et al., 2025; Stöhr et al., 2024; Wang & Ren, 2024). AI-speaking assistants have been found to support oral practice, grammatical accuracy, and self-paced language learning (Almassaad et al., 2024; Alzubi et al., 2025; Slepankova et al., 2025; Tu & Hwang, 2024; Zakwani & Binu, 2025; Zou et al., 2023). Conversational chatbots can provide real-time feedback, enhance self-regulated learning, and facilitate personalized tutoring (Jasin et al., 2023; Lee et al., 2022; Li et al., 2025; Sáiz-Manzanares et al., 2023; Sallam et al., 2024; Shuhaiber et al., 2025; Slepankova et al., 2025; Tbaishat et al., 2025). ChatGPT has been shown to assist in research idea generation, academic writing, and collaborative learning by offering instant responses and structured information (Ajlouni et al., 2023; Al-Abdullatif, 2023; Anghel et al., 2025; Blahopoulou & Ortiz-Bonnin, 2025; Farinosi & Melchior, 2025; Hamid et al., 2023; Hazari, 2025; Kayalı et al., 2023; Wang & Ren, 2024; Zhang et al., 2025).

Writing Support Tools and Their Impacts

Researchers reported wide utilization of AI based writing assistance tools like Grammarly, QuillBot, Turnitin, and ChatGPT to support students with content creation, grammar correction, paraphrasing, and plagiarism detection (Almassaad et al., 2024; Du et al., 2025;

Nelson et al., 2025; Nishshanka et al., 2025; Wang & Ren, 2024). Studies have shown that students experience increased self-efficacy, inventiveness, and writing efficiency while using AILAs. In Malik et al. (2023) for example, students reported improved time management and writing skills, and qualitative feedback indicated less cognitive load when composing essays. According to pre- and post-assessment tools, doctorate students who used AI writing helpers also reported their experiences as they have much higher writing confidence and lower anxiety (Farinosi & Melchior, 2025; Hazari, 2025; Nazari et al., 2021). Importantly, an investigation by Črček and Patekar (2023) revealed that 57% of undergraduate participants felt ChatGPT helped them generate ideas and write more clearly, reflecting a growing dependence on AILAs in academic work (see also Ravšelj et al., 2025; Villarino, 2025). The authors further cautioned that students might begin to rely on these tools as a substitute for developing their own learning skills. Students' increasing reliance without evidence of students' commensurate increasing intentionality of use has raised broader concerns, as some researchers warn that AILAs may hinder undergraduates' use of critical thinking and their problem-solving abilities (Alzubi et al., 2025; Kayalı et al., 2023; Morell-Mengual et al., 2025). Moreover, because these tools currently struggle with complex or discipline-specific tasks, they may have limited effectiveness for advanced academic assignments (Jasin et al., 2023; Kim et al., 2025; Le et al., 2025).

Speaking and Pronunciation Assistants for Language Development

In language learning contexts, AI-powered speaking tools like English Liulishuo and IELTS Liulishuo have been included to enhance grammatical accuracy, fluency, and pronunciation (Alzubi et al., 2025; Lin & Chang, 2020; Nelson et al., 2025; Zakwani & Binu, 2025). Survey results from Zou et al.'s (2023) study showed that students' oral ability and speaking confidence significantly improved, with positive comments emphasizing the AILAs' real-time remedial feedback (see also Slepankova et al., 2025). Furthermore, Tu and Hwang (2024) emphasized that students, especially those who lacked opportunities for in-person conversation practice, enjoyed the flexibility of AI-powered speaking tools that enabled self-paced learning and repeated practice (Kim et al., 2025; Shuhaiber et al., 2025).

Conversational Chatbots for Interactive Learning

Conversational chatbots have been studied in a number of domain-specific postsecondary courses, including chemistry, public health, and pharmacy (Swidan et al., 2025; Tbaishat et al., 2025). Students gave chatbots an average rating of 4.20 out of 5 for utility and 4.01 for enjoyment (Al-Abdullatif, 2023), indicating a high level of satisfaction with AI-enabled learning support (Shuhaiber et al., 2025). Chatbots were utilized to walk students through case-based scenarios, explain difficult topics, and offer real-time solutions (Slepankova et al., 2025). However, Jasin et al. (2022) and Lee et al. (2022) raised concerns related to undergraduates' reports of inconsistent and partial responses, especially when discussing complex topics with chatbots. These findings suggest that while undergraduate students appreciated the convenience and idea-generation support offered by chatbots, many still perceived them as lacking the depth needed for expert-level academic help, potentially limiting their perceived usefulness in more advanced learning contexts (Farinosi & Melchior, 2025; Jasin et al., 2023; Malik et al., 2023; Ravšelj et al., 2025; Stöhr et al., 2024).

ChatGPT as a Multifunctional Academic Assistant

Among AILAs, ChatGPT may be the most widely recognized tool. Indeed, several publications report how ChatGPT has been used for a variety of academic tasks, including developing research ideas, responding to topic-specific questions, and writing essays (Abdaljaleel et al., 2024; Alghazo et al., 2025; Blahopoulou & Ortiz-Bonnin, 2025; Farinosi & Melchior, 2025; Hazari, 2025; Ravšelj et al., 2025; Villarino, 2025; Zhang et al., 2025). Using a descriptive quantitative design and a questionnaire based on the ABC model of attitude, Ajlouni et al. (2023) found that 73.2% of surveyed undergraduate students viewed ChatGPT as improving their learning experience. This improvement was attributed to enabling task completion and offering instant feedback (Anghel et al., 2025; Du et al., 2025; Li et al., 2025; Nishshanka et al., 2025; Sallam et al., 2024). All 18 pharmacy undergraduates in Hamid et al.'s (2023) small exploratory study described ChatGPT's role in fostering cooperation and group achievement. This further demonstrates AILAs' efficacy in collaborative problem-based learning (Shuhaiber et al., 2025; Zakwani & Binu, 2025). Despite these educational effects, undergraduate students expressed doubts regarding the authenticity of AI-generated content, particularly in technical disciplines, and the possibility of decreased cognitive engagement if it is over-relied upon (Hamid et al., 2023; Kim et al., 2025; Le et al., 2025; Li et al., 2025; Morell-Mengual et al., 2025).

