International Journal of Learning, Teaching and Educational Research
Vol. 25, No. 4, pp. 557-574, April 2026
https://doi.org/10.26803/ijlter.25.4.26
Received Jan 15, 2026; Revised Mar 3, 2026; Accepted Apr 14, 2026

AI–Human Intelligence Synergy and Student Voice in Health Sciences Education: A Conceptual Framework

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Abstract. The rapid adoption of artificial intelligence (AI) in health sciences education is often driven by technological capability rather than pedagogical purpose, raising concerns about automation, cognitive offloading, and the erosion of professional judgement. This conceptual paper argues that meaningful AI integration requires a shift from tool-oriented implementation to a pedagogically grounded model of artificial–human intelligence synergy. The author adopted a conceptual qualitative methodology grounded in interpretivist and critical pedagogical traditions. Drawing on cognitive load theory, experiential learning theory, and the Technological Pedagogical Content Knowledge framework, the paper conceptualises AI use as pedagogical alignment, ethical responsibility, and the distribution of cognitive agency. The paper introduces Student Voice as Pedagogical Intelligence as a novel theoretical construct that positions students' lived learning experiences as an epistemic resource for guiding curriculum design, ethical boundaries, and decisions about appropriate AI use. Building on this conceptualisation, an AI–HI synergy framework is proposed that clarifies the complementary roles of students, educators, and AI systems in supporting professional learning outcomes, including critical judgement, reflective practice, identity formation, and agency. By highlighting pedagogy over technological optimisation, the paper contributes a theoretically grounded framework for understanding AI integration in health sciences education. While the paper does not present empirical data, it offers a structured theoretical model to guide future research and practice. The framework offers conceptual and practical guidance for educators and institutions seeking to integrate AI in ways that protect human judgement, support deep learning, and align technological innovation with the normative purposes of professional education.

Keywords: AI in education; TPACK; cognitive load theory; student voice; pedagogical intelligence; health sciences education.

Citation:
Hu, Z. (2026). AI–Human Intelligence Synergy and Student Voice in Health Sciences Education: A Conceptual Framework. *International Journal of Learning, Teaching and Educational Research*, *25*(4), 557–574. https://doi.org/10.26803/ijlter.25.4.26

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1. Introduction

Artificial intelligence (AI) is becoming increasingly embedded in health sciences education, shaping curriculum design, assessment practices, feedback processes, and academic support across disciplines such as medicine, nursing, allied health sciences, and complementary medicine (Hummel, 2025; Rincón et al., 2025). Applications including intelligent tutoring systems, automated feedback platforms, and generative language models are now routinely presented as pedagogical innovations that promise efficiency, personalisation, and improved access to learning (Elnaffar et al., 2025; Hu et al., 2026). As a result, AI has shifted from a marginal educational technology to a constitutive presence within contemporary higher education practice (Qutieshat, 2025).

Yet, despite this rapid expansion, the pedagogical and theoretical foundations of AI integration remain underdeveloped. Literature reveals that much of the dominant literature continues to privilege questions of technical performance, accuracy, and usability, often framing AI as a neutral tool whose value can be evaluated primarily through measures of effectiveness or efficiency (Mergen et al., 2025). Such approaches leave largely unexamined the ways in which AI reshapes pedagogical relationships, mediates students' engagement with knowledge, and reconfigures agency, responsibility, and authorship in learning (Yan et al., 2025). This limitation is especially significant within health sciences education, where the purposes of higher education extend beyond knowledge acquisition to encompass the formation of professional judgement, ethical reasoning, reflexivity, and identity (Gago et al., 2024).

Wang et al. (2022) believe that this raises critical questions about power, pedagogy, and participation in AI-mediated learning environments. Emerging research suggests that students experience AI not simply as an external resource but as a relational presence within the learning ecology (Uden & Ching, 2024). This presence shapes their confidence, motivation, sense of ownership over knowledge, and understanding of what counts as legitimate learning. These dimensions are rarely captured in instrumental evaluations of educational technology, yet they are central to understanding how AI reshapes the conditions of teaching and learning. Their marginalisation reflects a broader absence of learner-centred and critically informed perspectives within much of the AI in education literature (Huang et al., 2024).

This paper pursues both conceptual and practical objectives. Conceptually, it aims to develop a theoretically grounded framework for understanding AI–human intelligence (AI–HI) synergy in health sciences education and to introduce Student Voice as Pedagogical Intelligence (SVPI) as a construct for interpreting how AI integration shapes learning, judgement, and professional formation. Practically, it seeks to offer principled guidance for educators and institutions navigating AI adoption in clinical and practice-based curricula.

