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Governing generative AI in higher education: a global Delphi study on policy and practice

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Abstract

As GenAI technologies become more pervasive in higher education (HE), scholars call for guidance on AI governance. To meet this need, a Delphi technique and collective writing was used in gathering expert perspectives from across 22 countries/locations and six continents. This resulted in the development of a HE GenAI policy/guidelines framework with eight core areas: (1) academic integrity, (2) ethical use and responsible use, (3) privacy and protection, (4) equitable access, (5) GenAI literacy, (6) integration strategy, (7) human oversight and accountability, and (8) institutional support and infrastructure. In addition, a six-part framework was developed to ensure that policies remain current and relevant: (1) creating a dedicated GenAI Committee, (2) conducting regularly scheduled policy reviews, (3) providing ongoing professional development and support, (4) communicating with all stakeholders, (5) evaluating the effectiveness and impact of GenAI, and 6) monitoring external developments. By providing a robust, eight-part framework for policy and guidelines, alongside a six-part mechanism for continued review, this study offers faculty, students, administrators, educational leaders, policymakers, and funders a responsible, adaptable, and consensus-driven blueprint for navigating the integration of GenAI in HE, ensuring that technological innovation serves pedagogical excellence.

Introduction

GenAI technologies are rapidly improving and increasingly integrated into academic contexts including teaching, learning, assessment, and research workflows, where they are used for tasks ranging from automated writing assistance and content creation to customized tutoring and feedback generation (Crompton & Burke, 2023; McDonald et al., 2024). Long-standing pedagogical and assessment practices were suddenly challenged as universities faced widespread student use of GenAI for tasks ranging from

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essay generation to complex problem-solving (Cotton et al., 2023). Alongside potential benefits for learning, GenAI also introduced risks, including challenges to academic integrity (Perkins, 2023), concerns about diminished critical thinking and cognitive engagement (Fan et al., 2025; Gerlich, 2025), and data privacy issues (Wang et al., 2025). Faced with this tension, institutional responses diverged sharply from outright prohibition to open encouragement (Luo, 2024). Scholars observed early on that prohibiting GenAI posed considerable practical and pedagogical challenges, such as, disruption of cognition (Kosmyna et al., 2025), difficulty in detecting GenAI use (Bassett et al., 2025), missed student opportunities to learn critical evaluation and ethical use of AI systems (Yang, 2023). As adoption has accelerated, HE institutions have begun to explore strategies for managing use in ways that uphold academic standards and educational objectives (Wang, et al., 2024). Scholars call for further research to stay current with GenAI technologies and usage (Barrett & Pack, 2023) and to explore policies and guidelines across the global HE landscapes (Jin et al., 2024). Yet, these efforts often remain localized and reactive. What is critically absent from the scholarly and policy landscape is a systematic, globally informed consensus on the core components of effective GenAI governance in higher education (Selvaratnam et al., 2024). We convened this study to develop that consensus, including whether HE should adopt formal policies or flexible guidelines, what this governance should encompass, and how policies can be updated in response to ongoing technological change.

Background

Defining GenAI

GenAI refers to a branch of artificial intelligence focused on creating content. It relies on advanced machine learning techniques, especially large language models (LLMs), and other generative models (such as generative adversarial networks or diffusion models), that, when prompted, produce outputs, including text, images, audio, video, code, and simulations (Storey et al., 2025).

Policies and guidelines

As GenAI technologies become more pervasive, institutional policies are essential to uphold academic integrity, support pedagogical coherence, promote equity, protect student rights, and prepare graduates for the GenAI-integrated future (Jin et al., 2024). These policies should be developed inclusively, iteratively, and in alignment with the evolving landscape of GenAI in education (Liu & Jagadish, 2024). However, institutional responses have been inconsistent and often reactive. A review of the world's top 50 universities found that less than half of these institutions had any publicly available policies or guidelines (Moorhouse et al., 2023). Luo (2024) examined the top 20 universities recognized by the 2024 QS World University Rankings and observed that many early policies framed the use of GenAI primarily as a threat to the originality of work. Luo argued that this narrow focus on originality might miss opportunities to integrate GenAI in constructive ways. This uneven response by HE institutions to respond to GenAI governance issues can be understood through institutional theory, which explains how organizations adapt policies in response to external pressures and evolving norms (Scott, 2014). From this perspective, the uneven and sometimes reactive development of GenAI policies across higher education reflects broader dynamics of policy implementation and

organizational governance**,** rather than purely technological concerns. GenAI is often adopted for its potential to enhance efficiency and provide customized support, but it may inadvertently encourage students to accept its outputs uncritically, engaging with information only at a surface level (Abdallah et al., 2025). Melisa et al. (2025) highlights the importance of instructional guidance in HE that promotes using GenAI to enhance students' critical evaluation and self-reflection, rather than fostering over-reliance on it. The key lesson for HE is that technology, left to its own momentum, can reconfigure teaching practices in ways that privilege speed or productivity over authentic intellectual engagement. Policies, therefore, cannot simply dictate the imperatives of GenAI use; they must provide a framework that ensures innovation strengthens, rather than undermines, educational goals.

To build such a framework, a systemic perspective is required (Sharples, 2025). The Socio-Ecological Technology Integration (SETI) framework (Crompton et al., 2024), in this regard, offers a model for how institutions can build such a framework (see Fig. 1). SETI recognizes that educators (the inner circle of the framework) operate within interconnected layers of influence, from course/classroom practice (microsystem) to institutional culture and broader policy environments (exosystem). While policies are shown in the exosystem level of the framework, the arrows in the mesosystem emphasize that policies (and their impacts) can be found at all levels: educator, microsystem, exosystem, and macrosystem. At the core of this framework is the recognition that educators cannot

