Scaffolded Progression for GenAI Literacy: A Design-Science-Inspired Intervention in First-Year Information Systems Courses

Research-in-progress

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Abstract

Generative AI (GenAI) is transforming knowledge production and use, raising urgent challenges for assessment integrity, curriculum design, and graduate capability. While policies and literacy frameworks set guiding principles, few demonstrate how to embed GenAI at scale in ethical and sustainable ways. This research-in-progress introduces a Scaffolded Progression Framework for GenAI Literacy, combining a pedagogical design with its operationalisation in the learning management system (LMS). Designed for large, first-year cohorts where foundational habits of academic integrity and digital practice are formed, the framework sequences guidance, application, and reflection through staged assessment tasks. The study adopts an exploratory, design-science-inspired intervention evaluated through mixed methods, integrating quantitative indicators (e.g., task completion rates, LMS logs) with qualitative insights from student reflections, focus groups, and staff interviews. Piloted in one first-year Bachelor of Information Systems (BIS) subject and now implemented in a second, it offers a scalable, institutionally aligned model for ethical GenAI literacy.

Keywords Assessment and curriculum, Design-science methodology, Generative AI literacy, Mixed-methods evaluation, Student agency.

1 Introduction

Generative AI (GenAI) is reshaping how information is produced, evaluated, and used across academia, work, and society. For the Information Systems (IS) discipline, this transformation raises urgent questions about curriculum, assessment, and the capabilities graduates need to participate responsibly in AI-mediated workplaces (Storey et al. 2025; Susarla et al. 2023; Van et al. 2023). Positioned within the ACIS 2025 theme of "The State of the Information Systems Discipline: Challenges and Opportunities", this paper examines how universities can embed GenAI literacy in ways that are ethical, sustainable, and scalable. Traditional assessment designs struggle to validate learning when GenAI tools can generate plausible outputs on demand (Gonsalves 2025; Shivshankar and Acharya 2025; Yan et al. 2024). While recent policies and AI literacy frameworks outline guiding principles, there remains a practical gap: few operational models demonstrate how to integrate GenAI into assessment at scale while also developing students' technical proficiency, evaluative judgment, and ethical awareness (Perkins et al. 2024). Evidence from first-year cohorts is particularly scarce.

This research-in-progress paper introduces and evaluates a Scaffolded Progression Framework for GenAI Literacy, an LMS-embedded framework that sequences guidance, testing and training, application within the discipline and content of a particular course, assessment integration, and reflection in iterative loops. Drawing on the above challenges and gaps in practice, the study is guided by three research questions that examine the impact, engagement, and implementation of the proposed framework:

RQ1. To what extent does a scaffolded, LMS-embedded progression improve students' evaluative judgment of GenAI outputs and their ethical awareness while meeting subject/unit Course Intended Learning Outcomes (CILOs)? **RQ2.** How do students engage with the staged activities over time, and what forms of student agency emerge? **RQ3.** What implementation challenges and opportunities do teaching staff identify when operationalising the framework at scale?

We employ an exploratory, design-science-inspired intervention (Hevner et al. 2004) evaluated through mixed methods. The research develops and trials the Scaffolded Progression Framework, an artefact designed to strengthen GenAI literacy in first-year Bachelor of Information Systems (BIS) course. The framework is implemented across two subjects in 2025, with piloting in Autumn semester (Feb-May) and extended implementation in the Spring semester (July-Nov). Data collection combines quantitative indicators (e.g., task completion rates, LMS log data, assessment outcomes) and qualitative evidence (student reflections, focus groups, staff interviews), providing triangulated insights across the three research questions. The contribution is twofold: (1) a theoretically informed and institutionally aligned progression framework that integrates policy, pedagogy, and assessment within the LMS; and (2) an evaluation conducted within real first-year classroom contexts at scale, foregrounding student agency (Jaaskela et al. 2021; Stenalt and Lassesen 2022) and sustainability rather than small pilots or tool-centric trials. Together, these contributions provide the IS discipline with a replicable framework for embedding GenAI literacy that directly responds to the challenges of digital transformation in higher education.