This paper argues that meaningful engagement with AI in health sciences education requires a conceptual shift away from technological optimisation towards AI–HI synergy grounded in pedagogy. Rather than treating students as

passive users of AI systems, the author reconceptualises student voice as a form of pedagogical intelligence: a situated, epistemically valuable resource that can illuminate how AI is experienced, where it supports or constrains learning, and how educational practices can be designed to sustain human judgement, agency, and professional formation. By foregrounding student voice in this way, the study contributes to ongoing debates in higher education about participation, epistemic justice, and the co-construction of pedagogical knowledge in technologically mediated learning environments. This paper does not aim to provide empirical validation, comparative effectiveness analysis, or policy evaluation of specific AI tools. Rather, its contribution lies in theory-building and conceptual clarification intended to inform future empirical research and pedagogical decision-making.

To guide the conceptual development of the framework, this paper addresses the following questions, advancing both theory-building and practice-oriented educational guidance.

a. How can AI–HI synergy be theoretically conceptualised in health sciences education? (Theory-Building)
b. What is Student Voice as Pedagogical Intelligence (SVPI), and how does it contribute to understanding AI-mediated learning and professional formation?
c. How can a pedagogically grounded AI–HI synergy framework informs responsible integration of AI into curriculum design, assessment, and clinical education?

The conceptual methodology underpinning the development of the framework is outlined in the following section to ensure transparency regarding theoretical synthesis and model construction.

2. Literature Review and Theoretical Foundations

2.1 Technocentric Trends and Pedagogical Gap

A dominant trajectory within AI-enhanced education has been the framing of AI primarily as a mechanism for automating instructional functions such as assessment, feedback, and content delivery (Elnaffar et al., 2025; Hummel, 2025). Rincón et al. (2025) argue that while these applications may offer gains in efficiency, they frequently privilege technological convenience over pedagogical purpose. When integration is guided by what technologies can accomplish rather than by what learning requires, pedagogical intentionality becomes marginalised and educational values are subordinated to technical affordances (Eltayeb, 2025).

This tendency is particularly problematic in health sciences education, where learning is characterised by complexity, uncertainty, and the need for contextual interpretation (Higgs et al., 2024). The cultivation of clinical judgement, ethical sensitivity, and professional reasoning requires sustained engagement with ambiguity, rather than its removal (Higgs et al., 2024). Over-automation risks narrowing pedagogical space by reducing opportunities for interpretive work, reflective dialogue, and the productive struggle that underpins deep learning and professional formation (Mahajan, 2025).

Furthermore, AI-driven personalisation is frequently oriented towards the optimisation of performance metrics such as speed, accuracy, or task completion (Umoga et al., 2024). Adaptive systems may adjust difficulty levels or provide rapid solutions without supporting the epistemic processes through which understanding develops (Zarei et al., 2024). Jian et al. (2025) are of the view that tuch approaches may yield short-term gains in measurable performance while leaving learners underprepared for the cognitive, relational, and ethical demands of professional practice.

2.2 Cognitive Offloading and the Development of Professional Judgement

From a learning sciences perspective, contemporary AI tools increasingly facilitate cognitive offloading by enabling learners to delegate complex cognitive processes to technological systems (Gerlich, 2025). When deployed deliberately, such offloading may be pedagogically productive; for example, by reducing extraneous cognitive load or supporting routine procedural tasks (Wahn et al., 2023). However, habitual or uncritical reliance on AI risks diminishing opportunities for sustained reasoning, uncertainty management, and independent judgement (George et al., 2024). The educational significance of AI therefore lies not in its presence, but in how its use reshapes responsibility for thinking.

This tension is particularly salient in health sciences education, where the development of diagnostic reasoning, ethical deliberation, and reflective practice depends on sustained engagement with clinical complexity (Kuhn et al., 2023; Mohamed et al., 2022). Emerging research further indicates that students experience ambivalence regarding authorship, accountability, and intellectual ownership in AI-mediated environments (Hu & Qiu, 2025; Hu et al., 2026). These concerns extend beyond procedural issues of academic integrity; they reflect deeper pedagogical questions about epistemic responsibility and the locus of professional judgement. Accordingly, principled pedagogical frameworks are required to guide decisions about when AI support enhances learning and when it may compromise the cultivation of disciplinary expertise (Zou et al., 2025).

Cognitive Load Theory offers a useful analytic lens for clarifying this distinction (Gkintoni et al., 2025). AI tools may enhance learning when they reduce extraneous cognitive load; for instance, through assistance with information retrieval, idea organisation, or linguistic expression, thereby preserving cognitive resources for conceptual integration and higher-order reasoning (Feng, 2025; Elnaffar et al., 2025; Eltayeb, 2025). In contrast, when AI substitutes for problem-solving, hypothesis generation, or reflective deliberation, it risks displacing germane cognitive load, the very cognitive effort through which durable learning occurs (Twabu, 2025). The pedagogical challenge in AI-rich environments is therefore to distinguish productive scaffolding from substitution of core cognitive labour.