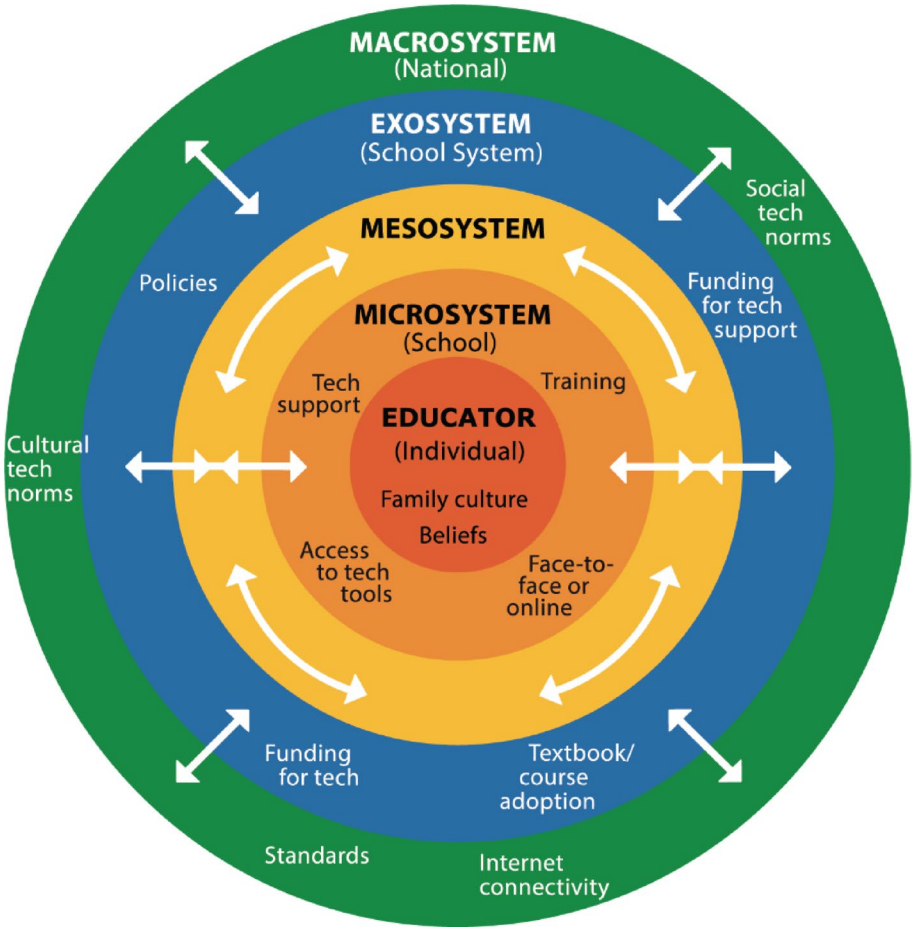

Fig. 1 Socio ecological technology integration framework (Crompton et al., 2024)

integrate technology effectively if they are left unsupported. They need a unified effort across interdependent systems around them (Crompton, 2025), including policies, leadership, infrastructure, and professional development that create conditions for responsible and pedagogically meaningful use.

This would involve leadership at the microsystem, ensuring that the policies/guidelines they create and implement take into account the nuances of the individual institution while also adhering to those policies and guidelines implemented at the exosystem and the macrosystem. Those developing policies/guidelines at the exosystem would need to also consider those working within the microsystem to ensure they are implementable within that system and again align with policies/guidelines from the macrosystem. The overarching macrosystem provides guidance from the national level. These can be policies/guidelines from the government, national organizations, and institutions. These policy developers would need to recognize the smaller exosystems and microsystems and align their policies with those overarching instructions. Within this ecological perspective, policies are not simply rules, but rather enabling structures that anchor technologies, such as GenAI, to values of equity, inclusion, and academic integrity. By situating policies as part of a wider ecosystem of support, SETI highlights how institutions can move beyond reactive restrictions and instead create coherent, proactive approaches to GenAI governance.

This broader view makes clear that policy development must be critical and reflective. As seen in the uneven adoption of past technologies, such as, mobile learning adoption, which varies in higher education by individuals' roles as educators or learners, their institutions, and their geography (Valencia-Arias et al., 2024), progress is never automatic, and outcomes depend on how technologies are framed, supported, and embedded within teaching and learning systems (Feng et al., 2025). The absence of coherent and informed policies has already led scholars to call for the establishment of ethical guidelines and institutional frameworks to guide GenAI adoption in HE (Batista et al., 2024). SETI provides a holistic perspective that can guide the development of well-designed policies that are not just protective but also empower educators and students in a GenAI-rich academic environment.

Policies versus guidelines

For this study, policies are defined as formal, authoritative statements that establish rules, responsibilities, and procedures. They are mandatory and enforceable across the institution. Policies are approved by governing bodies (e.g., board of trustees, academic senate) and are designed to ensure compliance with legal, regulatory, and institutional standards. Guidelines are advisory frameworks or recommended practices intended to support the implementation of policies or to promote consistency in practice. Guidelines are flexible and non-binding, allowing adaptation to specific contexts within the institution. They are often created by departments, committees, or administrative offices to interpret or operationalize policies.

Some HE leaders have advocated for nimble guidelines given the fluid state of GenAI technology (Ifenthaler et al., 2024). University experts have cautioned that standardized, one-size-fits-all GenAI policies are not sustainable in the long term, recommending a flexible foundation that can evolve as GenAI does (Le, 2024). However, without any formal policy, guidelines alone might lack substance and leave important questions

unanswered. Hybrid approaches are emerging as a possible path. Research suggests that policies and guidelines can be mutually supportive of the policy, setting the overarching expectations and accountability, whereas guidelines provide interpretation and implementation help (Robert & McCormack, 2024). This dual approach may support both clarity and flexibility, which are necessary to meet persistent calls for GenAI governance.

Extant policies and guidelines

In response to the opportunities and risks created by GenAI, calls for governance frameworks around GenAI in HE have intensified (An et al., 2025). Chan (2023) proposed a GenAI-in-education policy framework spanning institutional governance, operations, and pedagogy. This framework highlights the need to address issues like data governance, equitable access, academic integrity, and GenAI literacy within a cohesive strategy. Global bodies have also made recommendations. UNESCO (2023) released some of the first global guidance on GenAI in education, noting that fewer than 10% of educational institutions had formal guidance on GenAI and recommending measures to promote equity, transparency, and learner safety. In addition, UNESCO (2025a, 2025b) developed the AI Competency Framework for Students and Educators. There is a broadening consensus that HE needs to develop responses to GenAI that harness its benefits for learning while mitigating potential harm through appropriate policies or guidelines (Moorhouse et al., 2023). It is important that HE institutions embrace a nuanced governance approach: one that supports innovation while safeguarding integrity and fairness and encourages ongoing review as GenAI continues to evolve. Despite the varied institutional responses to developing policies and guidelines for GenAI in HE, most institutions remain in the early stages of policy formulation. Few existing policies are empirically grounded, comprehensive, or sufficiently robust to address the complex and evolving nature of GenAI integration in higher education contexts.

Purpose

Urgent calls for GenAI governance have often focused on prohibitions as a reactive stance (Luo, 2024). However, scholars (viz., Barrett & Pack, 2023; Jin et al., 2024; Selvaratnam et al., 2024) and frameworks, such as SETI (viz., Crompton et al., 2024), emphasize the need for clear guidance on the governance of GenAI in HE. Therefore, the purpose of this study is to address these scholarly calls by identifying the core components of effective GenAI governance in HE. Specifically, this study responds to Barrett and Pack (2023) and Jin et al. (2024), who urged research to establish appropriate policies and guidelines for GenAI use in HE; to Selvaratnam et al. (2024), who highlighted the need for a globally informed consensus on governance components; and to Barrett and Pack (2023), who advocated for strategies to ensure such policies and guidelines remain current. Addressing these gaps requires building international consensus among HE experts.

The research question is: RQ. What policies and/or guidelines should be developed in HE education to ensure the responsible and effective use of generative AI (GenAI) in learning experiences?

RQ1 When establishing direction for GenAI implementation in HE education, which approach is more suitable: formal policies, flexible guidelines, or a combination of both?