2 Background and Related Work

2.1 GenAI and the Challenging Nature of Assessment

GenAI in education has sparked global debate, with concerns centring on plagiarism, deskilling, and bias, alongside optimism about enhancing creativity, critical thinking, and digital literacy. Lodge et al. (2023) highlight the regulatory challenges of AI in higher education, while frameworks such as the AI Assessment Scale (AIAS) (Furze et al. 2024) stress the importance of foundational GenAI literacy, ethical engagement, and discipline-specific application. At the level of assessment design, GenAI challenges the long-standing reliance on text-based assignments and knowledge recall. Tools can now generate plausible, grammatically sound outputs within seconds, making it increasingly difficult for educators to distinguish between authentic student work and AI-generated text. This raises questions of academic integrity, attribution, and the very purpose of assessment in a context where information production can be automated. Assessment tasks that once measured reproduction of knowledge now risk losing their validity unless redesigned to foreground higher-order skills such as evaluation, reflection, and synthesis.

In response, institutions have begun articulating guiding principles (Atif et al. 2025; Gonsalves 2025; Lodge et al. 2023; TEQSA 2024). Recent foresight-informed analysis of Australian university policies highlights diverse institutional responses to AI in assessment, ranging from compliance-driven to

strategically aligned approaches (Atif et al. 2025). The Tertiary Education Quality and Standards Agency (TEQSA 2024) in Australia, for instance, has published guidance on responsible AI use in teaching and learning, while universities such as the University of Sydney have adopted a "two-lane" approach that distinguishes between contexts where GenAI use is permitted and where it is restricted (Bridgeman and Liu 2025). These frameworks emphasise transparency, accountability, inclusivity, critical engagement, and ethical awareness (Furze et al. 2024; Perkins et al. 2024). However, they remain largely declarative, offering limited guidance on how to operationalise these values within assessment design, particularly at scale (Gonsalves 2025; Shivshankar and Acharya 2025). GenAI further complicates these principles by blurring authorship, producing plausible yet unverifiable outputs, and challenging conventional evidence-of-learning approaches (Storey et al. 2025; Yan et al. 2024). These gaps highlight the need for structured, scalable models that connect policy aspirations with pedagogical and technological practice. As a result, many educators resort to ad hoc adaptations: tightening plagiarism checks, banning AI use, or experimenting with small reflective exercises without a systematic approach (Gonsalves 2025; Lodge et al. 2023). Yet what remains absent is a structured, scalable framework that connects institutional principles to assessment design in ways that build student capability while safeguarding academic integrity. Addressing this gap is the focus of the current study.

2.2 Scaffolding and Evaluative Judgment for Student Agency

A key issue in this context is evaluative judgment: the ability to determine the quality of work, whether produced by oneself, peers, or AI systems (Bearman et al. 2024). Without these skills, students risk over-reliance on GenAI or an inability to critically engage with AI outputs. Scaffolded, low-stakes assessment tasks have been proposed as one mechanism to foster such judgment (Bridgeman et al. 2024). The concept of scaffolding, grounded in Vygotsky's (1978) sociocultural theory of learning, emphasises the importance of structured support that is gradually removed as learners gain independence. In higher education, scaffolding has been widely applied through transition pedagogy (Kift 2009, 2023), which advocates carefully staged learning activities to support student development, particularly in large and diverse first-year cohorts. While scaffolding itself is not new, its application in GenAI contexts requires re-conceptualisation: supporting students not only in mastering tools but in developing ethical, reflective, and evaluative dispositions toward automated outputs. Applied to GenAI literacy, scaffolding offers a way to progressively develop students' technical and ethical competencies, moving from guided experimentation to autonomous and critical use (Kim et al. 2025; Wang et al. 2025; Wu et al. 2025).

Reflection is central to this process. By requiring students to document and evaluate their own use of GenAI tools, reflective tasks encourage metacognitive awareness and the development of professional judgment (Schraw 2001). Iterative cycles of application and feedback not only strengthen evaluative judgment but also provide opportunities for students to exercise agency, shaping their learning pathways within the boundaries of structured activities (Bearman et al. 2024). In the GenAI context, reflection takes on a distinct form: students interrogate the reasoning and quality of GenAI outputs, compare alternatives, and justify when and why human judgment should override automated suggestions. Such reflection cultivates epistemic awareness, helping learners understand the boundaries between human and machine-generated knowledge. In this sense, scaffolding does not reduce autonomy but rather creates conditions for it to flourish responsibly.