Emerging empirical evidence suggests that these concerns are not merely theoretical. Experimental studies indicate that heavy reliance on algorithmic suggestions may be associated with reduced recall accuracy and weaker transfer

of problem-solving strategies to novel contexts (Wahn et al., 2023; Gerlich, 2025). Similarly, research in medical education demonstrates that premature exposure to automated diagnostic support can narrow hypothesis generation and constrain diagnostic flexibility among novice learners (Kuhn et al., 2023). While such findings do not imply inevitable cognitive decline, they underscore the importance of structured, context-sensitive integration of AI to ensure that technological assistance strengthens rather than supplants the cognitive work foundational to professional formation.

2.3 Experiential Learning and Reflective Formation

Experiential learning theory foregrounds learning as an iterative process of experience, reflection, conceptualisation, and application (Beard, 2022). This perspective is particularly resonant in health sciences education, where professional competence is developed through engagement with clinical uncertainty, embodied practice, dialogic supervision, and reflective judgement across contexts such as clinical placements, simulation, and case-based learning (Razlog & Hu, 2025).

AI can contribute meaningfully to experiential learning when used to scaffold reflective processes rather than to replace them. For instance, AI-generated prompts may encourage learners to articulate clinical reasoning, consider alternative interpretations of cases, or interrogate their own assumptions (Naqvi et al., 2024). Used in this way, AI can function as a reflective companion that deepens engagement with experience (Andersson, 2025). Conversely, when AI is positioned primarily as an answer-generating tool, it risks truncating the reflective dimensions of the learning cycle and weakening learners' capacity to tolerate ambiguity and complexity. Pedagogically grounded AI–HI synergy therefore requires that AI be positioned as a resource for reflective engagement rather than as a shortcut around epistemic struggle (Dai, 2025; Naqvi et al., 2024).

2.4 Technology Integration Frameworks and Their Limits

The Technological Pedagogical and Content Knowledge (TPACK) framework emphasises that effective technology integration arises from the dynamic interplay between technological knowledge, pedagogical knowledge, and content knowledge (Petko et al., 2025). Applied to AI in education, this perspective underscores that the educational value of AI does not lie in technological sophistication alone but in the degree to which AI use is meaningfully aligned with disciplinary epistemologies and pedagogical purposes (Eltayeb, 2025).

This paper extends conventional interpretations of TPACK by highlighting alignment not only as a design concern but as an experiential and relational process. Pedagogical alignment is not achieved solely through curriculum planning; it is also enacted and negotiated in practice through how students experience AI use in learning contexts (George, 2023). Learners' perceptions of effort, trust, authorship, responsibility, and ownership provide critical insight into whether AI integration genuinely supports educational aims (Petko et al., 2025). From this perspective, student voice becomes central to evaluating and refining alignment over time. Pedagogical coherence in AI–HI synergy must therefore be

understood as iterative, dialogic, and responsive to lived learning experiences rather than as a one-off design achievement (Tassilova et al., 2025).

Existing AI-in-education frameworks have primarily focused on technological integration, competence development, or policy governance. For example, TPACK emphasises alignment between technology, pedagogy, and content but does not explicitly theorise ethical redistribution of cognitive responsibility in AI-mediated environments (Petko et al., 2025). Policy-oriented models, such as AI competence frameworks for educators, foreground digital literacy and operational readiness yet often underemphasise professional identity formation and epistemic agency (Zou et al., 2025; Chan, 2023). Similarly, activity-theory-based AI ecosystems conceptualise systemic interaction but offer limited normative guidance regarding boundary-setting in clinical judgement contexts (Uden & Ching, 2024). The present framework extends these approaches by integrating distributed cognition, student voice, and professional ethics into a unified conceptual model tailored to health sciences education.

Figure 1 presents a conceptual map illustrating the relationships between (1) theoretical foundations, (2) SVPI, and (3) AI–HI synergy outcomes. Cognitive load theory informs the distribution of cognitive responsibility; experiential learning theory supports reflective professional formation; TPACK grounds pedagogical alignment. These theoretical strands converge in SVPI, which functions as a mediating construct linking learner experience to curriculum design. Together, these elements shape AI–HI synergy outcomes: clinical judgement, ethical discernment, and professional identity formation.

