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Generative AI-Enabled Student Support Services in Higher Education: A Systematic Review of Emerging Applications and Evidence (2022–2025)

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Abstract. The rapid integration of generative artificial intelligence (GenAI) into higher education student support services—including academic advising, personalised tutoring, and administrative assistance—offers significant operational benefits but raises critical concerns about equity, ethics, governance, and psychosocial impacts. This systematic review, conducted following the PRISMA 2020 framework, synthesises 47 empirical studies published between 2022 and 2025 from Scopus, ERIC, and Web of Science, addressing three research questions: technological approaches, student experiences, and implementation challenges. Findings indicate that GenAI enhances service efficiency, accessibility, and personalisation through retrieval-augmented generation, fine-tuned large language models, knowledge-enhanced systems, and predictive intervention models. However, persistent challenges include hallucinations, algorithmic bias, privacy risks, cultural misadaptation, and a lack of longitudinal outcome evaluations. Notably, the review identifies an AI-mediated social substitution effect, whereby excessive reliance on GenAI may weaken interpersonal connections and diminish students' sense of belonging. In response, we propose a hierarchical human–AI collaborative governance framework that positions GenAI as an augmentative tool rather than a replacement for human expertise, underscoring the necessity of balancing technological innovation with educational equity, ethical oversight, and meaningful human interaction.

Keywords: Generative AI, student support services, higher education, systematic review, human-centered AI

1. Introduction

The growing adoption of generative AI (GenAI) has reshaped higher education student support services—academic advising, personalised learning, and administration—improving accessibility and continuity [1]. Yet this efficiency-driven shift raises equity and human-centred concerns. Most research highlights GenAI's benefits (personalisation, reduced workload, faster responses), but insufficient pedagogical reflection may worsen inequalities. Ballantyne et al. [2] call for both computational and pedagogical interventions (culturally sustaining pedagogy, Universal Design for Learning); without these, AI risks perpetuating structural disparities [3]. Marginalised groups—

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international, first-generation, and disabled students—face added linguistic, cultural, and digital barriers [4]. While AI-enabled support shows practical value in advising and information services, empirical evidence on educational outcomes is fragmented [5]. Bibliometric studies identify AI and chatbots as emerging topics, yet systematic effectiveness evaluations are scarce [6]. Moreover, the potential negative consequences, especially the AI-mediated social substitution effect that may reduce interpersonal interaction and belonging, remain underexplored [7]. This review therefore examines GenAI-enabled student support from both technological and human-centred angles, focusing on inclusion, ethical risks, and educational implications, addressing three research questions:

RQ1: What types of GenAI-enabled student support services, technological approaches, and practical outcomes have been reported in higher education between 2022 and 2025?

RQ2: How do different student groups perceive and experience AI-based support tools, particularly regarding acceptance, effectiveness, and psychosocial impacts?

RQ3: What technological limitations, ethical risks, and implementation barriers have been identified in existing empirical studies?

2. Methods

2.1. Search strategy

This systematic review followed the PRISMA 2020 guidelines. We searched Web of Science, ERIC, and Scopus using three keyword groups (GenAI, student support services, and higher education); detailed strategies are in Table 1. The search covered January 2022-December 2025, yielding 688 initial records (Scopus: 120, WoS: 42, ERIC: 526). We also performed backward citation tracking from included studies to identify additional relevant works.

Table 1. Search terms and retrieval strategies by database

Database	Search Terms
Scopus	("ChatGPT" OR "Generative AI" OR "Large Language Model*") AND ("student support" OR "student service*" OR "academic advising" OR "student affairs" OR "student success") AND ("higher education" OR universit*)
ERIC	("ChatGPT" OR "Generative AI" OR "Large Language Model*") AND ("student support" OR "student service*" OR "academic advising" OR "student affairs" OR "student success") AND ("higher education" OR universit*)
WoS	("ChatGPT" OR "Generative AI" OR "Large Language Model*") AND ("student support" OR "student service*" OR "academic advising" OR "student affairs" OR "student success") AND ("higher education" OR universit*)

2.2. Inclusion/exclusion criteria

Inclusion/exclusion criteria are presented in Table 2. Of the 688 initial records, 27 duplicates were removed, leaving 661 for screening. Title/abstract screening excluded 607 records, primarily because they were off-topic, non-higher-education, irrelevant to GenAI/LLMs, non-empirical (e.g., reviews, conceptual papers), lacking original data, non-English, or conference abstracts only.

Following title and abstract screening, 54 studies proceeded to full-text assessment.