RQ2 If guidance structures are put in place for HE GenAI implementation, what core topics should they encompass?

RQ3 If policies or guidelines are established, what processes could help ensure they remain current as GenAI technologies and uses evolve?

Method

In this study, we drew on the principles of the Delphi technique (Powell, 2003; Rowe & Wright, 2001) paired with qualitative data analysis of grounded coding (Strauss & Corbin, 1995), and with collective writing (Bozkurt et al., 2024). The Delphi process was implemented first to systematically capture and refine expert perspectives on policies and guidelines for the use of GenAI in HE and is well-positioned to be adapted to best meet that need (Popov et al., 2020). This study builds on the Delphi technique by incorporating grounded coding (Strauss & Corbin, 1995) to qualitatively analyze survey findings across surveys. Insights from the Delphi rounds informed a subsequent collaborative writing phase, in which participants co-constructed a synthesized, critically interpretive account of the findings. Together, these approaches combined structured consensus-building with dialogic co-authorship, aligning with contemporary participatory research methodologies in educational technology.

Participants

A purposive sampling approach was used to identify and recruit a panel of international experts for this study. To ensure a high level of expertise and relevance to the study objectives, participants were chosen based on predefined inclusion criteria. Inclusion criteria required that candidates had expertise in HE educational technology and AI, as evidenced by their scholarly contributions, their professional experience in HE contexts, and/or their leadership roles in relevant professional organizations. Forty-one panelists were initially invited to participate. A total of 35 (85%) participants agreed to participate in all three phases of the study. The final panel included HE education technology academics (24), leadership from multilateral education organizations (4), and chief academic officers/directors of education technology organizations (7). These participants represented 22 countries and six continents (see Fig. 2). To ensure representation from low-income contexts, three panelists affiliated with multilateral organizations serving low-income countries were included. This purposeful approach ensured diversity across professional roles, economic contexts, and geographic regions, thereby strengthening the validity and transferability of the findings.

Data collection procedures

Data collection occurred across three phases. Phases 1 and 2 employed a Delphi-style approach combined with grounded coding methods (Strauss & Corbin, 1995), while Phase 3 involved a collective writing process. The Delphi method was used to gather expert perspectives on HE policies and guidelines from a broad group of participants. This approach allows expert insights to be synthesized in ways that produce more reliable and comprehensive understandings than individual viewpoints alone (Rowe & Wright, 2001). Consistent with Delphi procedures, participant anonymity was

Fig. 2 Participants' geographical locations

maintained during the early stages and lifted only during Phase 3, when the process transitioned to collaborative writing.

In Phase 1, participants completed a semi-structured, open-ended questionnaire designed to capture their perspectives on the need for HE GenAI policies and guidelines. Questions focused on whether such policies or guidelines should exist, what elements they should include and why, and what mechanisms might ensure they remain current. The researchers analyzed the responses from the panelists, and in Phase 2, the researchers shared a thematic synthesis of Phase 1 responses with the panel. They then invited participants to review the emerging themes and evaluate whether the themes capture all the topics needed and whether they would change anything.

In Phase 3, panelists examined a consolidated summary of the findings to verify that the interpretations accurately reflected their perspectives. At this stage, the study shifted to a collective writing process in which participants collaborated in developing the manuscript through iterative feedback and joint drafting. This collaborative approach enabled the integration of diverse perspectives, pluralistic interpretation (Jandrić et al., 2023), and methodological rigor by dialogic knowledge creation (Acar et al., 2024). The collective writing process has demonstrated effectiveness through academic literature (e.g., Cahusac de Caux & Pretorius, 2024; Lu & Kim, 2021) This process supported a shared articulation of the study's conclusions.

Data analysis

Data analysis proceeded in two integrated stages. First, responses from the first Delphi round were analyzed using grounded coding and the constant comparative method, identifying recurring ideas, tensions, and emergent categories. "In vivo" coding (Saldaña, 2015), which involves using key phrases or terms directly from the participants to preserve participants' original phrasing, ensuring that interpretations remain grounded in their language and conceptual framings. Three researchers independently reviewed and coded textual data, then compared and refined codes to reach theoretical saturation, where additional data no longer yielded new conceptual insights. These categories served as the basis for the Phase 2 synthesis. The data received included validation of the eight themes gathered from the first survey. However, there were also requests for clarification of terms, and more specificity regarding language used in the policies and

guidelines, and the need to highlight areas that were of particular importance. These changes were made to then continue onward to Phase 3. In Phase 3, panelists reviewed a consolidated summary of findings to confirm accuracy while also engaging in the collective writing.

The collective writing phase functioned as an integrative stage of both analysis and synthesis. Through co-authorship, participants expanded on the implications of the Delphi findings, negotiated differing interpretations, and co-developed a shared narrative situated within HE contexts. This approach has been shown to enhance methodological rigor by blending systematic consensus-building with dialogic and interpretive scholarship (Jandrić et al., 2023).

Findings and discussion

The three questions guiding this study provide the organization for the findings and discussion section of this paper.

RQ1. When establishing direction for GenAI implementation in HE education, which approach is more suitable: formal policies, flexible guidelines, or a combination of both?

The majority of the panelists (88%) indicated that effective GenAI implementation in HE requires a combination of formal policies and flexible guidelines, rather than prioritizing one form of governance. Only four panelists favored relying solely on informal guidelines. None advocated using only formal policies. This near-unanimous agreement on a hybrid model, which combines both policies and guidelines, suggests that panelists see formal policies and flexible guidelines as complementary, each addressing distinct needs in governing use of GenAI.

Qualitative statements from the panelists explain why a blended approach was favored. One panelist explained that clear guidelines are "essential so that learners know how to comply with policies," yet "since guidelines alone cannot…be enforced," formal policies are "also necessary to provide teeth and accountability." Several panelists responded that keeping formal rules minimal and focused, to avoid over-restriction of beneficial GenAI use, while employing guidelines to educate and support users. Within this consensus, a significant number of participants ($n = 18$) cautioned against heavy reliance on formal policy at this early stage of GenAI integration, advocating instead for a primarily guidelines-driven approach. These panelists stressed the importance of agility and adaptability, arguing that GenAI technology and its uses are changing too rapidly for any static policy to cover every scenario. One panelist compared broad guidelines to "guardrails to keep folks from going off the cliff," indicating the desire for supportive direction rather than punitive restriction. This perspective aligns with voices in the literature warning that one-size-fits-all GenAI policies are not sustainable in the long term, given the fluid state of the technology (Qiang et al., 2024). Likewise, recent research trends emphasize context-specific guidance over fixed, uniform policies (McDonald et al., 2024), reflecting the notion that each institutional context and discipline may require a tailored approach. The findings indicate a clear consensus that HE stakeholders believe a hybrid model is the most effective way to govern the use of GenAI.