Reports of Student Perceptions (RQ3)

All 54 reviewed papers reported both positive and negative student perceptions toward use of AILAs; none of the included studies presented solely positive or negative perceptions (see Appendix). This consistent pattern highlights the dual nature of students' attitudes, revealing how AILAs are simultaneously viewed as beneficial tools and as sources of concern. While AILA tools have been found to increase motivation and engagement (Al-Abdullatif, 2023; Baidoo-Anu et al., 2024; Cavazos et al., 2025; Hamid et al., 2023; Jasin et al., 2023; Jin et al., 2025; Swidan et al., 2025), writing efficiency and confidence (Du et al., 2025; Lin & Chang, 2020; Malik et al., 2023; Nazari et al., 2021; Nelson et al., 2025; Zakwani & Binu, 2025), and self-efficacy in academic performance (Ajlouni et al., 2023; Kim et al., 2025; Le et al., 2025; Lee et al., 2022) at the undergraduate and graduate levels, they also raise concerns about privacy risks (Acosta-Enriquez et al., 2024a, 2024b; Al-Abdullatif, 2023; Hamid et al., 2023; Jasin et al., 2023; Jin et al., 2025; Morell-Mengual et al., 2025), ethical issues (Črček & Patekar, 2023; Gasaymeh et al., 2024; George-Reyes et al., 2025; Stöhr et al., 2024; Țală et al., 2024), and an excessive reliance on AILA tools (Alzubi et al., 2025; Blahopoulou & Ortiz-Bonnin, 2025; Hazari, 2025; He et al., 2025; Kayalı et al., 2023; Malik et al., 2023; Nazari et al., 2021; Ravšelj et al., 2025; Zhou et al., 2024). Additionally, while AILAs support metacognition and self-regulation (Hamid et al., 2023; Sáiz-Manzanares et al., 2023; Shuhaiber et al., 2025; Slepankova et al., 2025), students perceived that AI remains limited in fostering higher-order cognitive skills (Anghel et al., 2025; Han et al., 2025; Pisica et al., 2024; Sáez-Velasco et al., 2025; Sáiz-Manzanares et al., 2023; Tu & Hwang, 2024; Wang & Ren, 2024).

Learning Engagement and Motivation

One of the most consistently reported perceived positive outcomes of AILAs is their ability to enhance student engagement and motivation. Zou et al. (2023) found that students in AI-assisted learning environments demonstrated significantly higher motivation scores ($M = 4.22$, $SD = 0.52$) compared to control groups ($M = 3.67$, $SD = 0.36$), with the difference being statistically significant ($F = 5.39$, $p < 0.05$). This suggests that AILAs offer an interactive learning experience that increases enthusiasm and time-on-task—clearly a perceived positive effect associated with usefulness (Baidoo-Anu et al., 2024; Cavazos et al., 2025; Jin et al., 2025; Swidan et al., 2025). Likewise, Malik et al. (2023) noted that AI-supported peer collaboration tools, such as AI-assisted writing feedback systems, encouraged students to engage more in iterative revision processes. This finding is consistent with evidence from other studies (Aldossary et al., 2024; Du et al., 2025; Nelson et al., 2025). The use of chatbots in Problem Based Learning (PBL) also led to higher levels of peer-to-peer interaction and discussion (Nazari et al., 2021; Tbaishat et al., 2025; Villarino, 2025). In another study, Hamid et al. (2023) observed that AILAs increased student motivation and participation in asking questions during PBL sessions. However, some students questioned the credibility of AI responses, reflecting a perceived negative concern (Alzubi et al., 2025; Hazari, 2025; Morell-Mengual et al., 2025).

Academic Writing Support and Self-Efficacy

AILAs were also associated with perceived positive impacts on writing confidence and self-efficacy. Jasin et al. (2023) found that 88% of students expressed willingness to continue using AI-powered tools for grammar correction, idea development, and content refinement (see also Du et al., 2025; Nelson et al., 2025; Zakwani & Binu, 2025). Al-Abdullatif (2023) further supported this, as students reported reduced writing anxiety and improved self-editing abilities (see also Farinosi & Melchior, 2025; Hazari, 2025).

Similarly, Lee et al. (2022) reported that AI-assisted writing interventions led to a significant increase in writing self-efficacy (Cohen's $d = 0.54$, 95% CI [0.18, 0.91]). This indicates that students felt more capable in their writing ability after using AILAs (Kim et al., 2025; Le et al., 2025). This improvement in writing self-efficacy also represents a perceived positive outcome toward use of AILAs, as the learning assistant tool contributed to students' confidence in their academic writing ability. In PBL contexts, students found these tools helpful in reducing stress and organizing their problem-solving process (Hamid et al., 2023; Nishshanka et al., 2025; Shuhaiber et al., 2025; Slepankova et al., 2025). These findings highlight the potential of AILAs to support not only task completion but also learners' academic development and emotional well-being, suggesting their broader applicability across diverse learning environments.

