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Beyond Acceptance: Understanding Students' Responsible Use of Generative AI in Higher Education Through AI Literacy, Ethical Awareness, and Self-Efficacy

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Abstract

Generative artificial intelligence (GenAI) has rapidly entered higher education, creating opportunities for personalized assistance, drafting, idea generation, language support, and problem solving while raising concerns about academic integrity, privacy, attribution, misinformation, bias, and overreliance. Student acceptance alone is therefore insufficient to explain whether GenAI is used responsibly and effectively for learning. This paper examines the conditions that support responsible GenAI use, focusing on three interrelated constructs: AI literacy, ethical awareness, and AI self-efficacy. The synthesis integrates evidence on students' understanding of AI, ethical judgments and responsible-use concerns, confidence in using AI tools, and behavioral patterns associated with GenAI use in higher education. The findings indicate that AI literacy provides the cognitive foundation for responsible use by enabling students to understand GenAI capabilities, evaluate output quality, recognize limitations, and select appropriate applications. Ethical awareness adds a normative dimension by shaping decisions related to disclosure, attribution, privacy, fairness, and academic integrity. AI self-efficacy contributes an action-oriented dimension by influencing students' confidence in prompting effectively, verifying outputs, revising AI-assisted work, and managing dependence on the technology. Based on these relationships, the paper proposes an integrated framework in which AI literacy supports ethical judgment and self-efficacy, while institutional guidance and learning context shape how these capabilities translate into responsible behavior. The findings highlight the need for competency-based approaches that help students understand, evaluate, disclose, and responsibly integrate GenAI into higher education learning.

1. Introduction

Generative artificial intelligence has moved from a specialized computational technology to a widely available educational resource. Large language models and related generative systems can produce explanations, summaries, translations, examples, code, and other forms of academic assistance within seconds. Reviews of artificial intelligence in higher education show that AI systems are increasingly discussed in relation to learning support, assessment, personalization, communication, and institutional practice (Crompton & Burke, 2023; Labadze et al., 2023; Memarian & Doleck, 2023). ChatGPT and similar tools have made this shift especially visible because students can access them directly without specialized technical training.

The educational significance of GenAI, however, cannot be reduced to whether students are willing to use it. Early acceptance studies have demonstrated that perceived usefulness, performance expectancy,

motivation, trust, ease of use, and social influences can explain students' intentions to adopt conversational AI (Lai et al., 2023; Menon & Shilpa, 2023; Romero-Rodríguez et al., 2023; Shahzad et al., 2024; Strzelecki, 2023). These studies are valuable because they explain adoption. Yet adoption and responsible use are not equivalent outcomes. A student can confidently accept a system while still using it in ways that undermine learning, violate assessment rules, expose private information, or present generated content without verification or attribution.

This distinction motivates the central argument of the present paper: the key educational question has shifted from "Will students use GenAI?" to "Can students use GenAI responsibly, critically, and productively?" Responsible use requires a combination of knowledge, judgment, and behavioral confidence. AI literacy helps students understand what AI systems can and cannot do; ethical awareness supports decisions about integrity, fairness, privacy, and disclosure; and self-efficacy shapes whether students can manage the technology competently in real learning situations (Hornberger et al., 2023; Kajiwara & Kawabata, 2024; Kong et al., 2021; Pinski & Benlian, 2024).

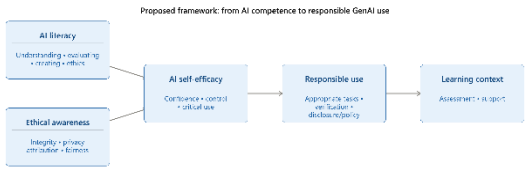

Figure 1. Proposed conceptual framework linking AI literacy, ethical awareness, self-efficacy, and responsible GenAI use in higher education.