Despite the promise of scaffolding and evaluative judgment frameworks, most existing applications remain small-scale, experimental, or limited to isolated assessment tasks. Few models (e.g., AIAS) provide a systematic, curriculum-wide approach to embedding GenAI literacy in ways that are both scalable and sustainable. There is a lack of LMS-embedded models that connect institutional policy, assessment design, and student development through iterative feedback loops. This project addresses this gap by trialling a Scaffolded Progression Framework for GenAI Literacy, designed to build technical proficiency, evaluative judgment, and ethical awareness through structured stages of guidance, application, and reflection.

3 The Scaffolded Progression Framework and LMS Model

This section presents the key artefact developed in this study: the Scaffolded Progression Framework for GenAI Literacy. Consistent with a design-science research (DSR) approach (Hevner et al. 2004), the framework was iteratively co-designed, implemented, and refined in collaboration with academic staff, policy leads, and educational designers. In line with DSR principles, the artefact is both informed by theory and grounded in real-world constraints, aiming to address a practical problem: how to embed GenAI literacy in large, first-year cohorts in a way that is ethical, scalable, and pedagogically robust.

The framework (Figure 1) provides a structured pathway for embedding GenAI skills across the student learning journey. Its design balances two imperatives: building student agency through progressive, reflective engagement with GenAI, and ensuring institutional sustainability through integration into existing policy and LMS infrastructure. It is organised into six interconnected stages.

Guidance and Resources. Implementation begins with foundational resources for both students and staff. Academic integrity guidelines, institutional policy frameworks (e.g., TEQSA principles), and targeted staff development workshops are embedded in the LMS. This ensures a consistent entry point for GenAI use and signals institutional endorsement of ethical, responsible engagement.

Testing and Training. Students are introduced to GenAI through low-stakes activities that encourage safe experimentation. These tasks build baseline familiarity while highlighting both the capabilities and limitations of tools. Delivered via the LMS, they are lightweight for staff yet impactful in preparing students for subsequent disciplinary application.

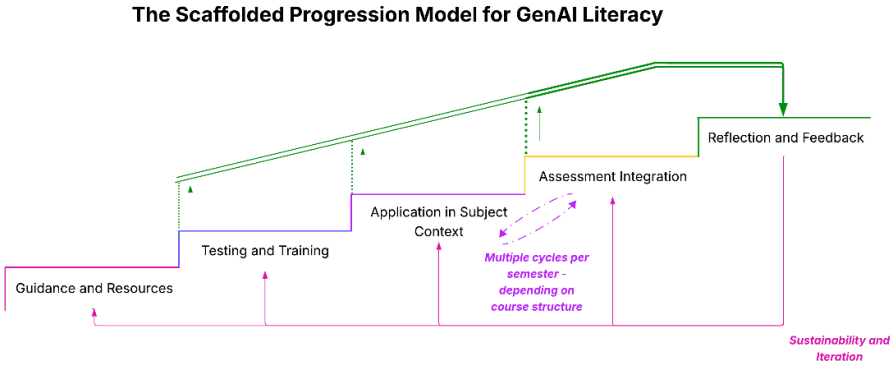

Figure 1: Scaffolded Progression Framework for GenAI Literacy

Application in Subject Context. Building on this foundation, students apply GenAI within discipline-specific contexts. In Information Systems, this might include generating process models, brainstorming system requirements, refining conceptual models, testing data visualisation, or drafting stakeholder communications for technical and non-technical audiences. By aligning tasks with CILOs, GenAI use is anchored in disciplinary learning rather than treated as an add-on.

Assessment Integration. Applied tasks feed directly into assessment design. For instance, a GenAI-supported analysis and modelling exercise might form the basis of a business report or prototype solution, accompanied by reflective commentary assessing ethical reasoning. This integration validates not only technical proficiency but also evaluative judgment, shifting assessment away from product-only evaluation toward critical engagement with process and decision-making.