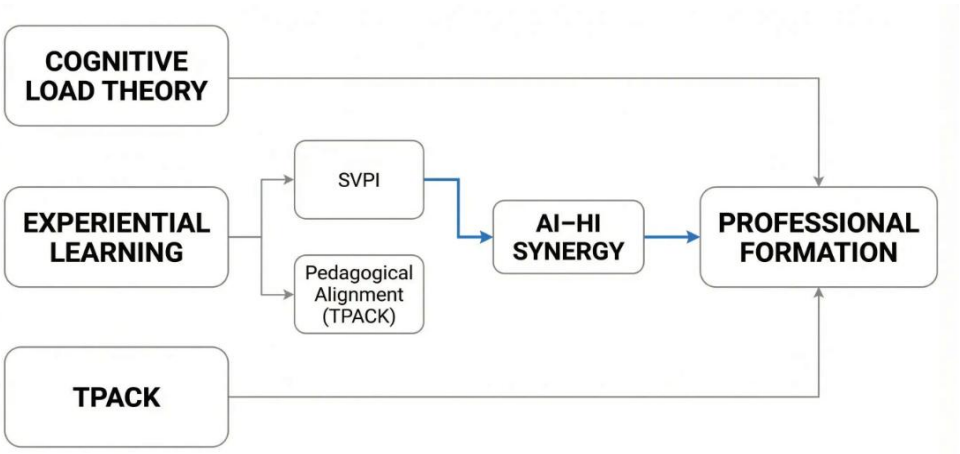

Figure 1: Conceptual Map of AI–HI Synergy Framework

3. Conceptual Method

This study adopts a conceptual qualitative methodology grounded in an interpretivist and critical pedagogical epistemology. From this perspective, knowledge about teaching, learning, and technology is understood as socially situated, relational, and shaped by power, values, and experience rather than as objectively neutral. This positioning aligns with the paper's central claim that AI integration in health sciences education must be examined in relation to agency,

professional identity, and pedagogical purpose rather than technological efficiency alone.

The framework was developed through a structured three-stage conceptual process: (1) analytical problematisation of existing discourse, (2) cross-theoretical synthesis, and (3) iterative conceptual modelling.

3.1 Analytical Literature Problematization

The first stage involved critical engagement with interdisciplinary scholarship on AI in education, health sciences education, student voice, professional learning, and educational ethics. Rather than aiming for exhaustive coverage, the literature was examined analytically to identify dominant assumptions, conceptual blind spots, and unresolved tensions. This process highlighted three recurring limitations in prevailing discourse: the technocentric framing of AI, insufficient attention to professional formation, and the marginalisation of students' lived experiences as a legitimate source of pedagogical knowledge. These tensions defined the conceptual problem space from which the framework emerged.

3.2 Cross-Theoretical Analytical Synthesis

The second stage involved the deliberate synthesis of cognitive load theory, experiential learning theory, and the TPACK framework as complementary analytical lenses. These theories were used not as design tools but as conceptual resources for interrogating how AI reshapes cognitive responsibility, reflective practice, and pedagogical alignment in professional education. Their integration enabled the reconceptualization of AI integration as a pedagogical and ethical challenge rather than a technical optimisation problem.

3.3 Iterative Conceptual Modelling and Refinement

The final stage consisted of the iterative construction and refinement of both the Student Voice as Pedagogical Intelligence (SVPI) construct and the AI–HI synergy framework. The iterative refinement process involved testing the emerging framework against three operational criteria: (1) theoretical coherence across the integrated traditions (cognitive load theory, experiential learning, and TPACK), (2) alignment with the normative aims of health sciences education, including professional judgement and ethical formation, and (3) explanatory capacity in accounting for documented student experiences of AI use in clinical and assessment contexts. This process involved repeatedly examining whether the model could meaningfully interpret tensions identified in the literature and whether its constructs remained internally consistent. Refinements were made where conceptual overlap, ambiguity, or insufficient differentiation was identified. Through successive refinement, the framework was clarified for conceptual coherence and practical interpretability.

This conceptual synthesis is shaped by the author's scholarly engagement in health sciences education and research on AI integration and student experience. This epistemologically grounded conceptual methodology provides a transparent and rigorous foundation for the proposed framework. It supports the paper's contribution not as prescriptive technique, but as theoretically defensible

pedagogical theory-building intended to inform future empirical inquiry and educational practice.

4. Student Voice of Pedagogical Intelligence

This paper positions student voice not as a supplementary evaluative instrument but as a central pedagogical resource for understanding and shaping AI-enhanced learning environments. It introduces the concept of SVPI to capture the distinctive epistemic contribution students make to interpreting how pedagogical designs operate in practice, particularly within technologically mediated contexts. According to Díaz and Nussbaum (2024), pedagogical intelligence refers to an understanding about how learning happens, and a disposition and capacity to shape one's own learning. SVPI highlights students not merely as recipients of educational provision but as knowledgeable participants whose lived experiences can inform the co-construction of pedagogical understanding.

4.1 Conceptualizing Student Voice Beyond Feedback

Within higher education, student voice is most mobilised through mechanisms designed to evaluate satisfaction, engagement, or teaching quality (Hu et al., 2026). While such approaches may yield useful institutional data, they frequently position students as respondents to predetermined questions rather than as epistemic contributors to pedagogical knowledge (Gramigna & Boschi, 2025). In doing so, they risk instrumentalising student participation and constraining the scope of what counts as legitimate insight.