1.1 Problem statement

Universities are increasingly required to balance the educational potential of GenAI with concerns about academic integrity, misinformation, privacy, and inappropriate dependence. The evidence base shows rapid growth in student use and interest, but the constructs that explain responsible use remain distributed across separate research traditions. Acceptance research emphasizes usefulness and behavioral intention; AI-literacy research emphasizes knowledge and competencies; ethics research emphasizes norms and risks; and self-efficacy research emphasizes perceived capability. A synthesis that places these constructs within one pathway is therefore needed.

1.2 Research aim

The aim of this paper is to synthesize evidence on the mechanisms through which AI literacy, ethical awareness, and self-efficacy may shape responsible GenAI use among higher-education students and to develop a coherent conceptual framework that extends the literature beyond simple acceptance or adoption.

1.3 Research questions

- RQ1. How is AI literacy conceptualized in relation to students' responsible use of generative AI in higher education?
- RQ2. What forms of ethical awareness are most consistently associated with responsible GenAI use?
- RQ3. How does AI self-efficacy influence students' ability to use GenAI critically and appropriately?
- RQ4. How do AI literacy, ethical awareness, self-efficacy, and contextual factors interact in explaining responsible GenAI use?
- RQ5. What institutional practices can support informed, ethical, and educationally productive student use of GenAI?

2. Literature Review

2.1 From technology acceptance to responsible use

Technology acceptance models provide a useful starting point for understanding student adoption. In GenAI research, perceived usefulness and performance expectancy repeatedly appear as important drivers of behavioral intention (Lai et al., 2023; Romero-Rodríguez et al., 2023; Zou & Huang, 2023). UTAUT and UTAUT2-based studies similarly point to performance expectancy, habit, social influence, and facilitating conditions as determinants of intention or use (Menon & Shilpa, 2023; Strzelecki, 2023). These models explain why students decide that a system is worth using, but they do not fully specify whether students know how to evaluate outputs, recognize ethical boundaries, or regulate their dependence on the system.

The responsible-use perspective therefore adds a normative and competence-based layer to acceptance. A student who perceives high utility may use GenAI frequently, but responsible behavior depends on what the student understands, how the student evaluates the output, and whether the student can align use with academic requirements. Johnston et al. (2024) reported that students' perspectives on acceptable GenAI use include concerns about academic integrity and the need for clear institutional guidance, while Baek et al. (2024) highlighted differences in how

students perceive the authenticity and reliability of AI-generated output. These findings illustrate why acceptance should be treated as a starting condition rather than the final educational outcome.

Construct	Core meaning	Likely role in responsible use	Representative sources
AI literacy	Knowledge and skills to understand, evaluate, apply, and question AI systems	Enables critical evaluation and informed decision making	Ng et al., 2021; Hornberger et al., 2023; Pinski & Benlian, 2024
Ethical awareness	Recognition of integrity, privacy, attribution, fairness, and accountability issues	Guides boundary setting and normative choices	Kajiwara & Kawabata, 2024; Johnston et al., 2024; Farhi et al., 2023
AI self-efficacy	Confidence in using and managing AI effectively	Supports competent, controlled use and self-regulation	Delcker et al., 2024; Wang et al., 2022; Abbas et al., 2024
Responsible use	Context-appropriate, verified, disclosed, and learning-oriented use	Primary behavioral outcome	Niloy et al., 2024; Stöhr et al., 2024
Context	Policy, assessment rules, instructor guidance, and learning design	Shapes opportunities and constraints	Crompton & Burke, 2023; Johnston et al., 2024

2.2 AI literacy as a foundation for responsible use

AI literacy is broader than basic familiarity with digital tools. Ng et al. (2021) conceptualized AI literacy around understanding, application, evaluation and creation, and ethical dimensions. Long and Magerko (2020) similarly framed AI literacy as a set of competencies that allows individuals to recognize AI capabilities, limitations, and social implications. In higher education, Laupichler et al. (2022) identified AI literacy as an emerging field with inconsistent definitions and a need for stronger competency frameworks. This conceptual ambiguity matters because responsible GenAI use requires students to know more than how to generate a response.