Reflection and Feedback. Reflection is embedded throughout the framework but becomes central at this stage. Students are required to critically evaluate their use of GenAI, explaining not only *what* the tool produced but *why* and *how* they engaged with it in relation to disciplinary tasks. This process foregrounds ethical considerations, limitations of outputs, and the implications of GenAI use for IS practice. Staff and peer feedback loops further reinforce these reflections, enabling students to refine their evaluative judgment and progressively take greater ownership of their learning. In this way, reflection functions as a bridge between structured support and independent, critical engagement with GenAI.

Sustainability and Iteration. The framework is also designed with scalability in mind. Its staged activities can be repeated within a single semester, allowing students to revisit and deepen their learning across multiple cycles. Equally, insights from one subject feed forward into subsequent offerings, supporting longitudinal refinement across courses and programs. Embedding the framework in the LMS ensures that assessment templates, reflection activities, and training resources are reusable, thereby reducing staff workload while maintaining consistency of practice. This design positions GenAI literacy not as an isolated experiment but as a sustainable, institutionally aligned approach to curriculum innovation.

In combination, these stages illustrate a progression from foundational guidance to independent, ethical engagement with GenAI. The framework operates not as isolated activities, but as a sustainable framework that can be scaled across the curriculum. A short fictional vignette illustrating how a first-

year student navigates these stages is provided in the Appendix. While the framework articulates the pedagogical progression, implementation also requires translation into institutional systems. The LMS Model for GenAI Literacy (Figure 2) fulfils this role by operationalising the framework within the digital learning environment. Here, the stages are instantiated as reusable LMS modules, assessment templates, and reflection activities that can be adapted across subjects, enabling scalability and consistency in practice. Together, Figures 1 and 2 present complementary views: the Scaffolded Progression Framework outlines the pedagogical design, while the LMS Model demonstrates its institutional embedding and day-to-day delivery.