Ethical and Reliability Concerns

Despite these benefits, several studies identified perceived negative concerns about ethics and reliability in AILA use. Sáiz-Manzanares et al. (2023) found that 70% of students expressed doubts about misinformation and bias in AI-generated outputs, and 20.7% felt uncomfortable using AILAs due to concerns about data accuracy (see also Alamäki et al., 2024; Gasaymeh et al., 2024; George-Reyes et al., 2025; Morell-Mengual et al., 2025; Țală et al., 2024). However, the

study did not measure changes in data accuracy between the use of or absence of AI and so the researchers could not determine whether students' negative attitudes were warranted. Similarly, Lin and Chang (2020) reported that 69% of students worried about unintentional plagiarism from AI-generated content (see also Acosta-Enriquez et al., 2024a; He et al., 2025; Stöhr et al., 2024). Tu and Hwang (2024) observed a potentially problematic attitude toward use of AILAs, as some students accepted AI-generated answers without critically evaluating their accuracy. This suggests a passive or overly trusting perception of the tool (Han et al., 2025; Wang & Ren, 2024). In contrast, Hamid et al. (2023) reported a more cautious and skeptical attitude toward use of AILAs in specialized academic fields. This indicates negative perceptions of the tool's reliability in those contexts (Hazari, 2025; Ravšelj et al., 2025). These findings reflect clear perceived negative factors that may undermine students' trust toward use of AILAs and hinder their overall acceptance and sustained use.

Moreover, although Nazari et al. (2021) found increased self-efficacy (Cohen's $d = 0.54$), they also reported heightened academic anxiety and dependency (Cohen's $d = -0.98$). This demonstrates how AILAs can lead to perceived negative emotional effects, such as over-reliance and reduced confidence in personal abilities (Alzubi et al., 2025; Shuhaiber et al., 2025; Slepankova et al., 2025; Zhou et al., 2024). These mixed perceptions suggest that while AILAs can support learning, they may also cause students to feel anxious or overly dependent, highlighting the need for educators to guide AILA use in thoughtful and balanced ways.

Cognitive and Creativity Impacts

The impact of AILAs on students' cognitive and creative skills was another major perceived negative theme. Ajlouni et al. (2023) found that 75% of students believed AILA tools weakened critical thinking by providing direct answers that required little reasoning (see also Han et al., 2025; Kim et al., 2025; Wang & Ren, 2024). Likewise, students reported that they feared formulaic writing, which hindered originality (Alzubi et al., 2025; Črček & Patekar, 2023; Morell-Mengual et al., 2025).

Although some students appreciated the tools for grammar and structure (Kayalı et al., 2023), many believed they lacked depth in feedback on argumentation and synthesis—another perceived negative (Hazari, 2025; Le et al., 2025). Students' reliance on AILAs could reduce their engagement in problem-solving tasks (George-Reyes et al., 2025; Hamid et al., 2023; Ravšelj et al., 2025). Finally, Nazari et al. (2021) found that while AI-assisted writing improved engagement and self-efficacy, it also led to cognitive passivity. Students depended on AI-generated text instead of actively forming their own ideas—an important perceived negative that raises concerns about the long-term effects of AILA use on independent thinking and creativity (Pisica et al., 2024; Sáez-Velasco et al., 2025; Shuhaiber et al., 2025; Slepankova et al., 2025; Villarino, 2025).

Discussion

This review of 1,854 studies produced a corpus of 54 relevant studies to illuminate several major developments in research on AILAs. These findings include: a noticeable rise in global research on AILAs, a wide range of educational uses for these tools, complex student reactions that include both appreciation and skepticism, and finally the need for deeper examination of whether AILAs are being used by students to assist their learning rather than

simply their task completion. These patterns suggest that while AILAs may offer academic support in certain contexts and capacities, their successful integration requires careful consideration of their broader impact on learning—not only in terms of academic outcomes but also in fostering critical thinking, ethical reasoning, and learner autonomy (Cavazos et al., 2025; Han et al., 2025; Hazari, 2025).

The notable rise in AILA research, particularly in 2025, suggests that educators and researchers are eager to explore the relevance and impact of AI in learning. This growing interest may be attributed to both increased technological availability and institutional motivations to improve student learning outcomes. Studies span a wide range of countries, indicating strong international momentum (Farinosi & Melchior, 2025; Nelson et al., 2025; Ravšelj et al., 2025; Zakwani & Binu, 2025). However, the absence of studies from other regions highlights ongoing disparities in access to AI infrastructure and research opportunities (Bozkurt et al., 2024). Future research should aim to include more diverse contexts to provide a fuller picture of how AILAs are used and experienced across different educational systems.

Most reviewed studies focus on undergraduate learners, framing AILAs primarily as tools to support early postsecondary-level academic skills. This trend reflects students' perceived usefulness of AILAs in improving performance but also reveals a gap in understanding how these tools function in more advanced or specialized contexts (Bond et al., 2024). As highlighted by Sáiz-Manzanares et al. (2023), Master's-level students reported higher satisfaction, more frequent use, and greater learning outcomes when engaging with chatbots, compared to undergraduates. These differences suggest that graduate students, who often engage in discipline-specific tasks, may hold more critical or demanding attitudes toward use of AILAs, expecting greater accuracy, adaptability, and depth from AI tools to meet their advanced academic needs.