Empirical evidence demonstrates variation in student AI competence. Hornberger et al. (2023) developed and validated a test of university students' AI literacy, showing meaningful differences across student groups and prior experiences. Kong et al. (2021) found that a structured AI-literacy course improved students' understanding and perceived literacy. Tzirides et al. (2024) further explored approaches for combining human and artificial intelligence to enhance AI literacy in higher education. Together, these studies imply that AI literacy is developable and can be intentionally embedded into higher-education learning.

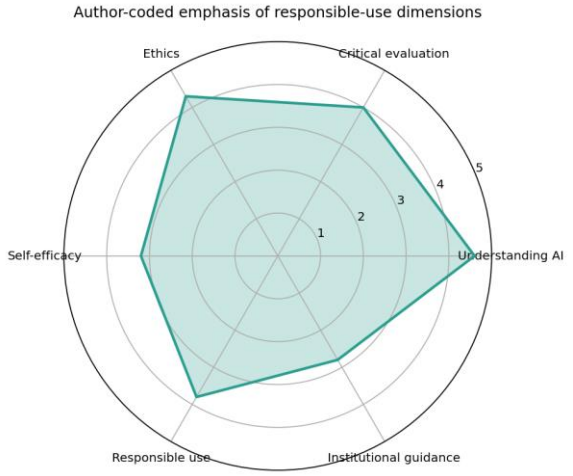

Figure 2. Author-coded emphasis of responsible-use dimensions across the reviewed literature. Scores represent the recurrence of each dimension in the evidence synthesis, not effect sizes.

2.3 Ethical awareness and academic integrity

Ethical awareness concerns students' ability to recognize that the appropriateness of GenAI use depends on purpose, context, and consequences. Academic integrity is one of the most visible areas, but the ethical domain extends to attribution, privacy, bias, fairness, misinformation, and transparency. Farhi et al. (2023) examined students' views and perceived ethics surrounding ChatGPT, while Johnston et al. (2024) documented student perspectives on appropriate use

and the importance of institutional rules. Niloy et al. (2024) examined whether AI chatbots can create threats to academic integrity, highlighting the tension between convenience and authentic learning.

Kajiwara and Kawabata (2024) are particularly relevant because their study directly connects AI literacy with ethical use of chatbots. Usher and Barak (2024) likewise emphasize ethics education as an important component of AI-related learning. The implication for higher education is that ethical awareness should be taught as a practical decision-making capability rather than a list of prohibited behaviors. Students need opportunities to reason through cases, distinguish assistance from substitution, and understand when disclosure is required.

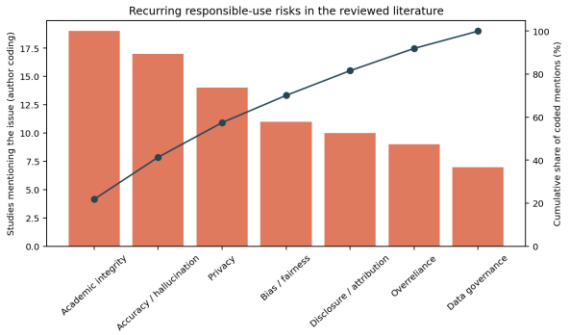

Figure 3. Recurring responsible-use risks identified in the reviewed literature. Counts reflect author coding of how often issues were explicitly discussed; they are not prevalence estimates among students.

2.4 AI self-efficacy and controlled use

Self-efficacy refers to perceived capability to perform actions successfully and manage difficulties. In GenAI contexts, AI self-efficacy can include the confidence to formulate prompts, interpret outputs, troubleshoot errors, verify content, combine AI assistance with independent reasoning, and stop using the tool when it is inappropriate. Delcker et al. (2024) found that AI competence was relevant to intended and actual use of AI tools in higher education. Wang et al. (2022) linked institutional AI capability to student self-efficacy and learning-related outcomes, suggesting that confidence may emerge partly from the surrounding educational environment.