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Table 2. Inclusion and exclusion criteria for study selection

Inclusion Criteria	Exclusion Criteria
Higher Education	K-12
GenAI/LLM	Teacher Training
Student Support	Teaching-focused
Empirical Study	Review Article

2.3. Quality assessment

Methodological quality was assessed using a mixed-methods appraisal tool with criteria covering five study designs. Studies were excluded if they lacked full empirical evidence, contained substantial duplication, or had inaccessible full texts. After quality assessment, seven studies were removed, resulting in a final sample of 47 empirical studies (see Figure 1 for the screening flow).

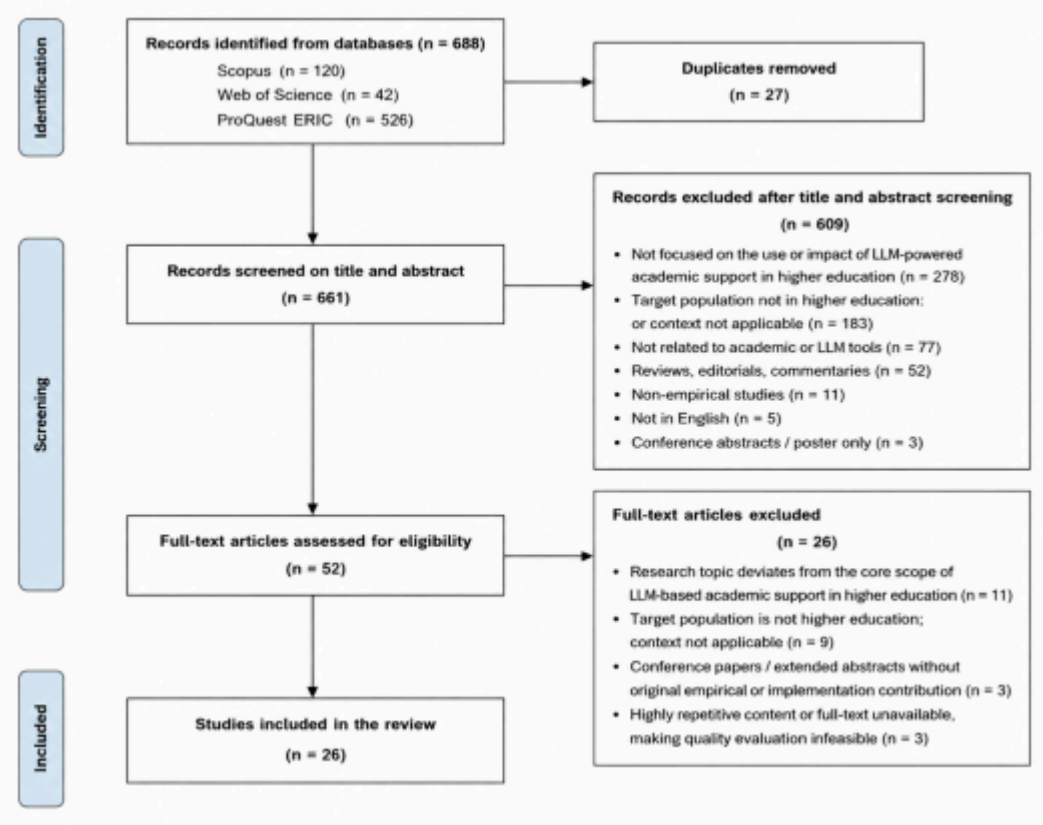

Figure 1. PRISMA flow diagram of the study selection process

3. Results

3.1. Summary of included studies

A total of 47 empirical studies published between 2022 and 2025 were included. The studies covered diverse geographical contexts, including Asia, Europe, North America, South America, and cross-regional investigations. Undergraduate students represented the dominant research population, while

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postgraduate students and specific groups such as international students and preservice teachers received comparatively limited attention. The included studies were categorized into three major themes: (1) technological architectures and performance evaluation, (2) user acceptance and psychosocial impacts, and (3) ethical risks and implementation barriers.

3.2. Technological approaches and performance

Several GenAI architectures have been applied to student support. Fine-tuned LLMs, often using parameter-efficient methods (e.g., LoRA, QLoRA), have shown competitive performance in multilingual advising contexts, with reported ROUGE and BERTScore improvements [8-11]. Retrieval-augmented generation (RAG) has become the dominant approach for enhancing factual reliability, consistently outperforming rule-based systems in accuracy and usability [12-17]; low-code RAG solutions also proved effective in multilingual settings [18, 19]. Knowledge graph-enhanced systems further improved advising precision by integrating structured institutional knowledge [20, 21]. Lightweight deployment through model quantisation and local hosting reduced computational demands while maintaining satisfactory performance [22-24]. Beyond conversational support, predictive intervention models—including BERT-based routing, deep neural networks, and human-in-the-loop systems—demonstrated high accuracy in dropout prediction and response-draft adoption, reducing resolution time and increasing outreach to at-risk students [25, 26].