This paper advances a reconceptualization of student voice as pedagogical intelligence: a form of situated experiential knowledge generated through learners' sustained engagement with curriculum, assessment, technology, and academic relationships. Students' accounts of effort, uncertainty, reliance, confidence, discomfort, and ethical unease offer access to dimensions of learning that are not readily captured through performance metrics, learning analytics, or system data (Alsayed et al., 2025). Such accounts reveal how pedagogical designs are enacted, negotiated, and sometimes resisted in practice, rather than how they are intended in theory. Framing student voice in this way shifts its status from evaluative feedback to a legitimate epistemic resource for theorising AI-mediated learning.

4.2 SVPI and Ethical Deliberation in AI Use

Students may be among the earliest to experience the practical and ethical ambiguities arising from AI use in assessment and clinical reasoning contexts. Their experiences frequently surface concerns related to authorship, transparency, academic integrity, trust, fairness, and accountability (Mulenga & Shilongo, 2024). These concerns should not be dismissed as compliance issues or individual anxieties; rather, they point to structural misalignments between technological practices and the normative purposes of higher education (Gramigna & Boschi, 2025).

Treating student voice as pedagogical intelligence allows these ethical tensions to become productive sites of inquiry rather than reactive problems to be managed

(Díaz & Nussbaum, 2024). By engaging systematically with students' experiences, educators and institutions can develop more contextually grounded ethical guidelines, clarify boundaries for responsible AI use, and design assessment practices that reflect shared values around integrity and authorship. In this way, SVPI provides a mechanism for situating ethical decision-making within the lived realities of learners rather than abstract institutional policy alone.

4.3 SVPI as a Resource for Pedagogical Design and Renewal

Beyond its ethical significance, SVPI offers a generative resource for pedagogical design. When students' experiences are engaged thoughtfully and systematically, they can inform decisions about where AI support meaningfully enhances learning and where it inadvertently undermines engagement, autonomy, or epistemic depth (Varghese, 2025).

For instance, student accounts of over-reliance on AI, diminished confidence, or confusion about intellectual ownership can signal the need to redesign tasks, reframe assessment expectations, or make the pedagogical purposes of AI use more explicit (Dai, 2025; Kotsis, 2025). Conversely, reports of heightened reflection, deeper understanding, or strengthened confidence can illuminate productive forms of AI integration worthy of further development (Hummel, 2025; Rincón et al., 2025). In this way, SVPI supports an iterative, reflexive approach to curriculum, assessment, and learning design, ensuring that AI integration remains grounded in educational purposes rather than driven primarily by technological convenience.

5. AI–HI Synergy Framework

The framework conceptualises AI–HI synergy not as a technical configuration but as a relational pedagogical system constituted through the dynamic interaction of three interdependent actors: students, educators, and AI systems. In contrast to dominant discourses that position AI as an autonomous solution or students as passive users, this framework believes the complementary and negotiated roles through which learning quality is produced. Figure 2 below illustrates the AI-HI Synergy framework.