These findings indicate that panelists conceptualize GenAI governance as requiring a balance between institutional regulation and adaptive flexibility. Within this framework, formal policies can provide the structural foundation, and guidelines can function as

operational tools that help faculty and students interpret how these expectations apply in specific disciplinary and pedagogical contexts. The preference for guidelines alongside policy also reflects the uncertainty surrounding the rapid evolution of GenAI technologies. Together, these findings indicate that higher education stakeholders view a hybrid governance model as a practical strategy for managing technological uncertainty while maintaining institutional accountability, enabling both responsible oversight and ongoing pedagogical innovation.

RQ2. If guidance structures are put in place for HE GenAI implementation, what core topics should they encompass?

The grounded coding of the panel's open-ended qualitative responses yielded a governance framework comprising eight core thematic areas, see Fig. 3. It is important to note that while these are presented as eight separate areas, they are highly interconnected. Furthermore, the order of the eight do not connote a level of importance or order. Figure 3 provides a visual overview of the eight core areas.

The specific policy and guideline elements for each theme are detailed in Table 1 and further described in the subsequent sections.

The foundational concern: academic integrity

Academic integrity emerged as the panel's paramount concern, representing the most frequently cited theme in the study. Panelists agreed that any policy or guidance must clearly define what constitutes GenAI-related academic misconduct and set enforceable consequences. In practice, institutions could include language in their academic integrity policies stating that submitting AI-generated text, code, or analysis as one's own work without the instructor's permission or proper disclosure constitutes academic misconduct. Faculty could include a statement in their syllabus regarding the use of GenAI in their courses. As one participant argued, institutions should "define acceptable GenAI

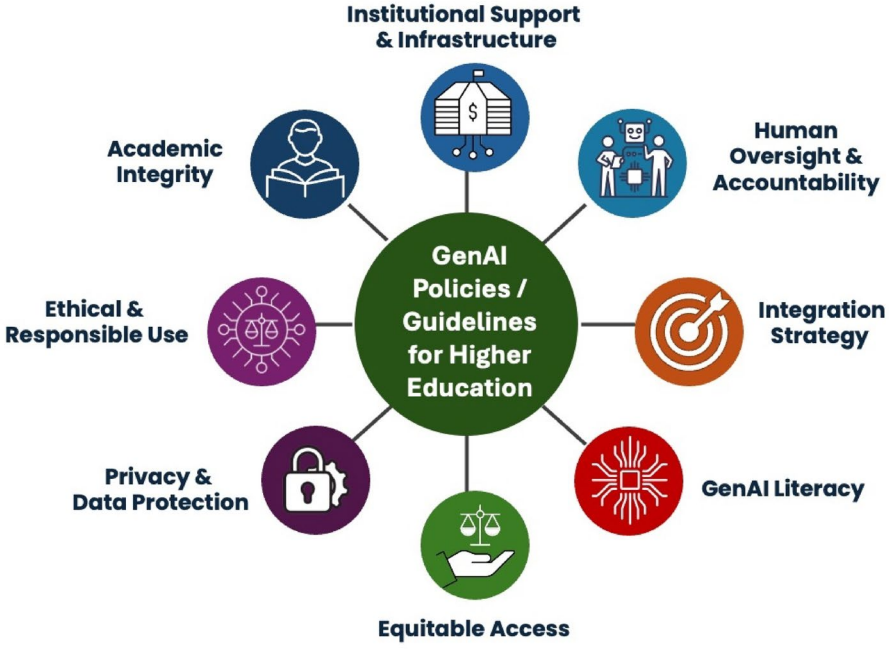

Fig. 3 Eight core thematic areas for GenAI policies and guidelines

Table 1 Higher education policies and guidelines for Gen AI use

Core area	Policy elements	Guideline elements
1. Academic integrity	Codify what constitutes academic misconduct at the institution related to GenAI and outline enforceable consequences	Provide clear communication and transparency about how GenAI should be used in each course and research projects. Educate about what constitutes GenAI-related academic misconduct and provide examples
2. Ethical and responsible use	Set enforceable standards for ethical conduct and define institutional expectations	Help recognize ethical dilemmas in GenAI use and offer strategies for responsible engagement. Provide case studies/scenarios/examples of what is or is not acceptable use of GenAI in different contexts. Encourage critical thinking about the implications of GenAI, including its societal impact and limitations
3. Privacy and data protection	Regulate what data can be shared with GenAI technologies, aligning institutional practices with data protection laws	Provide instruction on safe practices for using GenAI (e.g., anonymizing inputs, tool selection). Offer guidelines for compliance with data protection laws, standards for securing data inputs and outputs, and guidelines to prevent exposure of confidential information during GenAI interactions
4. Equitable access	Where possible ensure equitable access to Gen AI technologies and integration into institutional diversity and inclusion commitments	Provide equitable access to key GenAI-enhanced learning technologies and GenAI literacy training for all. Recommend GenAI technologies that enhance learning for diverse student needs, including those with disabilities, to support inclusive education
5. GenAI literacy	Establish expectations for GenAI competency and require GenAI literacy training programs. Create a GenAI literacy graduation outcome	Provide training, tutorials, and examples for using GenAI effectively and responsibly in learning and research contexts. Help students gain critical GenAI literacy skills to navigate, evaluate, and create digital content responsibly, ensuring safe, ethical, and effective use of technology. This includes competencies in communication, information handling, problem-solving, and protecting personal and societal well-being in digital environments
6. Integration strategy	Ensure GenAI is used to facilitate and/or support, not replace; promote learning; support innovation aligned with pedagogy. Maintain currency regarding workforce GenAI requirements	Provide opportunities to use GenAI to increase critical thinking. Create learning experiences that model the use of GenAI in students' future workplaces. Encourage assessments that test deeper learning and critical thinking, reducing over-reliance on GenAI-generated responses. Consider the design of new learning spaces
7. Human oversight and accountability	Require human review of GenAI-generated outputs that impact learning or student evaluation. Assign clear accountability for GenAI decisions	Promote thoughtful integration of GenAI to enhance students' critical thinking and support meaningful, authentic learning experiences. Avoid outsourcing educational governance to GenAI-driven analytics or administrative decision-making technologies without clear human oversight. Communicate with all AI-related student monitoring and analytics, allow for opt-out
8. Institutional support and infrastructure	Institutionalize commitments to maintain infrastructure and endorse approved GenAI technologies	Recommend technologies, provide support links, and explain how to access approved GenAI platforms. Create a continuous review process to refine and improve GenAI applications in learning and research

use in coursework, exams, and research to maintain academic standards and prevent misconduct."

This emphasis on academic integrity aligns directly with the broader scholarly discourse in HE about GenAI's challenges and opportunities (viz., Luo, 2024). Corroborating this view, extant literature (viz., Deep et al., 2025; Zhao et al., 2024) notes that early institutional responses to GenAI focused on plagiarism detection and prevention. Panelists insisted on upholding honesty and implicitly recognized that policy must evolve beyond a punitive stance. Scholarly consensus is emerging that a shift is needed from mere detection and punishment toward education, transparency, and student

engagement with GenAI technologies (Kangwa et al., 2025). Kangwa et al. note that the best practice is moving away from GenAI detection toward pedagogical strategies that foster academic transparency and GenAI literacy. Other researchers validate this approach (Smith et al., 2024), advocating pairing a strict policy backbone with educational guidelines to promote understanding and compliance. This strong consensus around academic integrity highlights HE's determination to maintain trust and fairness in the age of GenAI.