Across the reviewed literature, AILAs have been integrated in diverse ways to support learning. These tools generate a range of educational effects, including improved writing fluency, increased motivation, self-regulation, and reduced cognitive load. Tools like Grammarly and ChatGPT were found to support writing development, while pronunciation apps enhanced fluency and confidence (Du et al., 2025; Nishshanka et al., 2025; Slepankova et al., 2025; Tu & Hwang, 2024; Zou et al., 2023). Chatbots contributed to self-regulated learning and personalized feedback (Jasin et al., 2023; Shuhaiber et al., 2025; Swidan et al., 2025; Tbaishat et al., 2025). These outcomes, when aligned with high levels of perceived ease of use, shaped students' favorably attitudes toward using AILAs. When students found tools intuitive, timely, and responsive, their attitudes toward use were predominantly positive, increasing their behavioral intention to use these technologies further (Alzubi et al., 2025; Chang et al., 2022; Lai et al., 2023; Villarino, 2025).

These educational effects were not exclusively beneficial. On the one hand, perceived positive attitudes were linked to increased confidence, writing efficiency, and academic motivation. On the other hand, students also expressed perceived negative concerns about over-reliance, reduced creativity, and ethical ambiguity (George-Reyes et al., 2025; Morell-Mengual et al., 2025). This cognitive dissonance may stem from students' difficulty distinguishing between AI-generated and human-generated content, thereby fostering dependence and diminishing self-efficacy. As Bozkurt et al. (2024) argue, digital literacy gaps contribute to the uncritical adoption of AI outputs, which in turn increases perceived risk and undermines trust (Hazaimah & Al-Ansi, 2024; Ismail et al., 2024; Jin et al., 2025).

Furthermore, as noted in recent systematic reviews (e.g., Bond et al., 2024; Bozkurt et al., 2024), much of the existing research on AILAs focuses on short-term acceptance, particularly perceived usefulness and ease of use, while neglecting their long-term effects on conceptual understanding and critical thinking (Hazari, 2025; Kim et al., 2025). This raises an important concern: do AILAs genuinely foster higher-order learning, or do they encourage superficial engagement by prioritizing speed and task completion? When students use AILAs primarily to complete tasks quickly or efficiently, positive attitudes toward these tools may reflect convenience more than deep learning. In such cases, perceived usefulness may conceal a decline in independent reasoning and creativity. These mixed perceived positive and perceived negative responses show that students' attitudes toward using AILAs are context-dependent, shaped by digital literacy, trust, and instructional support (Avcı, 2024). As emphasized in models like TAM and the Value-based Adoption Model (VAM), actual use is not solely determined by functionality, but also by ethical awareness and value alignment (Hazaimah & Al-Ansi, 2024; Lai et al., 2023). To promote responsible engagement, institutions must foster critical AI literacy and support students' epistemic agency—their ability to evaluate, question, and co-construct knowledge with AI (Ravšelj et al., 2025; Slepankova et al., 2025). Without such guidance, AILAs risk encouraging over-reliance and reducing students' sense of authorship and ownership (Alzubi et al., 2025; Črček & Patekar, 2023; Nazari et al., 2021).

Finally, our review illuminates an exigent need for researchers and practitioners alike to examine the role of AILAs in assisting, rather than replacing, student learning. Scholars such as Luckin et al. (2016) and Zawacki-Richter et al. (2019) have acknowledged the potential of AI to function as a form of learning assistance, yet they leave open the question of whether AILAs fulfill the deeper pedagogical purposes traditionally associated with academic support. In order for AI to truly be a learning assistance tool, instead of simply a task completion tool, it needs to support students' development as critical thinkers, and all the other things we say learning assistance should do (e.g., Al-Abdullatif, 2023; Črček & Patekar, 2023; Hamid et al., 2023; Hazari, 2025; Jasin et al., 2023; Le et al., 2025; Villarino, 2025). These expectations highlight that AILAs should do more than just provide quick answers or improve efficiency. As learning assistance tools, AILAs should also actively support students in developing higher-order thinking skills and using deeper cognitive and metacognitive strategies.

Limitations and Implications

While this review offers a timely synthesis of student perceptions regarding AILAs, several limitations should be acknowledged. First, the heavy reliance on self-reported data across most studies introduces the potential for reporting bias, including the overestimation of benefits or underreporting of negative experiences. Such limitations may obscure the actual dynamics of student interaction with AILAs. Second, the majority of included studies focused on undergraduate populations, leaving a gap in our understanding of AILA integration in graduate-level, professional, and lifelong learning contexts. Third, the imbalance in research methods, with relatively few qualitative studies, limits the scope of current investigations. This imbalance restricts exploration of the affective, ethical, and cognitive complexities associated with AILA use.

These limitations suggest several directions for future research and institutional practice. Researchers are encouraged to employ longitudinal, cross-cultural, and mixed-method approaches to capture the evolving and contextual nature of students' experiences with AILAs. Theoretical exploration should go beyond the TAM to incorporate complementary frameworks such as VAM,

Cognitive Load Theory, or AI literacy models. These frameworks may better address constructs like trust, fairness, and metacognitive engagement. On a practical level, higher education institutions must take a proactive stance in shaping the ethical and pedagogical integration of AILAs. This includes offering faculty training on responsible AI use, embedding critical AI literacy into student development programs, and establishing clear guidelines that promote reflection, equity, and academic integrity in AI-assisted learning environments.