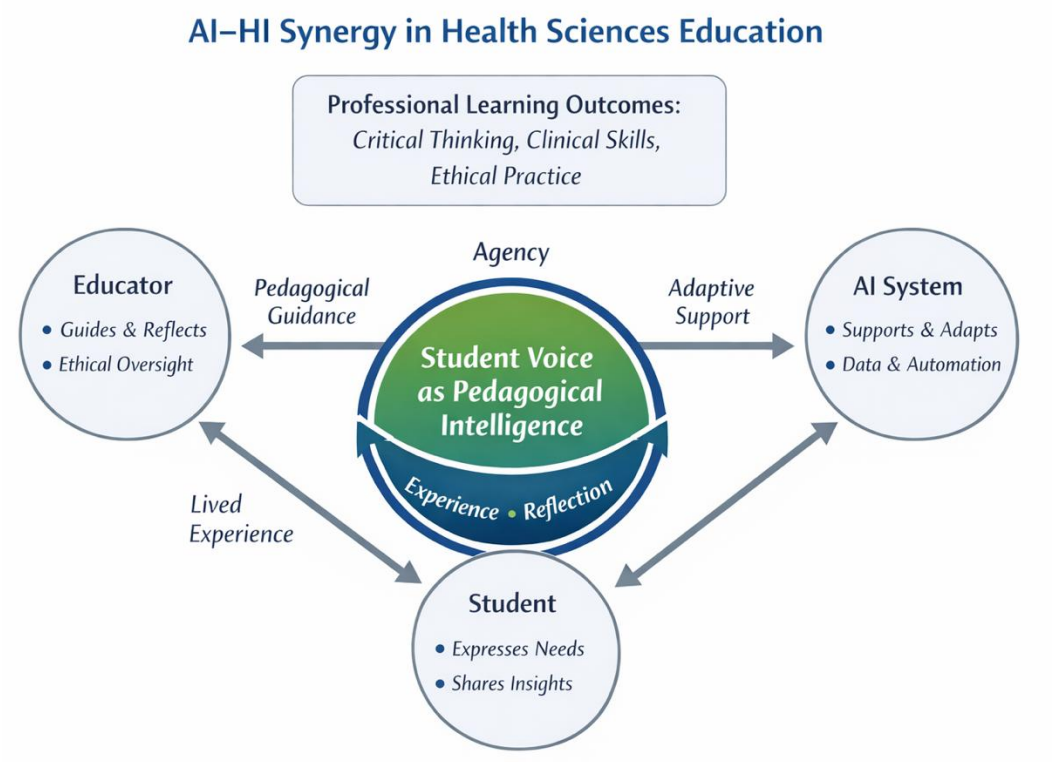

Figure 2: AI-HI Synergy framework (own image)

Students are positioned as active epistemic agents whose experiences provide critical insight into cognitive effort, motivation, engagement, uncertainty, and ownership of learning (Gramigna & Boschi, 2025). Their perspectives illuminate how pedagogical designs are enacted in practice rather than merely how they are intended (Andersson, 2025; Beard, 2022). These experiential insights constitute the foundation of SVPI and are treated within the framework as an indispensable source of pedagogical knowledge rather than as supplementary feedback.

Educators occupy a central and irreducible role within the framework as pedagogical designers, ethical stewards, and models of professional judgement. Their responsibilities extend beyond selecting technologies to include articulating the educational purposes of AI use, framing expectations around appropriate engagement, and cultivating learners' capacity for reflection, responsibility, and epistemic agency (Zou et al., 2025). In this sense, the framework resists narratives of teacher displacement and instead affirms the heightened pedagogical labour required in AI-rich environments.

AI systems are positioned as pedagogical supports rather than pedagogical agents. Their value within the framework lies in their capacity to augment learning processes, such as scaffolding reflection, supporting formative feedback, or assisting with routine cognitive tasks, while preserving the core intellectual, ethical, and interpretive work that must remain central to professional education (Qutieshat, 2025 Yan et al., 2025). This positioning deliberately resists both techno-solutionism and the assumption that increased automation necessarily constitutes educational progress.

A central organising principle of the framework is dynamic role distribution. The appropriate contribution of AI is not fixed but contingent upon pedagogical goals, disciplinary epistemologies, and developmental stages of learners (Feng, 2025). In some contexts, AI support for information retrieval, language refinement, or formative feedback may enhance learning. In others, deliberate constraint of AI use may be necessary to preserve opportunities for independent reasoning, uncertainty management, and reflective judgement (Gago et al., 2024; Mergen et al., 2025). The framework therefore conceptualises effective AI–HI synergy as dependent on ongoing, situated pedagogical judgement rather than on universal rules or standardised institutional policies.

Crucially, the framework prioritises the protection and cultivation of learners' capacity for critical thinking, reflective practice, and professional identity formation as essential and non-negotiable educational outcomes. AI integration is thus evaluated not primarily in terms of efficiency or performance metrics, but according to whether it strengthens or weakens these deeper dimensions of learning (Dai et al., 2025). In doing so, the framework aligns AI integration with the broader normative purposes of higher education: the cultivation of thoughtful, ethical, and agentic professionals rather than merely technically proficient graduates.

6. Discussion

This paper contributes to scholarship on AI in higher education by situating AI integration within the distinctive pedagogical purposes of health sciences education. Rather than treating AI as a general educational technology, the paper argues that its significance must be understood in relation to the epistemic, ethical, and professional demands of preparing future health practitioners. Three key contributions are advanced.

6.1 Reframing AI Integration Around Professional Formation

First, the paper reframes AI integration not as a question of technological effectiveness but as a question of professional formation. In health sciences education, the goals of learning extend beyond knowledge acquisition to include the cultivation of clinical judgement, ethical reasoning, reflective practice, and responsibility towards patients and communities (Gago et al., 2024; Higgs et al., 2024). These forms of learning are inherently relational, contextual, and morally situated.

The AI–HI synergy framework therefore shifts the evaluative focus away from whether AI improves performance metrics and towards whether it supports or constrains the development of these professional capacities. These reframing challenges dominant technocentric approaches that prioritise efficiency and optimisation while overlooking the risks that automation may pose to clinical reasoning, accountability, and practitioner identity. It contributes to health professions education scholarship by offering a conceptual lens for examining AI not only as a tool but as a force that reshapes how future practitioners learn to think, judge, and act (Eltayeb, 2025; Hummel, 2025).

6.2 Theoretical Contribution: SVPI in Professional Education

A second contribution lies in theorising SVPI specifically within the context of professional education. In health sciences programmes, students occupy a complex dual position: they are learners within academic institutions and emerging practitioners who must develop confidence, responsibility, and ethical awareness (Gago et al., 2024). Their experiences of AI use therefore provide uniquely valuable insight into how educational practices are shaping their emerging professional identities.