Beyond mistrust: ethical and responsible use

The panel identified a broad commitment to ethical and responsible use as a distinct foundational principle. Panelists argued that the use of GenAI must be guided by principles of honesty, transparency, privacy, and social responsibility. Many noted that GenAI introduces new ethical dilemmas, such as when (or whether) to disclose GenAI assistance on assignments, how to avoid overreliance on GenAI for original thought, and how to address GenAI-generated content that may be biased or inaccurate. One panelists stressed ethical behavior in authorship, highlighting "the importance of not claiming to be the creator of work you did not create" as a key guideline. An example of policy in this case could be institutional expectations requiring transparent acknowledgement when AI contributes to academic work or research outputs. Guidelines could encourage instructors to include ethical discussions about AI bias, misinformation, and limitations within their courses. Two-thirds ($n = 23$) of the panelists explicitly referenced ethical or responsible Gen AI use, often overlapping with academic integrity but extending into issues of honesty, GenAI fairness, and the broader impacts of GenAI on society.

This focus on ethics and responsibility is well supported by the current literature (Bond et al., 2024; Usher et al., 2025). Panelists' insistence on guiding principles, such as transparency about GenAI use and awareness of GenAI bias, mirrors these scholarly recommendations. It also resonates with global GenAI ethics principles. For example, UNESCO's (2023, 2025a, 2025b) guidance emphasizes transparency, safety, and fairness in the use of GenAI. Other researchers advocate educating students on GenAI's societal impact and limitations, calling for the development of students' moral and critical understanding of GenAI (Ghimire & Edwards, 2024). In the context of GenAI governance, this means policies and guidelines will not only forbid overt misconduct, but also positively encourage responsible, principled use of GenAI consistent with academic and societal values (Jin et al., 2024).

Protecting the digital sanctum: privacy and data protection

Data privacy and protection emerged as a critical governance theme. Over half the panel (55%) explicitly raised privacy or data security in their comments, reflecting deep concern about how GenAI technologies handle sensitive information. Panelists noted that GenAI applications often require users to input personal data or institutional content, thereby increasing the risk of unintended data exposure or violations of privacy laws. A common recommendation was that institutions should set clear rules on what data are permitted to be shared with GenAI platforms. Faculty syllabi could include a statement that students should not enter personal information, student records, unpublished research data, or any confidential course materials into generative AI tools, as many public AI platforms store or reuse user inputs. One participant argued that GenAI policies

"must protect privacy, ensuring that data is collected, stored, and used ethically, in compliance with regulations such as GDPR." This call reflects the consensus that universities need to uphold prevailing data protection standards, such as Europe's General Data Protection Regulation (GDPR), when adopting GenAI. In practice, panelists proposed measures such as requiring anonymization of inputs, controlled experimentation environment, and approving only certain GenAI technologies that meet security standards and educating users about safeguarding their data online. Panelists also highlighted several security issues. For instance, GenAI use could introduce new cyber vulnerabilities, so guidelines should outline safe practices and mandate regular reviews of GenAI technologies to ensure security compliance.

Literature supports this emphasis on privacy and data protection, such as Chan (2023) and Yang and Beil (2024), who posited that data governance should be a core pillar in a GenAI-in-education policy. Institutions are grappling with how to allow GenAI technologies while adhering to regulations like Family Educational Rights and Privacy Act (FERPA in the U.S.), GDPR (in Europe), or other jurisdictional privacy mandates. This study's recommendations also highlight the need for alignment with these legal standards, a point also highlighted in global policy discussions (UNESCO, 2023, 2025a; World Economic Forum, 2024). In response, scholars argue that universities should proactively establish data protection protocols for GenAI use (Robert & McCormack, 2024). Panelists' suggestions, such as vetting technologies and anonymizing inputs, are concrete examples of these broader recommendations.

The equity imperative: equitable access

Another prominent theme emerging from the coding was the importance of equitable access. Panelists voiced concern that without deliberate action, GenAI could exacerbate digital divides or create new inequities. Several panelists noted that not all students have equal access to the latest GenAI technologies or the resources needed to use them. One panelist warned that "the digital divide remains a problematic issue and GenAI policies that do not explicitly address access risk furthering the divide along class and other socio-economic lines." This caution highlights that HE institutions, as far as possible, must ensure all students have the same opportunities to benefit from GenAI-enhanced learning. Therefore, an example policy could be an institutional commitment to provide students with access to approved AI tools through campus licenses or shared platforms. In addition, guidelines could encourage faculty to avoid designing assignments that require paid AI tools. This includes access to GenAI through shared common spaces, inclusivity in design, and literacy skills to use AI.

Practically, panelists suggested ideas that institutions might need to provide campus access to approved GenAI platforms and to accommodate students who lack connectivity off campus. Panelists highlighted inclusivity in the design and implementation of GenAI technologies. They noted that GenAI systems can carry biases that disproportionately impact certain groups. One participant emphasized "it is essential to ensure that GenAI does not amplify existing inequalities, such as limited access to technology or biases in algorithms that could disadvantage certain groups." Some panelists proposed an equity audit of GenAI technologies before adoption to evaluate their fairness and accessibility. Participants also noted that while some students may have access to the technologies without knowledge and skills in how to use GenAI, this can, in a similar

way, negatively impact students as much as not having those technologies. GenAI literacy is listed as its own piece of the framework but is also noted here with its importance in considering equitable access. Overall, one-third of the panelists explicitly mentioned equity or inclusion, but even those who did not use those terms often implied such concerns by discussing access to technologies or fairness.

The panel's multi-dimensional framework for equity provides a crucial synthesis of conversations in the related literature. International organizations and researchers are increasingly vocal that GenAI's transformative potential should not leave marginalized communities behind. UNESCO's (2023, 2025a) global guidance on GenAI in education explicitly recommends measures to promote equity and inclusion. In alignment with UNESCO's advice, panelists want proactive steps to ensure GenAI does not become a source of advantage for some and disadvantage for others. This includes addressing the "resource gap" by which students in poorer circumstances might lack GenAI access to tools or GenAI literacy training. The findings highlight that GenAI, if governed with equity in mind, could even serve as a tool to reduce disparities, but that outcome depends on deliberate policy choices to make access universal and usage fair.