3.3. User acceptance and psychosocial impacts

Students generally expressed positive attitudes towards GenAI support tools, with usability scores indicating acceptable performance. Studies based on information systems success models reported that service quality and information quality significantly predicted student satisfaction. For international students, AI-supported orientation systems showed potential in reducing adjustment difficulties, though limitations in accent recognition and cultural adaptation persisted [4]. Among pre-service teachers, ChatGPT was mainly used for academic clarification, yet concerns about information manipulation and insufficient institutional guidance were common [1]. Psychosocially, the AI-mediated social substitution effect was identified: heavy reliance on AI may reduce human interaction and weaken belonging, though anonymity of chatbots might lower psychological barriers for introverted students [7].

3.4. Challenges and ethical risks

Despite progress, hallucinations and factual inaccuracies remain critical, even with RAG and chain-of-thought techniques. Static knowledge bases limit real-time responsiveness [1, 4]. Ethical concerns centre on data privacy, algorithmic bias, and cultural adaptation; speech recognition performs poorly with non-native accents, and culturally sustaining pedagogy frameworks remain under-empirically validated [2]. Implementation barriers include insufficient governance, limited institutional integration, and reliance on small-sample, short-term evaluations. Most studies lack longitudinal designs and cross-institutional validation, constraining generalisability [7].

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4. Discussion

4.1. Limitations

This review has several limitations. Although three major databases were searched, some relevant conference papers and technical reports may have been missed, and the English-language restriction may introduce bias. At the study level, most included works used small, single-institution samples; undergraduate students dominated, while postgraduates and international students were underrepresented. Geographically, evidence concentrated in a few regions, limiting transferability. Additionally, cross-sectional designs and automated metrics predominated, with insufficient longitudinal and user-centred assessments, which restricts causal inference and ecological validity [7].

4.2. Theoretical implications

Three theoretical insights emerge. First, task-technology fit appears more influential than institutional feasibility in predicting AI adoption, suggesting that existing acceptance models (e.g., UTAUT) should incorporate anthropomorphic perception and personalisation. Second, the identified four-dimensional affordance framework—challenge mitigation, practice enhancement, transformation, and disruption—extends technology acceptance perspectives by acknowledging both positive and negative consequences of AI integration. Third, the AI-mediated social substitution effect challenges the assumption that acceptance automatically yields beneficial outcomes; it may weaken belonging and increase withdrawal intentions, thus requiring student development theories to account for human–AI interaction mechanisms. Culturally sustaining pedagogy and Universal Design for Learning, though still conceptual, offer valuable foundations for inclusive design [2].

4.3. Practical implications

For administrators, a human-AI collaborative governance model is recommended. Evidence from human-in-the-loop systems shows that AI can augment decision-making: routing recommendations and response drafts achieved high acceptance rates, reducing resolution time and increasing satisfaction [25]. A hierarchical structure—AI handling routine inquiries, professionals reviewing high-risk decisions, and collaboration for complex cases—is feasible. Low-code, locally deployed and multilingual fine-tuned solutions offer cost-effective pathways for resource-constrained institutions while ensuring data sovereignty [24]. For educators, AutoML dashboards enable participation without advanced technical skills, highlighting the need for AI literacy training [1]. For policymakers, predictive intervention systems can extend support beyond office hours and reach at-risk students equitably. Given students' concerns about information manipulation, universities should establish clear ethical guidelines and strengthen AI literacy education [1, 4].

5. Conclusion

This systematic review synthesised 47 empirical studies (2022-2025) on GenAI-enabled student support services in higher education. Findings show that LLMs, RAG-based systems, knowledge-enhanced models, and lightweight deployments improve accessibility, efficiency, and personalisation in academic advising, administration, and predictive interventions. Yet technological progress alone is insufficient; we propose a hierarchical human–AI collaboration framework that positions AI as augmentative, not substitutive.

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Future research should move beyond short-term evaluations. Five priorities emerge: (1) longitudinal and experimental studies to assess sustained impacts on academic development, self-regulation, belonging, and social connectedness; (2) cross-cultural and cross-institutional comparisons to examine how cultural factors shape AI acceptance, trust, fairness, and personalisation; (3) algorithmic fairness and inclusive design, ensuring equitable support for international students, those with disabilities, first-generation students, and disadvantaged groups, especially regarding accessibility and linguistic diversity; (4) integrated evaluation frameworks that combine technical performance with educational and psychosocial outcomes, including autonomy, critical thinking, well-being, and interpersonal engagement; and (5) sustainable governance mechanisms—institutional policies, ethical standards, AI literacy, and human oversight—to ensure GenAI strengthens rather than replaces the human dimension of higher education.

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