Issues in Information Systems
Volume 26, Issue 1, pp. 324-337, 2025

DOI: https://doi.org/10.48009/1_iis_124

More than a chatbot: Human-centered AI for student engagement and academic efficiency

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Abstract

Anthropomorphic artificial intelligence (AI) is transforming digital education by creating interactive, learner-centered environments. This systematic review examines peer-reviewed literature from 2015 to 2025 to evaluate how AI tutors influence student engagement, retention, and faculty workload, while addressing ethical concerns such as bias, data privacy, and over-reliance. Findings indicate that AI tutors can improve retention by up to 21% and reduce grading time by more than 30% by providing personalized, adaptive feedback. Despite these gains, challenges remain, including algorithmic bias and the risk of students overvaluing AI-generated content at the expense of critical thinking and mentorship. This study introduces the AI-Pedagogy Integration Model (APIM), a four-phase governance framework designed to guide ethical, transparent, and pedagogically aligned AI adoption. By following a structured approach, institutions can integrate AI to enhance learning outcomes while safeguarding academic integrity and human connection.

Keywords: anthropomorphic AI, higher education, student engagement, AI tutors, academic integrity, governance framework

Introduction

Anthropomorphic artificial intelligence (AI) is redefining education by reshaping pedagogy, faculty roles, and student engagement. AI tutors use human-like feedback and adaptive support to foster a sense of social presence often missing in online learning. These tools show strong potential to improve motivation and reduce dropout rates, which remain 30% to 50% higher online than in traditional formats. However, the integration of AI presents ethical concerns including transparency, data privacy, and overdependence on automation. In response, institutions such as Harvard, Cornell, and the University of Sheffield have developed governance frameworks to ensure responsible use. This systematic review examines the benefits and risks of anthropomorphic AI in higher education and proposes strategies for ethical, pedagogically aligned implementation. The study adopts a design-based research (DBR) approach, combining theoretical foundations with iterative development to guide practical, institution-level integration.

Background and Literature Review

AI is transforming higher education by influencing instructional delivery, student engagement, and institutional policies. This review synthesizes current research across three core themes: (1) the pedagogical impact of AI tutors, (2) anthropomorphic AI in human-computer interaction, and (3) ethical and institutional challenges of AI integration. AI tutors support real-time feedback, adaptive instruction, and personalized

learning. Studies show improved academic performance, reduced attrition, and stronger support for underrepresented learners (Frankford et al., 2024; Wang et al., 2025). These systems align with constructivist and self-regulated learning theories but are not universally accepted. Some learners question AI's ability to provide empathy and mentorship, highlighting a gap between technological efficiency and human connection (Koivisto, 2023). Global initiatives underscore the importance of context. China's Squirrel AI focuses on scalable personalization, Finland's Elements of AI promotes public digital literacy, and Monash University in Australia uses AI for academic advising. These cases reveal that ethical planning, local infrastructure, and stakeholder input shape successful implementation.

Anthropomorphic features such as avatars, voice interfaces, and conversational tone can enhance trust and engagement (Ackermann et al., 2024). These designs align with theories of social presence and affective computing but can lead to over-reliance or emotional misinterpretation. Reinecke et al. (2025) found students often misjudge AI capabilities, and Blut et al. (2021) observed discomfort when AI behavior conflicted with its human-like appearance. Ethical concerns include bias in training data, lack of transparency, and diminished faculty-student interaction. Institutions like the California State University system and Cornell have introduced governance frameworks to address these challenges, while Trinity College Dublin now requires AI citation to reinforce academic integrity. These developments reflect a growing global shift toward responsible oversight.

The literature affirms AI's promise to personalize instruction and scale access, while also emphasizing the need for thoughtful design, faculty involvement, and transparent policy. A human-centered approach remains essential to ensure equity, trust, and ethical implementation in AI-enhanced education.

Research Questions

This study examines how anthropomorphic AI tutors influence student outcomes and educational efficiency. The following research questions guided the systematic review:

RQ1: *How does anthropomorphic AI affect student motivation, engagement, and cognitive retention?*
RQ2: *What impact does it have on student persistence and long-term retention?*
RQ3: *How do faculty members perceive AI tutors and their influence on instructional workload?*
RQ4: *What ethical concerns arise regarding transparency, emotional influence, and data privacy?*
RQ5: *What practices support responsible, effective AI integration in higher education?*

These questions reflect the study's aim to evaluate both pedagogical value and ethical implications of AI tutors in learning environments. The analysis draws from established theoretical models, including Cognitive Load Theory, Self-Regulated Learning, Social Presence Theory, Constructivism, the Technology Acceptance Model (TAM), and Connectivist Theory. Together, these frameworks provide a foundation to assess how AI can support personalized instruction, reduce faculty burden, and uphold academic integrity within digital learning ecosystems.