Conclusion

The growing integration of AILAs in higher education reflects a broadly shared assumption by students, scholars, and general society of the tools' perceived potential to enhance motivation, self-efficacy, and personalized learning. However, the dual nature of student perceptions—highlighting both enthusiasm and skepticism—underscores a critical tension between technological support and cognitive development. Specifically, the risks of over-reliance, diminished creativity, and ethical ambiguity point to the urgent need for pedagogical strategies that emphasize critical engagement with AI, not just operational use. While the TAM remains a valuable framework for examining students' initial responses to AILAs, future research must expand beyond this model to include deeper theoretical perspectives that address trust, fairness, and student agency. The dual perception of AILAs underscores the need to teach AI critical thinking, not just technical skills. It is also important to teach both students and educators how to use AILAs effectively (Ismail et al., 2024). By proactively addressing limitations and maximizing pedagogical potential, institutions can foster inclusive, reflective, and ethically grounded learning environments that prepare students for AI-enhanced futures.

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Articles marked with an asterisk (*) indicate studies included in the review (n = 54).

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Appendix

Summary of Reviewed Studies

Reviewed study	Country	Method	Participants	Data collection	AILA tool	Educational effects of using AILAs	Students' Perspectives on AILAs	
							Perceived positive	Perceived negative
Alghazo et al. (2025)	Pakistan	Quantitative	400 undergraduate students	Online survey	ChatGPT	Supported understanding of theories and concepts, saved time, boosted writing efficiency and productivity, provided translation, personalised tutoring, feedback.	Easy to use, quick answers, useful for research and study aid	Accuracy concerns, over-dependence, plagiarism risks, unreliable references, citation issues, weak on complex tasks
Alzubi et al. (2025)	Saudi Arabia	Mixed	546 undergraduate students	Online survey and interviews	ChatGPT	Supported conversation practice, supported idea generation, provided instant feedback, enhanced vocabulary enrichment, supported collaboration, supported real-life simulation, improved accessibility.	Brainstorming, writing feedback, fluency practice, vocabulary building, collaboration aid, on-demand support	Dependency, reduced critical thinking, inaccurate/context-poor feedback, weaker real-life interaction, suppressed creativity.
Anghel et al. (2025)	Romania	Quantitative	250 undergraduate students	Online survey	Mainly ChatGPT	Managed learning time, improved critical thinking, performance, personalization, supported autonomy and motivation.	Improved performance, personalized learning, motivation, critical thinking, time management, autonomy	Reduced creativity, ethical concerns, privacy issues, policy uncertainty, unequal adaptation
Blahopoulou and Ortiz-Bonnin (2025)	Spain	Quantitative	737 undergraduate students	Online survey	ChatGPT	Enhanced access, supported time-saving, supported career preparation.	Convenience, efficiency, skill preparation	Reliance, perceived harm to education
Cavazos et al. (2025)	USA	Quantitative	569 undergraduate students	Online survey	ChatGPT	Supported information gathering for assignments, improved writing (paraphrasing, rewriting), aided learning and personal growth,	Convenient use, valuable support, enjoyable experience, moderate accuracy, helpful for coursework	Misuse risk in exams/assignments, ethical concerns, accuracy doubts, support for penalties against cheating

STUDENTS' PERCEPTIONS OF AI-BASED LEARNING ASSISTANTS (AILAs) IN HIGHER EDUCATION

						contributed to grades and perceived learning gains.		
Du et al. (2025)	Vietnam	Mixed	212 undergraduate students	Online survey and interviews	ChatGPT ; also Grammarly, Quillbot, Wordtune.	Increased clarity, grammar, and structure, improved writing efficiency, supported idea generation, supported coherence check.	Clearer/professional writing, efficiency, idea generation, grammar/coherence support	Accuracy/misalignment, overuse reducing creativity and critical thinking, integrity/ethics concerns, call for usage guidelines
Farinosi and Melchior (2025)	Italy	Mixed	531 undergraduate students	Online survey and interviews	ChatGPT	Summarised and clarified concepts, created exam simulations, saved time, improved efficiency, supported information search and understanding.	Study support, efficiency, information access	Lower accuracy and credibility, reduced writing, creativity, reading, and critical thinking
George-Reyes et al. (2025)	Latin America and Europe (10 countries)	Quantitative	4,005 students (85.6% undergraduate students, 13.2% graduates)	Online survey	ChatGPT	Increased academic performance, increased advanced skills.	High capabilities, greater satisfaction in private universities	Ethical concerns (plagiarism, misinformation), negative link with performance, similar ethics concerns across public-private contexts
Han et al. (2025)	Australia and China	Qualitative	71 undergraduate and graduate students	Online survey with scenario-based tasks	AIEd with AI monitoring	Increased engagement, supported self-reflection, provided equal attention, supported an introvert-friendly approach.	Engagement, reflection, analytical insights, equal attention	Loss of autonomy, result orientation, less enjoyment, reduced interaction, over-digitalization
Hazari (2025)	USA	Qualitative	116 undergraduate students	Assignments with ChatGPT and online survey	ChatGPT	Increased learning, supported research aid, enhanced creativity, improved efficiency, improved writing and grammar, improved accessibility, developed skills.	Educational enhancement, efficiency, innovative learning, skill development, support for wider use	Cheating/plagiarism, dependence reducing critical and creative thinking, inaccuracy, privacy/security/ethics concerns