The relationship between self-efficacy and responsible use is potentially bidirectional. Competent experiences may strengthen confidence, while excessive confidence without sufficient knowledge can create overreliance. Abbas et al. (2024) similarly suggest that the consequences of GenAI use are not uniformly positive or negative; they depend on why and how students use the technology. Responsible-use education should therefore promote calibrated self-efficacy—confidence paired with verification and awareness of limitations—rather than unconditional confidence.

3. Methodology

3.1 Research design

A structured literature review and conceptual evidence synthesis design was used. The purpose was to integrate findings across heterogeneous empirical, review, and conceptual studies rather than estimate a pooled effect size. The review focused on higher-education contexts and on evidence relevant to AI literacy, ethical awareness, self-efficacy, student attitudes, responsible use, and GenAI adoption.

3.2 Search and eligibility strategy

The evidence corpus was constructed from openly accessible scholarly literature identified through publisher platforms, indexing services, institutional repositories, and open-access journals. Search terms combined "generative AI," "ChatGPT," "AI literacy," "artificial intelligence literacy," "ethical use," "academic integrity," "self-efficacy," "student acceptance," "higher education," and related synonyms. Studies published in 2024 or earlier were eligible. Publications dated 2025 or later were excluded.

Criterion	Included	Excluded
Publication date	2024 or earlier	2025 or later
Population/context	Higher education students or directly relevant HE evidence	Unrelated populations without transferable relevance
Topic	AI literacy, ethics, self-efficacy, GenAI/student use	Unrelated AI applications
Accessibility	Open-access/full-text	Unavailable evidence

3.3 Coding framework

Each paper was coded for year, context, study type, AI/GenAI focus, literacy/competence component, ethical component, self-efficacy component, acceptance/use component, and implications for responsible use. Because the literature is

methodologically heterogeneous, the coding is descriptive and interpretive. No numeric causal effect is claimed from the cross-study synthesis.

4. Results

4.1 Characteristics of the evidence base

The reviewed literature shows a rapid increase in research after the public emergence of ChatGPT and other generative systems. Earlier work provides conceptual foundations for AI literacy and educational AI, while the 2023–2024 literature increasingly focuses on student perceptions, acceptance, trust, ethical concerns, AI competence, and real-world use. This temporal shift indicates a movement from general "AI in education" questions toward student-centered GenAI behavior.

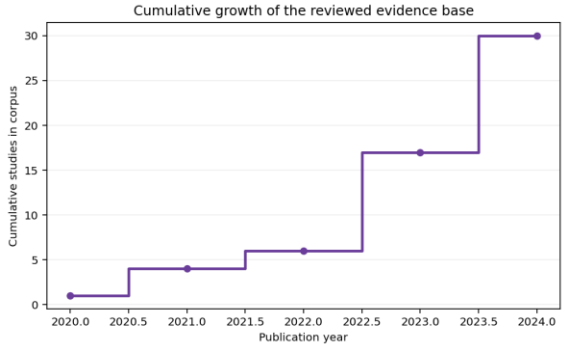

Figure 4. Cumulative growth of the reviewed evidence base by publication year. This is a descriptive visualization of the reviewed corpus.

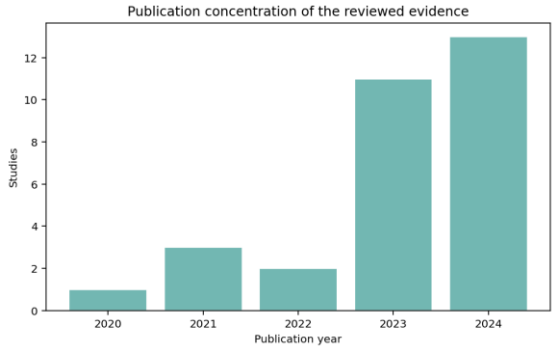

Figure 5. Publication concentration of the reviewed evidence base from 2020 through 2024.