From tool use to critical engagement: GenAI literacy

A strong agreement emerged around the need for GenAI literacy as part of GenAI governance. Panelists widely agreed that education should focus on how generative GenAI works, its appropriate uses, and its limitations. Many panelists advocated that HE institutions treat GenAI competencies as a core future learning skill set, potentially making GenAI literacy a required learning outcome for graduates. GenAI literacy, as one panelist argued, is the foundation of any effective GenAI policy because it empowers students to use these technologies critically and responsibly rather than naively. In the words of that panelist, the success of a GenAI policy depends on addressing GenAI literacy "very comprehensively," including "technical training on the use of GenAI, and its potential implications on students' epistemic development, … autonomy, agency and sense of identity, and their overall moral and social development." This expansive view suggests that GenAI literacy is not just about knowing how to prompt ChatGPT but also about understanding how GenAI might influence one's learning habits, critical thinking, and worldview. The panelists broadly agreed on key facets of GenAI literacy. Users should learn how to evaluate GenAI outputs, how to cite or acknowledge GenAI assistance, how to protect their data when using GenAI, and how to integrate GenAI into problem-solving in an effective way. Quantitatively, references to training, literacy, or upskilling appeared in over half of the responses.

This insistence on GenAI literacy aligns with emerging best practices and literature highlighting the transformative impact of GenAI on education. A growing number of scholars argue that GenAI literacy is now an essential graduate attribute (Waring, 2024). In a 2025 global student survey, 80% of undergraduates reported using GenAI, yet many expressed concerns about accuracy and proper use (Chegg, 2025). This gap between high usage and uncertain understanding highlights why universities must actively teach critical AI literacy. Critical AI literacy goes beyond the functional understanding of these tools to include the knowledge and skills to analyze, question, and evaluate AI's social, ethical, and political implications, such as bias, accountability, and power structures, and to engage with AI systems reflectively and responsibly (Hauck et al., 2025).

The literature also notes a shift from earlier GenAI detection approaches to an emphasis on training, pivoting from policing GenAI to educating about GenAI, so that engagement with GenAI occurs knowingly and critically (Kangwa et al., 2025). In the broader policy context, this resonates with the notion that HE must not only regulate GenAI but also leverage it to enhance learning outcomes.

From resistance to reform: integration strategy

Panelists strongly advocated for a proactive strategic approach to integrating GenAI into teaching and learning across disciplines, maximizing educational benefits while minimizing negative impacts on learning processes. Panelists warned against outright bans. This approach is guided by a central principle: GenAI should be used to "support, not replace" human learning and critical thinking. This means designing curricula and assignments that leverage GenAI to enhance learning. One faculty participant wrote that guidelines should "educate students on using GenAI as a support tool for critical thinking and creativity rather than as a shortcut to completing work." They advocated for more in-class, oral, or application-based assessments, or process-focused assignments that require students to document their thinking and GenAI use. The underlying principle is to assess higher-order skills and understanding, so that simply copying GenAI's answer would not fulfill the task. Panelists clearly preferred proactive integration by using GenAI as a teaching tool and preparing students for a GenAI-enriched workforce. Along these lines, panelists mentioned the importance of keeping curricula aligned with the realities of workplaces that are increasingly adopting GenAI. They stated that students should gain experience with GenAI through HE, so they enter the job market with relevant skills. Approximately 40% of panelists explicitly discussed the need for pedagogical/andragogical strategies or mentioned the word "assessment" in context of GenAI, indicating a substantial concern for how teaching methods must evolve alongside GenAI.

Connecting these findings to the literature shows a strong alignment with emerging recommendations for curriculum and assessment reform in the age of GenAI. Scholars have critiqued the early focus on plagiarism detection, calling instead for a rethinking of assessment standards considering GenAI's capabilities (Crompton & Burke, 2024). The integration theme in the data also resonates with workforce development literature. The OECD (2024), for instance, has posited that education must adapt to prepare students for a GenAI-infused economy. By integrating GenAI into the curriculum thoughtfully, universities can give students hands-on practice with these technologies, making them more GenAI-literate and adaptable graduates. Current HE policy research states that effective GenAI governance is not about resisting GenAI, but about reshaping pedagogy and assessment to integrate GenAI in a pedagogically sound manner (Chan, 2023).

The human imperative: human oversight and accountability

Panelists strongly agreed that human oversight must remain central in any use of GenAI for academic decisions or evaluative processes. Even as GenAI technologies become more sophisticated, panelists argued that universities should never abdicate accountability to an algorithm. One panelist insisted that policies "ensure AI is not framed as an autonomous force but as a tool shaped by human intentions, values, and biases." Several panelists proposed that any significant output from GenAI should be reviewed and

validated by a human. Panelists also discussed accountability in terms of role clarity. Institutions should specify who is accountable when GenAI is deployed. Whereas previous themes highlighted what should be done with GenAI, this theme emphasizes who is ultimately answerable. Humans should always be in charge. This theme was discussed by half of the panelists, often intertwined with ethical use and integration topics.

The prioritization of human oversight in the findings aligns closely with prevalent GenAI ethics frameworks and HE policy commentary. A recurring principle in global GenAI guidelines is the idea of human-in-the-loop decision-making. The World Economic Forum lists "Agency: Maintain human decision-making" as one of its seven principles for GenAI use in education, explicitly stating that any GenAI-supported decision-making must allow for human intervention and rely on human approval processes (World Economic Forum, 2024). Panelists' insistence that GenAI be treated as a supportive technology, not an autonomous actor, directly echoes this principle. It also reflects the stance of UNESCO (2023, 2025a) that emphasizes human oversight to ensure GenAI systems do not infringe on human rights or educational values. Researchers have debated that accountability for decisions cannot be delegated to an algorithm (Nguyen, 2025). Mistakes by GenAI carry real consequences for students, so institutions must have humans accountable to review and rectify such issues. Panelists' recommendation for transparency about GenAI use also resonates with the literature calling for openness in GenAI deployment (Hsu et al., 2025).

The foundational enabler: institutional support and infrastructure

The final theme identified by the panel serves as the foundational enabler for the entire governance framework: robust institutional support and infrastructure. Policy documents alone will accomplish little unless universities invest in the technologies, resources, and organizational structures needed to implement them. Panelists noted that institutions should take an active role in provisioning approved GenAI platforms for academic use. One panelist recommended that universities "create or expand infrastructure to support the innovative application of AI in instruction, student advising and support, and assessment." Such infrastructure includes not only software and hardware but also human support, such as dedicated staff or centers to help faculty develop their GenAI literacy and integrate GenAI into their pedagogy and help students learn to use GenAI effectively. Accordingly, several panelists suggested establishing a GenAI support office or committee on campus. Panelists also emphasized the importance of institutional leadership and vision, noting that senior administrators need to publicly endorse the responsible use of GenAI and allocate budget and personnel to sustain ongoing support. Additionally, panelists pointed out the necessity of agile revision processes. The institution should treat GenAI governance as an iterative practice, continually investing in improvements to infrastructure and support based on what is working or not. In quantitative terms, this theme was frequently implied across responses.