STUDENTS' PERCEPTIONS OF AI-BASED LEARNING ASSISTANTS (AILAs) IN HIGHER EDUCATION

He et al. (2025)	China	Quantitative	149 undergraduate students and 13 graduate students	Online and in-person survey	ChatGPT ; also New Bing, Stable Diffusion , Midjourney	Supported homework help, supported knowledge acquisition.	Awareness, acceptance with citation, support for regulation, clear marking, ethics education, detection	Survey reliability, regional limits, cheating concerns, over-restriction risks
Jin et al. (2025)	Australia	Mixed	58 undergraduate students	Lab ratings, in-semester trace data, and interviews	PolyFeed	Provided explanations for making sense of feedback, offered visualisations of strengths and weaknesses, supported seeking, interpreting, and using feedback.	Useful explanations, positive visualizations, sense-making, effective use of information, overview support	Reliability concerns, privacy issues, declined enthusiasm after real use
Kim et al. (2025)	China	Qualitative	7 undergraduate students and 13 graduate students	60-min IELTS essays and interviews	ChatGPT	Supported ideation, planning, drafting, and revision, increased quality, speed, and topic knowledge, increased joy, questioning, and support, improved self-efficacy.	Process support, performance, affective outcomes	Hallucination, weak context, limited higher-order and cultural/pedagogical skills, low explainability, interoperability limits, low AI literacy, negative attitudes, weak HOTS/topic knowledge/writing, time limits
Le et al. (2025)	China	Quantitative	114 undergraduate students	Pre-task and post-task surveys	ChatGPT	Provided revision support, supported AI-assisted dialogue	Shift toward AI in free-dialogue, stronger preference with higher English proficiency	Preference for human feedback, AI seen as less reliable
Li et al. (2025)	China	Mixed	167 undergraduate students	Online survey	ChatGPT	Supported personalized learning, improved efficiency, provided convenience, enhanced career and skill development, supported independent learning.	Personalized learning, efficiency, career/skill development, independent learning support	Dependence, reduced critical thinking, bias/ethics concerns, inaccuracy, privacy/data security issues
Morell-Mengual et al. (2025)	Spain	Quantitative	974 undergraduate students	Online survey	ChatGPT ; also Bing Chat, Perplexity, Google Bard; You.com,	Improved understanding, improved time management, developed digital skills, fostered creativity.	Better understanding, time management, digital skills, innovative learning	Procrastination, weaker writing, lower information evaluation skills, dependency

STUDENTS' PERCEPTIONS OF AI-BASED LEARNING ASSISTANTS (AILAs) IN HIGHER EDUCATION

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Nelson et al. (2025)	Ecuador	Quantitative	56 undergraduate students	Online survey	ChatGPT	helped save time, supported brainstorming, overcame writer's block	Useful for writing support and learning	Academic dishonesty, harm to writing skills, perceived detectability
Nishshanka et al. (2025)	Sri Lanka	Qualitative	18 undergraduate students	Interviews	Mainly ChatGPT; also Gemini, QuillBot, Grammarly, others	Saved time, reduced effort, improved language and grammar, supported paraphrasing and summarizing, provided quick access to ideas and information, supported personalized study and self-assessment, improved productivity, reduced stress, aided organization.	Easy access, affordability, study support, reliable internet/technology	Reduced creativity and critical thinking, inaccuracies, over-dependence, need for output verification
Ravšelj et al. (2025)	Global (109 countries)	Quantitative	23,218 undergraduate students	Online survey	ChatGPT	Supported brainstorming, supported text summarising, supported research search, simplified complex information.	Simplified information, summarization, clearer than peers/lecturers, positive emotions (calm, happy, hopeful)	Low reliability, weak classroom support, cheating/plagiarism, social isolation
Sáez-Velasco et al. (2025)	Spain	Quantitative	23 undergraduate students	Ad-hoc survey, and two 20-min sketch tasks	BlinkShout	Improved effectiveness, efficiency, creativity, design autonomy, limited contribution to learning, moderate quality of output.	Trust linked to creativity, autonomy, efficiency	Hindered creativity
Shuhaiber et al. (2025)	UAE	Quantitative	283 undergraduate students	Online survey	ChatGPT	Explained concepts and found facts, summarised and paraphrased information, supported essays, assignments, coding, and study plans, improved	Trust, performance expectancy, hedonic motivation drive attitude and intention to use	Concerns about inaccuracy, overreliance, skill erosion; call for regulation/policies

STUDENTS' PERCEPTIONS OF AI-BASED LEARNING ASSISTANTS (AILAs) IN HIGHER EDUCATION

						understanding and sped up learning, boosted productivity.		
Slepankova et al. (2025)	Czech Republic	Mixed	270 undergraduate students	Online survey	ChatGPT	Increased effectiveness, increased adaptability, improved feedback, increased motivation.	Personalization, self-paced learning, immediate feedback, AI as future	Less impactful than teacher, need deeper explanation, limited interactivity
Swidan et al. (2025)	United Arab Emirates	Quantitative	822 undergraduate students	Online survey	ChatGPT and other AI tools	Supported quicker task completion, enhanced learning effectiveness, benefits mediated knowledge.	Beneficial and useful, intention to continue use	Ethical concerns, plagiarism, policy uncertainty, fear of detection, peer pressure–related stress
Tbaishat et al. (2025)	United Arab Emirates and Saudi Arabia	Quantitative	471 undergraduate students	Online survey	Mainly ChatGPT ; also Grammarly, Canva, Gemini, QuillBot	Improved academic writing (grammar, paraphrasing, summarising, citation), supported faster and easier assignments, improved research quality and time management, provided personalised feedback, built digital competence, enhanced communication skills.	Better results, skill development, study effectiveness, curiosity	Academic dishonesty, bias
Villarino (2025)	Philippines	Mixed	451 undergraduate students	Online survey	ChatGPT ; also Gemini, Gamma, others	Supported research and idea generation, assisted with writing, presentations, and editing, helped with problem solving, easy to use and helpful in learning, improved work quality and saved time, supported personalised learning.	Confidence using AI, ethical acceptance, peer support	Concerns about inaccuracy, bias, reduced critical thinking, plagiarism; some fear AI replacing teachers