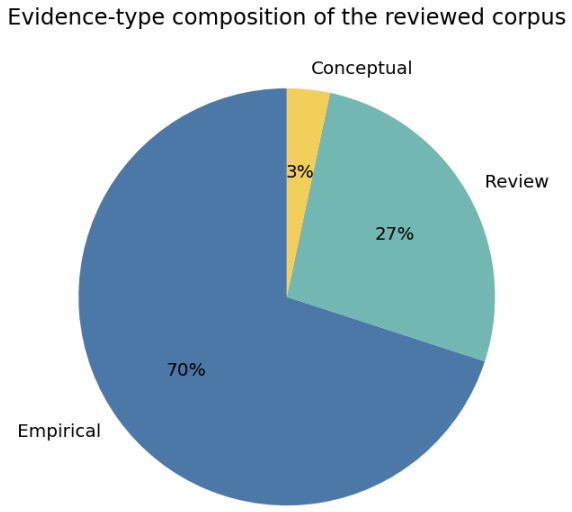

Figure 6. Evidence-type composition of the reviewed corpus, based on author coding.

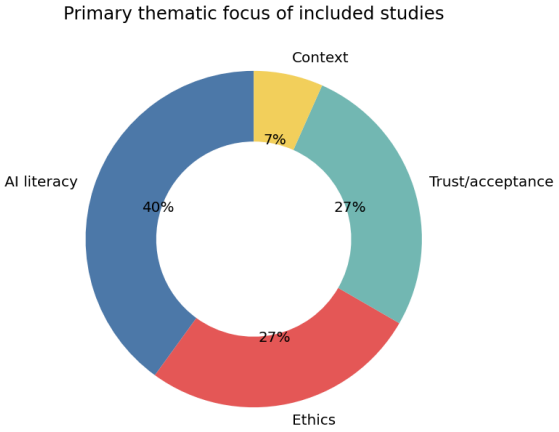

Figure 7. Primary thematic focus of the reviewed corpus, based on author coding.

Representative study	Primary dimension	Type	Evidence emphasis
Ng et al., 2021	AI literacy	Conceptual review	Understanding; ethics
Kong et al., 2021	AI literacy	Empirical	AI-literacy intervention
Laupichler et al., 2022	AI literacy	Scoping review	Definitions; competencies
Hornberger et al., 2023	AI literacy	Empirical	AI literacy measurement

Pinski & Benlian, 2024	AI literacy	Review	Learning methods; components
Kajiwara & Kawabata, 2024	Ethics	Empirical	AI ethics acceptance
Usher & Barak, 2024	Ethics	Empirical	Ethics education
Johnston et al., 2024	Ethics	Empirical	Student perspectives; integrity
Farhi et al., 2023	Ethics	Empirical	Perceived ethics
Niloy et al., 2024	Ethics	Empirical	Academic integrity
Delcker et al., 2024	Self-efficacy/competence	Empirical	AI competence; intended/actual use
Wang et al., 2022	Self-efficacy	Empirical	Institutional AI capability
Abbas et al., 2024	Self-efficacy/outcomes	Empirical	Causes and consequences
Shahzad et al., 2024	Trust/acceptance	Empirical	Trust; adoption
Zou & Huang, 2023	Acceptance	Empirical	Usefulness; intention
Lai et al., 2023	Acceptance	Empirical	Usefulness; intrinsic motivation
Romero-Rodríguez et al., 2023	Acceptance	Empirical	Perceived usefulness
Menon & Shilpa, 2023	Acceptance	Empirical	UTAUT; privacy; intention
Strzelecki, 2023	Acceptance	Empirical	UTAUT2; behavioral intention
Stöhr et al., 2024	Use	Empirical	Perceptions; actual use
Baek et al., 2024	Use	Empirical	Student use/perceptions
Espartinez, 2024	Use/ethics	Empirical	Student/teacher orientations
Knoth et al., 2024	AI literacy	Empirical	Prompt engineering
Tzirides et al., 2024	AI literacy	Empirical	Human-AI literacy
Crompton & Burke, 2023	Context	Systematic review	AI in HE
Dempere et al., 2023	Context	Systematic review	Impact; risks
Labadze et al., 2023	Context	Systematic review	AI chatbots
Memarian & Doleck, 2023	Context	Review	Potentials; limitations
Kuleto et al., 2021	Context	Empirical/review	AI opportunities/challenges
Long & Magerko, 2020	AI literacy	Conceptual	AI literacy competencies