Students' accounts of reliance on AI in clinical reasoning tasks, discomfort about authorship in case analyses, or uncertainty about accountability when using generative tools reveal critical tensions at the heart of professional formation (Umoga et al., 2024; Wang et al., 2022). By conceptualising these experiences as pedagogical intelligence rather than as mere opinion, this paper contributes to health sciences education by offering a way to systematically incorporate learners' perspectives into decisions about curriculum, assessment, and ethical guidance around AI use. This contribution is particularly important in practice-based disciplines, where the consequences of poorly developed judgement extend beyond academic outcomes to patient safety, professional conduct, and public trust (Hu et al., 2026; Razlog & Hu, 2025).

6.3 Reconceptualizing Alignment for Practice-Based Learning

A third contribution concerns the reconceptualization of pedagogical alignment in the context of practice-based learning. In health sciences education, alignment cannot be understood solely in terms of curriculum coherence or assessment design. It must also account for how learning activities prepare students to function in complex clinical environments characterised by uncertainty, time pressure, ethical dilemmas, and interpersonal responsibility (Eltayeb, 2025; Hu & Qiu, 2025).

By conceptualising alignment as dynamic, experiential, and negotiated, the framework offers a way to evaluate whether AI use genuinely supports readiness for professional practice. For example, if students report that AI-generated clinical explanations reduce their engagement with diagnostic reasoning, this signals misalignment between AI integration and the educational goal of cultivating independent clinical judgement (Hu et al., 2026; Kuhn et al., 2023). Conversely, if students report that AI-supported reflective prompts enhance their understanding of patient complexity, this suggests productive alignment. This contribution extends existing models of educational design by grounding alignment not only in curricular intention but in lived experiences of professional learning.

6.4 Conceptual and Practical Limitations

As a conceptual paper, it does not offer empirical data and therefore invites future research to examine how SVPI can be systematically operationalised and studied across diverse institutional and disciplinary contexts. Several limitations warrant consideration. First, as a conceptual study, the framework has not been empirically validated across diverse institutional or disciplinary contexts. Its explanatory power remains theoretically argued rather than empirically

demonstrated. Second, the framework foregrounds student experience and professional judgement, which may underemphasise institutional constraints such as workload pressures, technological mandates, or accreditation requirements. Third, cultural and regulatory variability across global health education systems may affect the transferability of the model.

At a practical level, implementing structured student voice mechanisms and bounded AI use may face resistance due to time constraints, policy ambiguity, uneven staff AI literacy, or institutional incentives prioritising efficiency over deliberation. These constraints highlight that the framework should be interpreted as a guiding orientation rather than a prescriptive blueprint. Empirical work exploring students' experiences of AI use in clinical education, assessment, and professional identity formation would provide valuable opportunities to test, refine, and extend the framework.

7. Implications for Health Sciences Education

While the paper remains conceptual, the framework developed has important implications for teaching, curriculum design, and governance within health sciences education specifically.

7.1 Implications for Educators: Safeguarding Clinical Judgement

For educators, the framework emphasises deliberate boundary-setting in AI use. Teaching with AI requires distinguishing between tasks where augmentation enhances learning (e.g., structured literature synthesis, reflective prompts) and tasks where independent reasoning must remain primary (e.g., diagnostic formulation, viva examinations, clinical simulations).

For example, educators might permit AI-assisted drafting in early-stage case analyses while requiring oral defence of reasoning without AI support. Similarly, AI-generated explanations can be used as critique objects, requiring students to identify inaccuracies, biases, or omissions. Such strategies shift AI from answer-provider to reflective stimulus (Higgs et al., 2024).

Educators are also encouraged to make the pedagogical purpose of AI use explicit. Clarifying why AI is permitted, limited, or required in specific tasks helps students understand that AI governance is grounded in professional formation rather than surveillance or compliance (Elnaffar et al., 2025; Eltayeb, 2025; Gago et al., 2024).

7.2 Implications for Curriculum Designers

At the curriculum level, AI integration should be deliberately aligned with learning outcomes related to clinical judgement, ethical reasoning, and professional identity formation. Rather than treating AI literacy as an isolated technical skill, programmes should embed critical engagement with AI within clinical and practice-based modules (Hu et al., 2026; Hummel, 2025). Assessment design requires particular attention. Tasks may differentiate between AI-supported drafting and independent reasoning, ensuring that students develop both collaborative competence with intelligent systems and autonomous

interpretive capacity (Hu et al., 2026; Kuhn et al., 2023). For example, clinical reasoning modules might combine AI-integrated case analysis with structured opportunities for students to defend diagnostic decisions without technological assistance. Such dual design helps prepare learners for AI-mediated healthcare environments while preserving the epistemic responsibility central to professional practice. Curriculum design therefore becomes an iterative process grounded in how professional learning is experienced (Vreuls et al., 2022).