Institutional support is also frequently mentioned in the literature as an aspect of HE digital transformation. Researchers note that introducing GenAI into universities is not a one-time policy change but an ongoing capacity-building endeavor (Liu & Jagadish, 2024). Study findings echo the EDUCAUSE 2024 Action Plan (Robert & McCormack, 2024) which argues for a coordinated institutional strategy on GenAI, including investment in infrastructure and support personnel. Additionally, the call for a GenAI

governance committee or task force on campus reflects best practices in change management. Studies of ed-tech adoption have shown that having a dedicated team managing policy implementation greatly improves success (Feng et al., 2025). With strong institutional support, universities can create an environment where GenAI is used safely, equitably, and effectively to enhance learning, thereby realizing the promises of this technology while upholding academic values.

A holistic analysis of these eight themes indicates that effective GenAI governance functions as an interconnected institutional ecosystem rather than a collection of independent policy areas. Notably, academic integrity operates as a central regulatory anchor, but its practical implementation relies on the development of GenAI literacy and ethical reasoning that enable students and faculty to interpret appropriate AI use in complex academic contexts. Ethical and responsible use further intersects with privacy and data protection and human oversight, forming a governance layer that safeguards legal compliance, transparency, and accountability in AI-mediated practices. At the same time, equitable access and integration strategies represent the pedagogical and social dimensions of institutional adoption, ensuring that GenAI supports inclusive learning environments and authentic educational experiences rather than exacerbating existing inequalities or replacing human-centered teaching. These dimensions are sustained by institutional support and infrastructure, which provide the technological, training, and policy mechanisms necessary to operationalize GenAI across teaching, research, and administration. Within this ecosystem, GenAI literacy emerges as a cross-cutting capability that enables stakeholders to navigate the ethical, technical, and pedagogical implications of AI use. Taken together, the interdependencies among these themes highlight that sustainable GenAI governance requires a coordinated institutional approach that integrates policy, pedagogy, ethics, and infrastructure.

RQ3. If policies or guidelines are established, what processes could help ensure they remain current as GenAI technologies and uses evolve?

The grounded coding of the Delphi responses identified six key processes to ensure that GenAI policies and guidelines remain current and relevant in HE settings. Figure 4 provides a visual reference of the six processes.

The order of the six processes depicted in Fig. 4 does not connote a sequence of action or importance. These six are each standalone processes to consider to keep policies and guidelines current and relevant. Table 2 provides further information on the recommended processes and how to operationalize those processes.

Fig. 4 Six processes to ensure that GenAI policies and guidelines remain current and relevant

Table 2 Six process recommendations for keeping GenAI policies and guidelines current

Recommendation	Description
1. Create a dedicated GenAI Committee	Create a multidisciplinary group representing all stakeholders to ensure that different perspectives are considered, including faculty, administrators, parents/caregivers, and students. This group would be responsible for the overall policy, including its development, implementation, management, and review
2. Conduct regularly scheduled policy reviews	Implement a regular review cycle to assess GenAI policies and guidelines, adapting to new developments and emerging challenges
3. Provide ongoing professional development and support	Provide regular professional development to keep faculty and staff informed about emerging GenAI technologies and promote GenAI literacy
4. Communicate with all stakeholders	Share updates on the most important facets of GenAI as well as current research
5. Evaluate effectiveness and impact of GenAI	Regularly evaluate GenAI's impact on student learning, academic integrity, and research quality to refine policies accordingly
6. Monitor external developments	Invest in ongoing research and partnerships with GenAI developers, tech companies, and academic institutions. Stay informed about changes in laws, data privacy standards, industry standards, and new GenAI research or applications

Panelists emphasized the need to establish a dedicated GenAI governance committee or task force to oversee policy development and updating. This multidisciplinary body would include diverse stakeholders, faculty, administrators, and students, to ensure broad perspectives are represented in decision-making. One panelist suggested forming a "dedicated GenAI oversight committee with members from faculty, tech panelists, and students" to manage policy development, implementation, and regular review. This recommendation was one of the most frequently mentioned, with over 50% of panelists advocating for a formal committee to monitor GenAI policies and guidelines. The prominence of this theme highlights that keeping policies current is not a one-time task; it requires an ongoing institutional mechanism with clear ownership.

Panelists emphasized scheduled policy review cycles as crucial for maintaining relevance. Many panelists argued that GenAI-related policies and guidelines should not be static documents but revisited on a regular timetable. One faculty panelist noted that policies should "never be set in stone—we need an annual AI policy review to adapt to new technologies and unforeseen challenges." Half of the panelists explicitly called for establishing a formal review cycle for GenAI policies. This recommendation is supported by current literature on GenAI governance. UNESCO's (2023, 2025a) guidance for GenAI in education explicitly urges institutions to adopt an iterative approach to GenAI governance, continuously reviewing and refining policies to keep pace with technological innovation. Overall, regular policy reviews were seen not as bureaucratic formalities, but as a vital practice to continuously align academic policies with the fast-changing GenAI landscape.

Panelists emphasized the need for ongoing professional development to help faculty stay current with the latest developments in GenAI. One panelist noted that "regular training and professional development must be prioritized to keep faculty and staff informed about emerging AI technologies and best practices. Workshops, webinars, and certifications can help educators stay ahead of the curve, enabling them to effectively integrate AI into their teaching and research while adhering to evolving policies." This approach highlights the importance of continual faculty development alongside policy revisions. Embedding regular training strengthens the policy feedback loop, as new technologies or challenges identified through training can inform future policy reviews, ensuring that guidance remains timely and relevant.

Panelists also identified the importance of transparent communication with stakeholders as GenAI policies evolve. Nearly a quarter of the panelists highlighted that keeping policies current is not just an internal administrative exercise. It requires actively informing and engaging the wider academic community. One panelist stated that "we need to keep everyone in the loop on major AI developments and policy updates, from instructors to students, so policies aren't made in a vacuum." This call for stakeholder communication serves multiple purposes. First, regular updates ensure that faculty and students are aware of new guidelines or revisions and the rationale behind them. Second, open channels allow stakeholders to provide feedback and share ground level insights. This insight resonates with participatory governance models advocated in the literature. Jin et al. (2024) highlights participatory policy design in the age of GenAI, suggesting that involving educators and students in developing academic integrity policies leads to more effective and accepted outcomes. This approach aligns with broader change management literature which posits that sustained communication is key to adapting organizational policies in times of technological change (Kotter, 2014).

The panel advocated for regularly evaluating the impact of GenAI on learning and integrity as a mechanism to keep policies effective and up to date. As one panelist stated, "Our policies must be evidence-based. We need to continually measure AI's impact on student learning, academic integrity incidents, and other outcomes, then adjust the rules accordingly." This theme highlights an emphasis on data-driven policy iteration. By monitoring indicators of GenAI use, the institution gathers feedback on what is working and what new problems are arising. Impact evaluation is also about staying aligned with educational goals. Initial institutional responses to ChatGPT have often focused narrowly on detection and punishment of misuse, without much data on actual student behavior or learning effects (Luo, 2024). Fortunately, scholars such as Luo (2024) have critiqued this knee-jerk approach, calling for a re-examination of assessment strategies and policies considering GenAI's capabilities. In the literature on GenAI, there is an emerging consensus on the need for responsible experimentation (OECD, 2024). Such experimentation is only valuable if followed by adjustments informed by the results.