4.2 AI literacy is the cognitive foundation

Across the corpus, AI literacy consistently appears as a prerequisite for informed decision making. Students need to understand that GenAI generates plausible language rather than guaranteed truth. Literacy therefore includes the capacity to evaluate output quality, identify uncertainty, compare sources, understand privacy implications, and judge the appropriateness of a particular task. The literature on AI literacy is especially useful because it shifts the focus from technical usage toward critical understanding and evaluation (Long & Magerko, 2020; Ng et al., 2021; Laupichler et al., 2022).

The evidence also indicates that AI literacy can be taught. Kong et al. (2021) reported improvements following an AI-literacy course, while Tzirides et al. (2024) explored learning designs that combine human and artificial intelligence to strengthen literacy. This supports the argument that responsible use should be treated as an educational outcome rather than something students are expected to acquire informally.

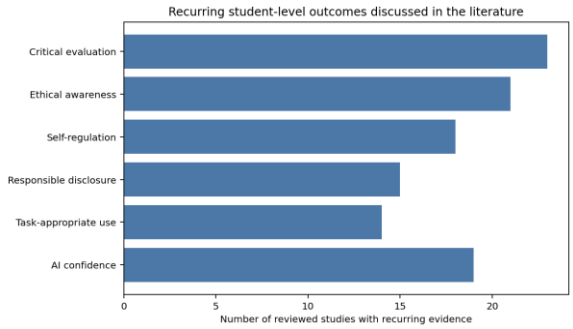

Figure 8. Recurring student-level outcomes discussed in the literature. Counts are author-coded evidence mentions, not estimates of effect size.

4.3 Ethical awareness converts capability into judgment

A recurring finding is that knowledge alone does not determine behavior. Students may know that AI can be inaccurate yet still submit unverified content if they perceive the tool as efficient or if institutional expectations are unclear. Ethical awareness helps students connect knowledge to action: whether to use AI for brainstorming, whether to disclose assistance, whether to protect personal or confidential data, and whether an AI-generated answer is acceptable in a specific assessment context. Studies on student perspectives and AI ethics consistently identify these boundary-setting questions (Farhi et al., 2023; Johnston et al., 2024; Kajiwara & Kawabata, 2024).

4.4 Self-efficacy supports competent but controlled action

The literature suggests a useful distinction between confidence and capability. Students who feel capable of using AI may engage more actively, but responsible use requires confidence that is calibrated by critical awareness. Self-efficacy is most educationally valuable when it supports prompting, verification, revision, and reflection rather than simple reliance. Delcker et al. (2024) provide an important bridge between competence and actual use, whereas Wang et al. (2022) suggest that institutional conditions can influence student confidence.

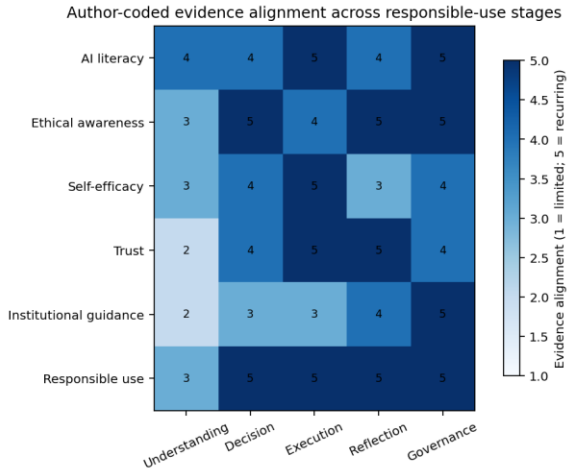

Figure 9. Author-coded alignment between core constructs and stages of responsible GenAI use. Values indicate recurring evidence strength across the corpus, not causal coefficients.