7.3 Implications for Institutions and Policy

At the institutional level, AI governance should be framed not solely as an academic integrity concern but as a matter of educational purpose and professional ethics (Chan, 2023; Schiff, 2022). Policies that focus narrowly on misconduct risk overlooking how AI reshapes cognitive responsibility and judgement formation. Institutions should therefore support pedagogically informed AI integration through professional development, interdisciplinary dialogue, and alignment with accreditation and regulatory standards. Importantly, successful implementation depends on coherent policy messaging. If institutional incentives emphasise efficiency while educators are asked to prioritise reflective depth, tensions may undermine meaningful integration. Clear articulation of educational values is therefore essential.

7.4 Implications for Students: SVPI as Agency

The framework also reframes students as active participants in shaping AI-enhanced learning environments. By conceptualising student voice as pedagogical intelligence, SVPI positions learners as contributors to curriculum refinement and ethical deliberation. Structured opportunities for students to reflect on how AI influences their confidence, reasoning processes, and sense of professional responsibility can cultivate meta-cognitive awareness and critical oversight. Involving students in discussions about AI boundaries and expectations supports the development of agency rather than passive compliance (Elnaffar et al., 2025; Eltayeb, 2025; Hu et al., 2026; Hu & Qiu, 2025). In this sense, SVPI not only informs institutional decision-making but also strengthens learners' capacity to engage responsibly with intelligent systems in future professional contexts.

8. Conclusion

This paper has argued that meaningful integration of AI in health sciences education requires a shift from technological optimisation to pedagogically grounded AI–HI synergy. This study contributes a theoretically coherent model for examining how AI redistributes cognitive responsibility, shapes professional identity, and influences ethical formation in practice-based disciplines.

Three immediate recommendations follow. First, educators should make AI boundaries explicit within clinical reasoning and assessment tasks, distinguishing between augmentation and independent judgement. Second, programmes should embed structured student reflection on AI use within curriculum and capstone modules to operationalise SVPI. Third, institutions should align AI policies with

professional ethics and provide pedagogical AI competence development for staff.

The paper makes three interconnected contributions. First, it offers a pedagogically grounded framework for understanding AI–HI synergy that resists techno-deterministic narratives. Second, it introduces the concept of SVPI, positioning students' lived experiences not as evaluative feedback but as a vital epistemic resource for understanding how AI-mediated pedagogies function in practice. Third, it illustrates how this framework can inform concrete pedagogical decisions across curriculum design and clinical reasoning development, demonstrating its relevance to everyday educational practice.

The implications of this work extend beyond health sciences education. As AI continues to reshape higher education more broadly, questions of agency, epistemic responsibility, and educational purpose will become increasingly urgent. By foregrounding pedagogy over technology and experience over assumption, this paper contributes to a more ethically grounded and educationally meaningful approach to AI integration.

Ultimately, the promise of AI in health sciences education lies not in its capacity to automate teaching, but in its potential to support the development of thoughtful, reflective, and ethically grounded practitioners. Realising this promise depends on our willingness to centre pedagogy, listen seriously to students, and treat AI integration as an ongoing educational responsibility rather than a technical solution.

9. Recommendations for Health Sciences Education

The AI–HI synergy framework calls for coordinated action across classroom, programme, and institutional levels. At the micro level, educators should establish explicit AI-use protocols, particularly in clinical reasoning tasks where independent judgement remains central (Higgs et al., 2024). This may involve designating AI-restricted activities, such as viva examinations or simulated diagnostic tasks, alongside structured AI-supported reflection that requires students to critique or justify AI-generated outputs. Embedding AI literacy within core modules can strengthen students' critical oversight and professional accountability when engaging with intelligent systems (Hu et al., 2026).

At the meso level, curriculum design should integrate AI governance into assessment and supervision practices (Hu et al., 2026). Assessment briefs can require disclosure and justification of AI assistance, while clinical reasoning rubrics distinguish between AI-supported drafting and independently defended judgement (Higgs et al., 2024). AI-ethics components aligned with professional regulatory standards should also be embedded within clinical training.

At the macro level, institutions and regulators should frame AI governance as a matter of professional formation rather than solely misconduct management (Schiff, 2022). Policies should emphasise ethical responsibility and pedagogical alignment, supported by AI competence standards for health educators (Zou et

al., 2025). Together, these multi-level measures position AI–HI synergy as an ongoing educational commitment rather than a technical adjustment.

Conflict of Interest, Acknowledgements, etc.
The author has no conflict of interest.

Funding
This study is supported by the University of Johannesburg (Reference: 720050390).

Acknowledgments
The author wishes to acknowledge Prof Roy Venketsamy from the University of KwaZulu-Natal and Prof Radmila Razlog from the University of Johannesburg for their guidance and supports.

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