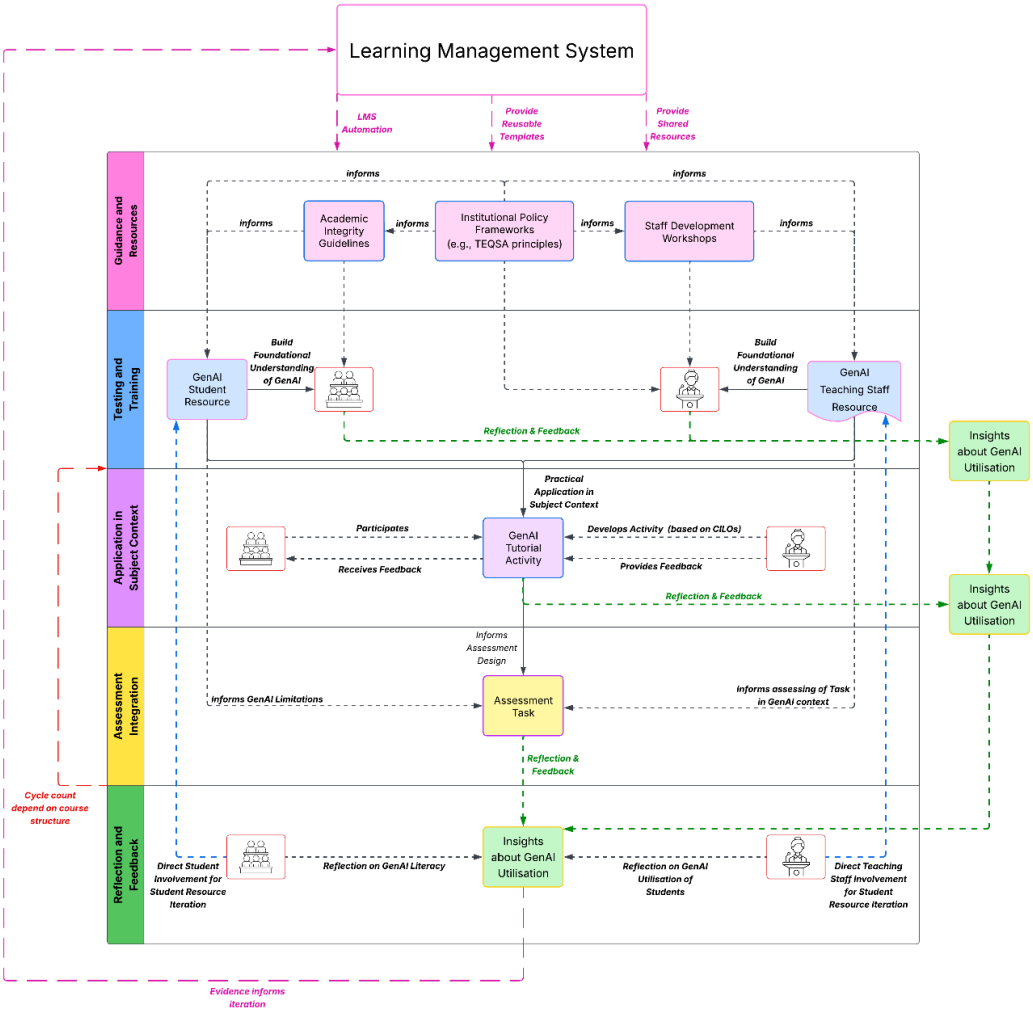

Figure 2: LMS Model for GenAI Literacy

4 Methodology

This study adopts an exploratory, design-science inspired methodology (Hevner et al. 2004), appropriate for developing and evaluating artefacts that address complex, practice-based problems in education. The research is situated in two large first-year BIS subjects at an Australian university, with combined enrolments exceeding 2,700 students. First-year cohorts are targeted as they represent a critical transition into disciplinary learning and academic integrity practices, where early GenAI engagement can shape ethical and evaluative habits. Implementation occurs in two stages: the *Foundational Stage* (Weeks 1-6) introduces low-stakes tasks that build GenAI literacy, and the *Application Stage* (Weeks 7-13) extends it through discipline-based assessments.

Data collection mirrors this staged design. The framework was first piloted in a first-year BIS subject in Autumn 2025 and is now being implemented in a second subject in Spring 2025, with data collection currently underway. Evidence is gathered through quantitative indicators such as task completion rates, LMS log data, assessment outcomes and qualitative sources including student reflections, focus groups, and staff interviews. This triangulated approach enables evaluation of student learning outcomes,

student agency, and staff perspectives, while also supporting iterative refinement between offerings. The project received ethics approval from the University of Technology Sydney Human Research Ethics Committee (ETH25-10552).

5 Anticipated Contributions and Early Observations

This study offers contributions at multiple levels. At the *theoretical level*, it introduces and operationalises a Scaffolded Progression Framework for GenAI literacy, grounded in assessment design, evaluative judgment, and transition pedagogy. At the *practical level*, it provides a scalable, LMS-embedded framework that can be adopted across disciplines to integrate GenAI literacy in structured and sustainable ways. At the *policy level*, it demonstrates how institutional principles for the ethical use of GenAI can be embedded into curriculum and assessment at scale, moving beyond ad hoc staff guidance. At the *societal level*, it contributes to the preparation of graduates who combine technical proficiency with evaluative judgment and ethical awareness, equipping them to participate responsibly in AI-integrated workplaces.

Early observations from the Autumn 2025 pilot, together with emerging evidence from the current Spring 2025 implementation, suggest several dynamics. Students engage strongly with low-stakes exploratory tasks that foreground hands-on experimentation with GenAI tools. Staff report that a staged progression reduces student anxiety and limits inequitable use of GenAI, while clarifying expectations in assessment design. Reflective work indicates that many students readily identify surface-level ethical issues (e.g., plagiarism, bias), but deeper ethical reasoning develops more gradually and benefits from iterative feedback and explicit prompts. These patterns reinforce the importance of integrating scaffolding and reflection into curriculum-wide assessment design rather than treating GenAI literacy as peripheral. Subsequent analysis will synthesise data from the Autumn pilot and the ongoing Spring offering to evaluate how the framework supports evaluative judgment, fosters student agency, and enables sustainable implementation at scale, directly addressing the three research questions.