STUDENTS' PERCEPTIONS OF AI-BASED LEARNING ASSISTANTS (AILAs) IN HIGHER EDUCATION

Zakwani and Binu (2025)	Oman	Mixed	190 undergraduate students	Online survey and interviews	ChatGPT	Improved writing, vocabulary, reading, and grammar, enhanced listening and speaking confidence, supported autonomy (independence, personalization, goal-setting), increased satisfaction, engagement, and proficiency.	Flexible, convenient, instant, enjoyable, supportive	Complex/unclear answers, lack of voice output, generic/limited responses
Zhang et al. (2025)	China	Mixed	850 undergraduate students	Online survey	ChatGPT	Supported comfort, supported enjoyment, supported rational hopes.	Academic use, reliable information, efficient retrieval	Auxiliary tool only, cautious/critical use, unease, worries
Abdaljaleel et al. (2024)	Egypt, Iraq, Jordan, Kuwait, Lebanon	Quantitative	2,240 undergraduate students	Online survey	ChatGPT	Enhanced efficiency in assignments, supported academic duties.	Higher ease of use, perceived usefulness, positive attitude to technology, social influence, and behavioral/cognitive factors predicted positive attitudes and greater usage	Higher perceived risks and anxiety reduced attitudes and usage
Acosta-Enriquez et al. (2024a)	Peru	Quantitative	201 undergraduate students	Online survey	ChatGPT	Supported essay and article drafting, helped resolve doubts step by step, boosted productivity, provided creative ideas.	Recognition of usefulness	Over-reliance reducing critical and creative thinking, threat to education purpose, unreliable data, need for guidelines and restrictions
Acosta-Enriquez et al. (2024b)	Peru	Quantitative	499 undergraduate students	Online survey	ChatGPT	Predicted intention to verify information, supported responsible use.	Positive emotions, acceptance, ease of use, importance, interest	Perceived risk, boredom
Aldossary et al. (2024)	Saudi Arabia	Quantitative	1,390 undergraduate students	Online survey	ChatGPT and other GenAI tools	Improved understanding of complex concepts, provided immediate and tailored feedback, saved time, supported self-directed learning.	High acceptance, ease of use, usefulness, enjoyment, future use	Privacy/security concerns, reduced interaction, overuse, limited critical thinking, unethical use

STUDENTS' PERCEPTIONS OF AI-BASED LEARNING ASSISTANTS (AILAs) IN HIGHER EDUCATION

Alamäki et al. (2024)	Finland and Austria	Quantitative	158 undergraduate students	AI-based essay task and post-task questionnaire	Eximiatu tor 1.0	Enhanced learning, improved studies, increased productivity, accelerated task completion, provided overall usefulness.	Higher trust in AI, perceived benefits, preference for AI feedback, remote learners more inclined	Technology affinity not significant, demographics no effect, lower trust when seen as less effective than teacher feedback
Almassaad et al. (2024)	Saudi Arabia	Quantitative	859 undergraduate students	Online survey	ChatGPT ; also Gemini, Socratic, Copilot, and others	Defined and clarified concepts, generated ideas, facilitated projects and assignments, supported literature search and summarising, provided translation, enhanced writing quality and proofreading, supported coding, multimedia, and presentations.	Ease of use, usefulness, positive attitude to technology, social influence, behavioral/cognitive factors	Perceived risks, anxiety reducing attitudes and usage
Baidoo-Anu et al. (2024)	Ghana	Quantitative	277 undergraduate students	Online survey	ChatGPT	Facilitated academic duties, helped understand difficult concepts, saved time and effort on assignments, provided convenience and easy access, saved time searching for information.	Recommended, supports understanding, saves time/effort, convenient, accessible, enjoyable	Over-reliance reducing critical thinking, security vulnerabilities, privacy risks, lack of originality, policy concerns, lack of training/guidelines
Gasaymeh et al. (2024)	Jordan	Quantitative	43 undergraduate students and 52 graduate students	Online survey	ChatGPT ; also Jasper AI, Copy.ai, Writesonic, Rytr, Wordtune, Grammarly, ShortlyAI, QuillBot, INK Editor, Scribe	Enhanced learning experiences, supported personalization and differentiation, improved collaboration and communication, increased access and equity, enhanced efficiency and productivity, supported critical thinking and analysis, fostered creativity and innovation.	Creativity stimulation, innovation fostering	Misinformation, data security concerns