Finally, panelists agreed that institutions must monitor external developments to keep their GenAI policies relevant. In practice, this means HE leaders should stay informed about advances in GenAI technologies, shifts in legal and ethical standards, and the evolving practices of other institutions. One panelist advised that universities "need to stay abreast of the fast-moving AI landscape—new models, edtech innovations, changing data privacy laws—and anticipate the next policy update before it's urgent." This recommendation is well-supported by broader frameworks in the literature. UNESCO's (2023, 2025a) global guidance for GenAI in education explicitly recommends that institutions be proactive and agile in their governance approaches, which entails continuously watching the horizon of GenAI development and policy. The need to keep up with the pace of innovation is a refrain not only in this study but in numerous policy reports. Nguyen (2025) identifies emerging ethical and regulatory challenges around GenAI in education, implying that universities must vigilantly track such external factors to update their local policies in line with new ethical norms or legal requirements.

In integrating these sub-themes, the panelists note that keeping GenAI policies current and relevant requires a proactive, system-wide approach. By prioritizing these

processes, HE institutions can not only maintain the currency of their GenAI policies over time but also foster a culture of adaptability and learning.

Implementation

The implementation of GenAI policies and guidelines in higher education should be understood as an institutional change process rather than the simple publication of policy documents. Research on AI governance in higher education indicates that effective policy requires translating high level principles into structures, responsibilities, and everyday practices within institutions (Chan, 2023; Jin et al., 2024). GenAI affects teaching, assessment, research, and student support simultaneously, therefore implementation requires coordinated institutional action rather than isolated policy statements.

The findings of this study provide institutions with a framework that can guide this process while remaining adaptable to local contexts. It is important for faculty and students from the institution to be involved in the development of the final framework to ensure institutional relevance. Furthermore, although the study draws on international perspectives, the framework was intentionally developed at a level that allows institutions to interpret and apply it within their own governance structures, regulatory environments, disciplinary traditions, and student populations. The eight core areas should therefore be viewed as guiding considerations rather than a fixed checklist. Universities can use them to review existing policies and guidelines, identify gaps, and determine where additional direction may be required.

Implementation also requires translating policy principles into operational guidance for those expected to apply them. General statements about responsible or ethical GenAI use are unlikely to influence practice unless accompanied by practical instructions for teaching, learning, and research contexts (Chan, 2023). For example, academic integrity expectations may be communicated through syllabus templates or course statements that clarify how GenAI may be used in assignments. Ethical use and GenAI literacy may be supported through workshops, professional development programs, and institutional resource hubs that provide examples of appropriate use. Privacy and data protection guidance may include recommendations to anonymize inputs, use approved tools, and avoid submitting sensitive institutional or student data to public GenAI systems. As higher education institutions operate within diverse disciplinary and organizational environments, implementation will often involve localized interpretation. Departments may develop discipline specific guidance reflecting differences in research practices, assessment formats, and professional norms. Institutions may also support equitable access through campus licenses for approved GenAI tools, training to build GenAI literacy, and attention to accessibility and inclusion in technology adoption.

The six processes for keeping policies and guidelines current identified in this study further support sustained implementation. Establishing a GenAI committee, conducting regular policy reviews, providing ongoing professional development, communicating with stakeholders, evaluating the impact of GenAI, and monitoring external developments create mechanisms through which governance can evolve alongside technological change (Jin et al., 2024). Together, the eight core areas and six processes provide institutions with a structured yet flexible foundation for translating international insight into governance that is meaningful within their own institutional contexts.

Limitations

Although this study offers substantive insights into the governance of GenAI in HE, certain limitations must be acknowledged. This study defines the core competencies for GenAI in HE. Intentionally, it does not list all the specific policies and guidelines in detail, as those details would rapidly become irrelevant and/or obsolete (Le, 2024). It is important that these be overarching and customizable to the individual institution. The rapid pace of GenAI innovation means that any policy or guideline recommendations risk becoming outdated as technologies, capabilities, and ethical implications continue to evolve. The findings, therefore, represent a detailed understanding of expert perspectives at a specific point in time rather than a static or definitive account. While the Delphi method and collective writing approach ensured methodological rigor and inclusivity of expert perspectives, the participant pool, although geographically diverse, was limited to HE experts. The perspectives of other crucial stakeholders, such as students, policymakers, employers, and technology developers, were not directly represented. Their inclusion may have yielded additional insights into the lived experiences and institutional consequences of GenAI adoption.

Implications for future research

This study's findings lay the groundwork for a critical future research agenda focused on the practical implementation and long-term impact of GenAI governance. Future research could move beyond conceptual policy design as manifested in our findings to investigate how GenAI governance operates in practice across diverse HE contexts. Studies could examine policy or guideline implementation, faculty and student engagement, and the effects of policies on teaching, learning, and integrity. Studies could incorporate actual usage experiences from students and teachers to address the ecological validity, moving beyond an expert-based perspective. Longitudinal research could trace how institutions adapt their policies over time as technologies and ethical norms evolve. Comparative studies across regions would clarify how cultural, regulatory, and infrastructural differences shape GenAI governance, while equity-focused research should assess whether policies bridge or widen educational divides. Including student and community voices will be essential to ensure fair and inclusive outcomes. Future studies could also explore systems-level research, informed by frameworks such as the SETI model, which could help guide institutions toward using the policies and guidelines in this study as well as the refinements, elaborations, and expansions of them which are sure to follow and then further explore them through the systems within HE and beyond.

Conclusion: a framework for responsible innovation

This Delphi study of international HE panelists offers a unique critical synthesis of current trends in GenAI policy development, revealing a growing consensus around context-specific, adaptable guidance rather than rigid institutional mandates. The study outlines eight key topic areas that form the foundation of any GenAI policy framework. These are academic integrity, ethical and responsible use, privacy and data protection, equitable access, GenAI literacy, integration strategy, human oversight and accountability, and institutional support and infrastructure. In addition, it proposes a six-part procedural model to ensure that policies remain current and relevant, including creating

a dedicated GenAI committee, conducting regularly scheduled policy reviews, providing ongoing professional development and support, communicating with all stakeholders, evaluating the effectiveness and impact of GenAI, and monitoring external developments.

The findings of this study reveal that effective policy must balance innovation with academic integrity, student agency with equitable access, and technological opportunity with institutional accountability. Future policy adaptations should actively integrate the voices of the student body, as their lived experiences with GenAI are essential for assessing the ecological validity of these frameworks. For GenAI to continue to transform HE, institutions will need to adopt flexible, inclusive, and evidence-based approaches that respond to the shifting technological and pedagogical terrain.

Author contributions

H.C. was responsible for conceptualization, methodology, data curation, investigation, writing original draft, review and editing. D.B. and C.N. were responsible for data curation, investigation, writing original draft, review and editing. All other authors were responsible for writing original draft, review and editing.

Data availability

No datasets were generated or analysed during the current study.

Declarations

Competing interests

The authors declare no competing interests.

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