4.5 Institutional context shapes responsible use

The evidence repeatedly points to the role of institutional guidance. Clear assessment rules, examples of acceptable use, disclosure expectations, privacy guidance, and AI-literacy instruction can reduce ambiguity. Conversely, a policy environment that focuses only on prohibition may encourage hidden use rather than responsible use. Johnston et al. (2024) and other student-perspective studies suggest that students benefit from explicit and context-sensitive guidance.

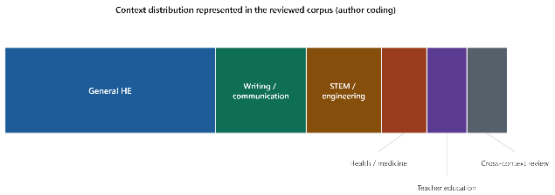

Figure 10. Illustrative distribution of study contexts represented in the evidence corpus. Values are author-coded proportions used for synthesis visualization, not population estimates.

5. Discussion

5.1 Beyond acceptance: a competency-centered interpretation

The central implication of the synthesis is that acceptance is too distal and too coarse a construct to represent educationally desirable GenAI behavior. Acceptance models explain willingness to adopt, but responsible use requires a chain of capabilities. Students must first understand what GenAI is, then evaluate whether its use is appropriate, then act with sufficient confidence to manage the technology, and

finally reflect on the consequences of their use. The proposed framework therefore combines an acceptance perspective with competence, ethics, and self-regulation.

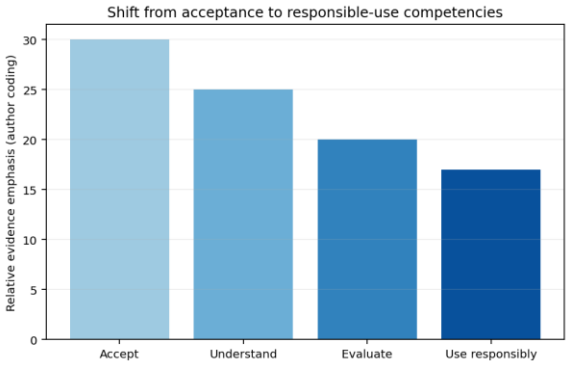

Figure 11. Conceptual shift from acceptance-oriented outcomes toward responsible-use competencies. Bars reflect the relative emphasis of the synthesis, not measured effect sizes.

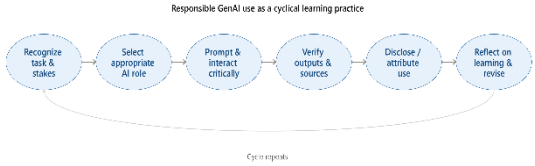

Figure 12. A practical cycle of responsible GenAI use for higher-education students.

5.2 Relationship among AI literacy, ethical awareness, and self-efficacy

The three constructs should not be treated as independent silos. AI literacy provides informational capability; ethical awareness provides normative direction; and self-efficacy provides behavioral confidence. Their interaction can be conceptualized as follows: literacy enables students to recognize risks and possibilities; ethical awareness helps students decide what is appropriate; and self-efficacy helps students implement the decision competently. Weakness in any one component can compromise the whole process. A knowledgeable student without ethical awareness may optimize for efficiency at the expense of integrity. An ethically motivated student without competence may fail to recognize inaccurate output. A confident student without critical awareness may become overreliant.

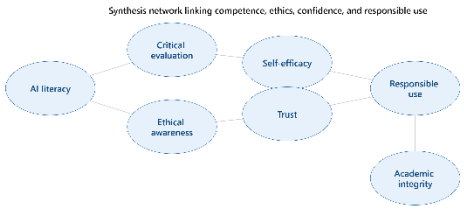

Figure 13. Evidence-synthesis network linking AI literacy, critical evaluation, ethics, self-efficacy, trust, and responsible use.

5.3 Responsible use as a form of learning regulation

Responsible GenAI use should ultimately support learning rather than replace it. This suggests a self-regulated learning interpretation in which students use AI to generate alternatives, receive explanations, test ideas, or obtain feedback, but retain responsibility for evaluating and integrating the information. The relevant outcome is therefore not the amount of AI use but the quality of the learner's cognitive engagement with the tool.