STUDENTS' PERCEPTIONS OF AI-BASED LEARNING ASSISTANTS (AILAs) IN HIGHER EDUCATION

Pisica et al. (2024)	Romania	Qualitative	70 undergraduate students	Online survey	ChatGPT, and other GenAI tools	Provided quick access to organized information, supported personalized learning, enhanced academic performance, improved evaluation and feedback, supported innovative and online teaching methods.	Faster processes, time management, easier access to information, life improvements, professional alignment	Dependence, reduced critical thinking, ethical concerns, privacy/security issues, reduced interaction, job loss/cost concerns
Sallam et al. (2024)	United Arab Emirates	Quantitative	608 undergraduate students	Online survey	ChatGPT	Perceived as useful and easy to use, supported positive learning attitudes and experiences.	Usefulness, ease of use, behavioral/cognitive support, positive attitudes shaped by technology and social influence	Perceived risk, anxiety lowering attitudes and usage
Stöhr et al. (2024)	Sweden	Quantitative	5894 undergraduate students	Online survey	ChatGPT; also Bing AI, CoPilot, YouChat, ChatSonic, Jasper, DialogPT, Socratic	Supported more effective learning, improved language ability, improved grades	Effective learning, language improvement, grade improvement	Concerns about learning impact, exam cheating
Țală et al. (2024)	Romania	Quantitative	364 undergraduate and graduate students	Online survey	ChatGPT	Improved creativity, enhanced employment prospects.	Curiosity and interest, efficiency, creativity, employability, interest in formal AI learning	Accuracy concerns, ethical concerns, privacy/misuse worries, lack of interest in AI learning
Tu and Hwang (2024)	Taiwan	Mixed	60 undergraduate students	Online survey and drawing tasks	ChatGPT	Provided tutor-like support for discussions and consultations, gave on-demand explanations and ideas, supported anytime and anywhere learning, helped remembering and understanding.	Positive emotions, productivity, flexibility, broader conceptions.	Over-reliance caution, limited higher-order learning.
Wang and Ren (2024)	Hong Kong	Mixed	140 undergraduate students	Analysis of Wikibook chapters and logs and online survey	ChatGPT and Padlet AI image generator	Supported shaping opinions and arguments, provided definitions and organizational ideas, served as a	Ease of use, productivity, content understanding, writing support, idea generation, vocabulary,	Misuse/plagiarism, tension, nervousness, moderate enjoyment

STUDENTS' PERCEPTIONS OF AI-BASED LEARNING ASSISTANTS (AILAs) IN HIGHER EDUCATION

						linguistic repository.	grammar, organizing ideas.	
Zhou et al. (2024)	United Kingdom	Mixed	28 undergraduate and graduate students	Online survey and interviews	ChatGPT ; also Grammarly, QuillBot, Notion AI, Canva “Magic Studio,” Appen, Surfer SEO	Provided writing assistance and text summarisation, generated academic essays, executed administrative tasks, supported market research and advertising, improved productivity and learning.	Productivity, efficiency, tutor-like support, improved language and confidence, subject guidance	Over-reliance, accuracy issues, limited use in assessments, privacy concerns, low AI literacy
Ajlouni et al. (2023)	Jordan	Quantitative	623 undergraduate students	Survey questionnaire based on the ABC model of attitude	ChatGPT	Enhanced self-confidence, lifelong learning, academic performance.	Boosted motivation, self-confidence	Dependence risk, anxiety without AI
Al-Abdullatif (2023)	Saudi Arabia	Quantitative	432 undergraduate and graduate students.	Online survey	Chatbot (TAM + VAM model)	Improved self-regulated learning, motivation, efficiency.	Enhanced motivation, learning enjoyment	Privacy concerns
Črček and Patekar (2023)	Croatia	Quantitative	170 undergraduate students	Online survey	ChatGPT	Assisted in writing (ideas, paraphrasing, summarizing).	Helped with writing structure and clarity	Loss of cognitive challenge, ethical ambiguity
Hamid et al. (2023)	Malaysia	Quantitative	18 undergraduate students	Questionnaires	ChatGPT in Process-driven Problem-based Learning (PDPBL)	Enhanced fast, personalized, self-regulated learning.	Quick information access, personalization	Inaccurate answers, privacy issues
Jasin et al. (2023)	Singapore	Qualitative	12 undergraduate students	Audio-recorded self-reflections and semi-structured interviews	Automated Question - Answering Chatbot	Boosted Chemistry learning, autonomy, 24/7 support.	Better Chemistry understanding, autonomy	Inaccurate answers, privacy concerns
Kayalı et al. (2023)	Turkey	Mixed	84 undergraduate students	Online survey using the Chatbot Usability Scale (CUS)	ChatGPT in Online Courses	Improved collaboration, engagement, critical thinking in Problem-based Learning (PBL).	Improved PBL participation and confidence	Over-reliance, accuracy issues

STUDENTS' PERCEPTIONS OF AI-BASED LEARNING ASSISTANTS (AILAs) IN HIGHER EDUCATION

				and written interview s				
Malik et al. (2023)	Indonesia	Quantitative	245 undergraduate students	Online survey	ChatGPT , Grammarly, Turnitin, etc.	Improved writing, plagiarism checking, idea generation.	Enhanced writing efficiency, idea generation	Over-reliance, reduced creativity
Sáiz- Manzanare s et al. (2023)	Spain	Mixed	42 undergraduate students and 15 master's degree students	Usage data analytics and satisfaction questionnaires	LMS- integrated Chatbot	Supported self- regulated learning, metacognition.	Supported self- regulation, satisfaction	Low use of higher- order skills
Zou et al. (2023)	China	Mixed	70 undergraduate students	Questionnaires, pre- test and post-test, and semi- structured interviews	AI Speaking Apps	Enhanced speaking practice, improved fluency, grammar, participation.	Improved speaking skills, confidence, motivation	Time constraints, limited real-life interaction
Lee et al. (2022)	Taiwan	Mixed	38 undergraduate students	Pre- and post-tests, questionnaires	Disease Stewards hip Chatbot	Improved academic performance, self-efficacy, motivation.	Improved performance, self-efficacy	Incomplete responses, lack of depth
Nazari et al. (2021)	Iran	Quantitative	120 postgraduate students	Online self- report questionnaires	Grammarly	Enhanced writing self-efficacy, academic emotions, engagement.	Increased writing self-efficacy and confidence	Over-reliance on AI-generated suggestions, reduced critical thinking
Lin and Chang (2020)	Canada	Mixed	357 undergraduate students	Quantitative assessments (essay scores) and student feedback surveys	Writing Chatbot DD	Improved essay writing, peer feedback, thesis statement quality.	Improved writing quality, peer feedback	Slow responses, limited handling of inputs



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