Methodology

This study follows a systematic literature review (SLR) guided by PRISMA protocols to examine the impact of AI tutors and anthropomorphic design in higher education. Database searches were conducted across GALILEO, Google Scholar, ProQuest, IEEE Xplore, PubMed, and ACM Digital Library. Peer-reviewed

articles from 2015 to 2025 were selected using Boolean keywords such as AI tutors in higher education, anthropomorphic AI, and AI ethics in academic integrity. Screening involved a two-step process: title and abstract review followed by full-text evaluation. Studies were included if they focused on AI tutoring systems, anthropomorphic interaction in educational settings, or ethical AI integration. Exclusions applied to non-empirical, non-educational, or non-peer-reviewed sources. Data extraction recorded study context, AI type, and major findings. Thematic analysis revealed three core categories: (1) AI tutors and student outcomes, (2) anthropomorphic design and interaction, and (3) ethical concerns involving bias, transparency, and privacy.

To evaluate the AI-Pedagogy Integration Model (APIM), a Fictional Institutional Simulation (FIS) was used. This narrative-based approach applies real-world patterns in a hypothetical setting to test framework viability. Qualitative coding surfaced trends and gaps across institutional strategies. Future phases may include Q-methodology to quantify faculty and student perceptions of AI trust and emotional influence. Study limitations include reliance on English-only sources, exclusion of gray literature, and absence of empirical validation. No human subjects were involved. Emphasis was placed on transparency and replicability throughout the process.

Future Research and Validation

To validate the APIM framework, a mixed-methods pilot study is proposed at Middle Georgia State University. The project will integrate an AI tutor into a general education course and collect both quantitative data (e.g., retention rates, engagement, performance) and qualitative input through faculty interviews and student focus groups. The implementation will follow a design-based research (DBR) cycle to support iterative refinement of the framework. Each APIM stage including Assessment, Policy, Implementation, and Monitoring will be evaluated in practice. Future phases may incorporate Cross-Impact Analysis (CIA) to explore dynamic relationships between policy decisions, student engagement, and monitoring systems. Figure 1 presents the PRISMA flow diagram outlining the literature selection process. From an initial pool of over 150 articles, a curated set of peer-reviewed studies on anthropomorphic AI in higher education was identified.

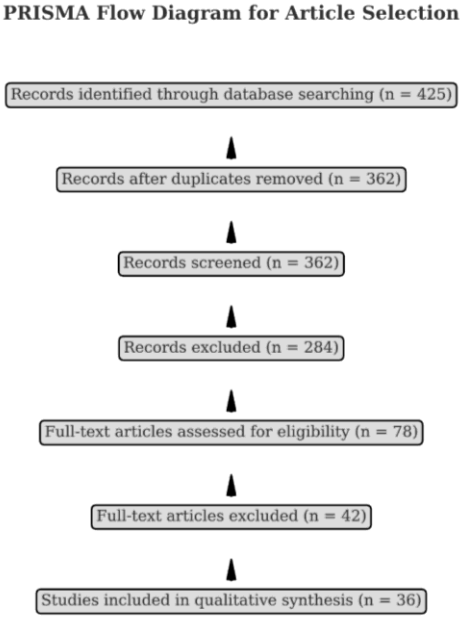

Figure 1. PRISMA Flow Diagram for Article Selection

Results and Findings

AI tutors are reshaping higher education by enhancing student engagement, boosting retention, and reducing faculty workload. Institutions using structured policies to implement AI such as Stanford's TutorCoPilot, Harvard's grading assistant, and Georgia State's chatbot Pounce to illustrate how governance frameworks can enable ethical, scalable innovation. To examine institutional trends, this study applied the AI-Pedagogy Integration Model (APIM) using a Fictional Institutional Simulation (FIS), a qualitative method that draws from real-world practices to test conceptual frameworks. This simulation aligned the study's five research questions (RQ1–RQ5) with institutional actions and the four APIM phases: Assessment (A), Policy (P), Implementation (I), and Monitoring (M). Table 1 maps the research questions with institutional responses and presents this alignment. Stanford and Harvard demonstrate full integration across research questions and APIM phases. Georgia State and Khan Academy show more selective implementation, especially in policy and monitoring.

Table 1. Institutional Alignment with Research Questions and APIM Model Components

Institution	RQ1	RQ2	RQ3	RQ4	RQ5	A	P	I	M
Stanford	✓	✓	✓	✓	✓	✓	✓	✓	✓
Harvard	✓	✓	✓	✓	✓	✓	✓	✓	✓
Middle Georgia	✓			✓	✓	✓	✓		
Georgia State	✓	✓			✓		✓	✓	
Khan Academy	✓	✓			✓	✓		✓	

Figure 2 presents the APIM model, a four-phase framework designed to guide strategic, ethical AI adoption while maintaining academic quality and institutional accountability. To illustrate its application, a fictional pilot was created at ACE University, focusing on online general education. Each APIM stage was implemented based on best practices identified in the literature.