6 Challenges and Opportunities

The implementation of the Scaffolded Progression Framework highlights both persistent challenges and promising opportunities for the Information Systems discipline. A central challenge is maintaining academic integrity and transparency in assessments where students are encouraged to engage with GenAI tools. While scaffolding and explicit ethical guidance provide safeguards, there remains an ongoing need to ensure that assessment tasks can meaningfully capture student learning rather than tool output. Staff development and workload also present a barrier: embedding GenAI literacy requires both pedagogical support and time for curriculum redesign, which not all teaching teams can readily accommodate. Further, the rapid pace of GenAI innovation continually outstrips curriculum design cycles, raising questions about how universities can remain agile without resorting to superficial tool training. At the same time, the framework surfaces significant opportunities. By structuring reflection and evaluative judgment into assessment design, it enhances student agency and helps students build independence in navigating AI-mediated learning environments. The work also contributes to institutional capacity-building by trialling scalable, LMS-embedded practices that can extend beyond single subjects or disciplines. Finally, the framework demonstrates a pathway toward sustainable assessment models that balance innovation with ethical responsibility, positioning GenAI literacy not as an add-on but as a core element of student learning and graduate capability.

7 Conclusion and Next Steps

This research-in-progress study introduces and evaluates the Scaffolded Progression Framework for GenAI Literacy in large, first-year BIS subjects. The framework was first piloted in Autumn 2025 and is now being implemented in a second subject in Spring 2025, with data collection currently underway. Findings from the Spring semester will guide refinements and inform subsequent iterations, supporting the development of an institution-wide framework for sustainable and ethical GenAI literacy. Ongoing analysis will directly address the three research questions by examining how the scaffolded progression shapes students' evaluative judgment and ethical awareness (RQ1), the forms of student engagement and agency that emerge across staged activities (RQ2), and the challenges and opportunities encountered by staff when embedding the framework at scale (RQ3). By embedding scaffolded, iterative, and reflective practices into assessment design, the project positions GenAI literacy as a core graduate capability, fostering technical proficiency, ethical judgment, and resilience in rapidly evolving digital environments. A fictional student walkthrough vignette in the Appendix provides an illustrative narrative of the framework in practice.

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Appendix 1: Walkthrough Vignette

To illustrate the Scaffolded Progression Framework in practice, consider *Alex*, a fictional first-year Bachelor of Information Systems student.

At the start of semester, Alex encounters **Guidance and Resources** in the subject LMS site: a short module on academic integrity, a staff-curated guide to GenAI, and links to institutional policy. Alex recognises that GenAI is not "off limits" but must be engaged with responsibly.

They then move into **Testing and Training** activities. A low-stakes quiz asks them to compare AI-generated answers with human-authored ones. In another task, Alex uses a GenAI tool to produce an outline for a weekly reading response. These activities are ungraded but build familiarity, helping Alex see both the strengths and limitations of GenAI.

In their core IS subject, Alex encounters **Application in Subject Context**. They are asked to generate a process diagram using a GenAI tool, then refine it manually and justify the changes. The task aligns with course learning outcomes, showing how GenAI can be a starting point but not the final product.

Later, in **Assessment Integration**, Alex submits a case study report where part of the analysis draws on GenAI-generated summaries. They must annotate their work to show where GenAI was used and include a reflective commentary on its appropriateness. This becomes part of the graded assessment, reinforcing both technical and ethical competencies.

As part of **Reflection and Feedback**, Alex uploads a short video journal reflecting on their use of GenAI and receives targeted staff and peer feedback. They begin to articulate evaluative judgment, acknowledging where GenAI helped and where it misled.

Finally, through **Sustainability and Iteration**, Alex recognises that these skills are not confined to a single subject/unit. In the following semester, they encounter similar scaffolded activities in a different subject, but now at a higher level of sophistication. They gradually develop independent strategies for integrating GenAI into their learning practice.

This vignette illustrates how the framework supports student agency, embeds ethical engagement, and provides a scalable framework for GenAI literacy across the curriculum.

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