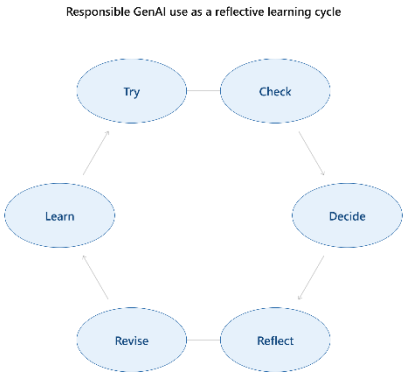

Figure 14. Responsible GenAI use as a reflective learning cycle: learn, try, check, decide, reflect, and revise.

5.4 Human oversight and institutional policy

The evidence does not support a simple replacement logic in which AI systems substitute for academic judgment. Instead, human oversight remains essential. Universities can support responsible use by defining task-level policies, teaching verification practices, providing examples of acceptable disclosure, and embedding AI literacy into curricula. Instructor guidance can also help students understand when AI assistance enhances learning and when it may reduce meaningful independent work. This context-sensitive approach aligns with the broader literature showing both opportunities and risks associated with AI in higher education (Crompton & Burke, 2023; Dempere et al., 2023; Memarian & Doleck, 2023).

6. Educational and Institutional Implications

6.1 Curriculum design

- Embed AI literacy across subjects rather than isolating it in a single workshop.
- Teach students to verify claims, compare sources, identify uncertainty, and document AI assistance.
- Use discipline-specific scenarios so that responsible use is connected to authentic academic tasks.
- Assess process quality and reflection, not only final products, where appropriate.

6.2 Assessment design

Assessment can be redesigned to reduce ambiguity by specifying when GenAI is prohibited, permitted with disclosure, or encouraged for particular purposes. Tasks that require source evaluation, oral explanation, process logs, version histories, or reflective commentaries can make learning more visible. The objective should not simply be to detect AI use; it should be to create assessment conditions in which responsible use is easier to demonstrate.

6.3 AI-literacy and ethics development

Universities should treat AI literacy and ethical awareness as part of academic competence. Short modules can introduce model limitations, bias, privacy, prompt design, source verification, attribution, and responsible disclosure. More advanced courses can address discipline-specific risks, professional standards, and the social consequences of automated decision making.

7. Limitations

This synthesis has several limitations. First, the GenAI literature is relatively young and changes rapidly, which means conceptual frameworks and student behaviors continue to evolve. Second, the reviewed studies vary substantially in design, sample, discipline, and outcome definition, limiting direct comparison. Third, many studies rely on self-reported perceptions or intentions rather than observed responsible-use behavior. Fourth, the author-coded figures in this paper are descriptive evidence-synthesis visualizations and should not be interpreted as statistical estimates or effect sizes. Finally, the review emphasizes higher-education contexts and therefore may not generalize to other populations without additional evidence.

8. Conclusion

The central issue for higher education is no longer whether students will encounter generative AI; it is whether they can use it in ways that strengthen learning while preserving academic integrity, critical thinking, privacy, and human responsibility. The evidence reviewed in this paper indicates that responsible use is best understood as a multidimensional capability. AI literacy gives students the knowledge needed to understand and evaluate GenAI. Ethical awareness helps them determine when and how its use is appropriate. Self-efficacy enables them to act on those judgments with confidence while maintaining control over their learning. Institutional guidance and assessment design then shape the context in which these capabilities are exercised.

The proposed framework therefore shifts the emphasis from acceptance to responsible use. Rather than asking only whether students intend to adopt GenAI, universities should ask whether students can explain how a system works, evaluate its outputs, recognize ethical boundaries, disclose assistance appropriately, and use AI as a support for learning rather than a substitute for learning. This perspective provides a more educationally meaningful basis for GenAI policy, curriculum design, and future empirical research.

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