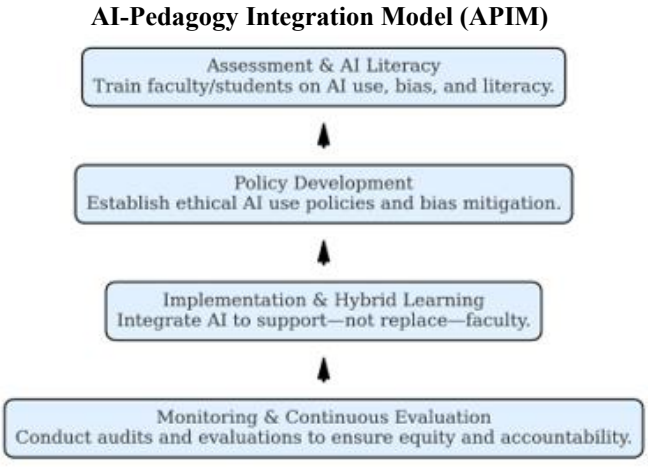

Figure 2. AI-Pedagogy Integration Model (APIM): A four-stage framework for ethical AI integration in higher education

APIM Framework in Action

To demonstrate the APIM model in practice, a fictional pilot was designed at ACE University. The initiative aimed to improve engagement and retention in online general education courses by following all four stages of the APIM framework: Assessment, Policy Development, Implementation, and Monitoring. Each stage was informed by best practices identified in the literature. Table 2 outlines how the framework was applied in this scenario. This case highlights the APIM model's adaptability and potential for practical use in academic environments.

Table 2. APIM Framework Application Fictional Case Study at ACE University

Stage	Description
Assessment (A)	Surveys and faculty focus groups to identify digital literacy gaps
Policy Development (P)	Creation of AI use policy aligned with FERPA and academic integrity
Implementation (I)	Deployment of AI tutor in hybrid pilot courses with faculty training
Monitoring (M)	Continuous evaluation via analytics, satisfaction surveys, and bias audits

Discussion of Findings

Anthropomorphic AI tutors are reshaping higher education by supporting personalized learning, real-time feedback, and self-regulated instruction. These benefits align with cognitive load theory and student-centered design, contributing to improved engagement and retention. However, ethical risks remain. Human-like features may lead students to misinterpret AI as emotionally intelligent, resulting in over-reliance and reduced critical thinking. Institutions like Trinity College Dublin have addressed this by requiring citation of AI-generated content to promote student reflection and accountability.

Bias and transparency challenges also persist. AI systems trained on non-representative data may reinforce inequities, and opaque algorithms limit trust. The California State University system has adopted bias mitigation strategies to address these concerns. Cross-Impact Analysis (CIA) may offer insight into how policies, student behaviors, and monitoring systems interact over time. Faculty resistance is common, often stemming from uncertainty about AI's role in instruction. Organizations such as EDUCAUSE recommend professional development and clear policy guidance to support faculty adaptation. Cognitive Task Analysis (CTA) may help map how educators adjust instructional practices when AI tools are introduced.

Finally, AI hallucinations, or false but plausible outputs, pose a threat to academic integrity. Detection tools, citation policies, and digital literacy training are necessary to help learners critically evaluate AI-generated responses.

Implications for Research and Practice

Institutional Applications

This study offers practical guidance for ethical AI integration in higher education. The APIM framework provides a structured model including Assessment, Policy, Implementation, and Monitoring for strategic planning and responsible deployment. Institutions adopting this model can better align AI tools with academic values and learner-centered goals.

Faculty development should include training in AI literacy, bias awareness, and adaptive instruction. Clear and consistent policies must define responsible AI use, reinforce academic integrity, and support reflective pedagogy across departments.

Research Opportunities

Future research should focus on evaluating AI's impact across diverse institutions using empirical and longitudinal methods. Studies exploring student cognitive, behavioral, and emotional responses to anthropomorphic AI are particularly needed. Q-methodology offers a useful approach to understanding faculty and student perceptions of AI trust, bias, and collaboration. Interdisciplinary research combining education, information systems, and ethics will be vital for refining best practices and shaping responsible AI frameworks in academic environments.

Limitations

This study is limited by its focus on English-language, peer-reviewed sources, potentially excluding relevant gray literature and international perspectives. While the APIM framework is informed by established theories, it has not yet been tested in applied educational settings. Further research should explore the model's adaptability across a range of institutional types, geographic regions, and instructional formats. Empirical validation through pilot studies will be essential to assess its practical value and refine its components based on real-world outcomes.

Conclusions

Anthropomorphic AI offers significant potential to personalize learning and reduce faculty workload, but its integration must be approached with ethical responsibility and pedagogical purpose. Institutional examples from Cornell, the California State University system, and Stanford illustrate the benefits of structured governance and hybrid learning strategies that place human needs at the center. Successful implementation will depend on AI literacy programs, clear institutional policies, and ongoing evaluation to ensure transparency and trust. The true value of AI in education is not in replacing human instructors, but in supporting them. Thoughtful design and responsible oversight will allow AI tools to enhance educational quality while preserving the essential role of human connection in teaching and learning.

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