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ARTICLE

AMPLIFIER AND RISK: A THEORY-BUILDING EXTENSION OF THE COMMUNITY OF INQUIRY (COI) FOR STUDENT AI USE

Amplificador e Risco: Uma Extensão de Construção Teórica do Modelo Community of Inquiry (COI) para o Uso de IA por Estudantes

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ABSTRACT | Purpose: This study extends the Community of Inquiry (CoI) framework by theorising two student-derived constructs, Cognitive Amplifier and Ethical Risk, to better capture how generative AI shapes learning in Caribbean higher education contexts. **Methodology:** Guided by a pragmatist, social-constructivist stance, this theory-building study conducted a secondary qualitative analysis using 68 open-ended narratives drawn from a larger mixed-methods study of 114 tertiary students. Deductive coding applied CoI categories, while inductive coding identified emergent themes. Teaching Presence was interpreted as a moderating factor. **Findings:** Students described AI as a Cognitive Amplifier, enriching meaning making by clarifying complex ideas, generating examples, and providing multimodal scaffolding. They also expressed strong Ethical Risk, including anxieties about misinformation, plagiarism, and policy ambiguity, which discouraged disclosure and weakened collaboration. Across both dynamics, Teaching Presence emerged as a key influence whether AI was experienced as supportive or stressful, suggesting its potential role as a moderating lever rather than a causal determinant. **Value:** The study positions Cognitive Amplifier and Ethical Risk as cross-cutting mechanisms rather than new presences, refining CoI to address AI-mediated inquiry. This theory-building contribution advances a more globally representative understanding by foregrounding Caribbean student perspectives, which are often underrepresented in AI in education research. **Practical Implications:** The extended framework suggests actionable strategies for higher education, including transparent institutional policies, embedded AI literacy curricula, integrity by design assessments and encouraging the responsible use of integration of multimodal AI scaffolding into teaching practice.

Keywords | AI in education, Community of Inquiry (CoI), Cognitive Amplifier, Ethical Risk, Teaching Presence, Higher education, Caribbean, Global South

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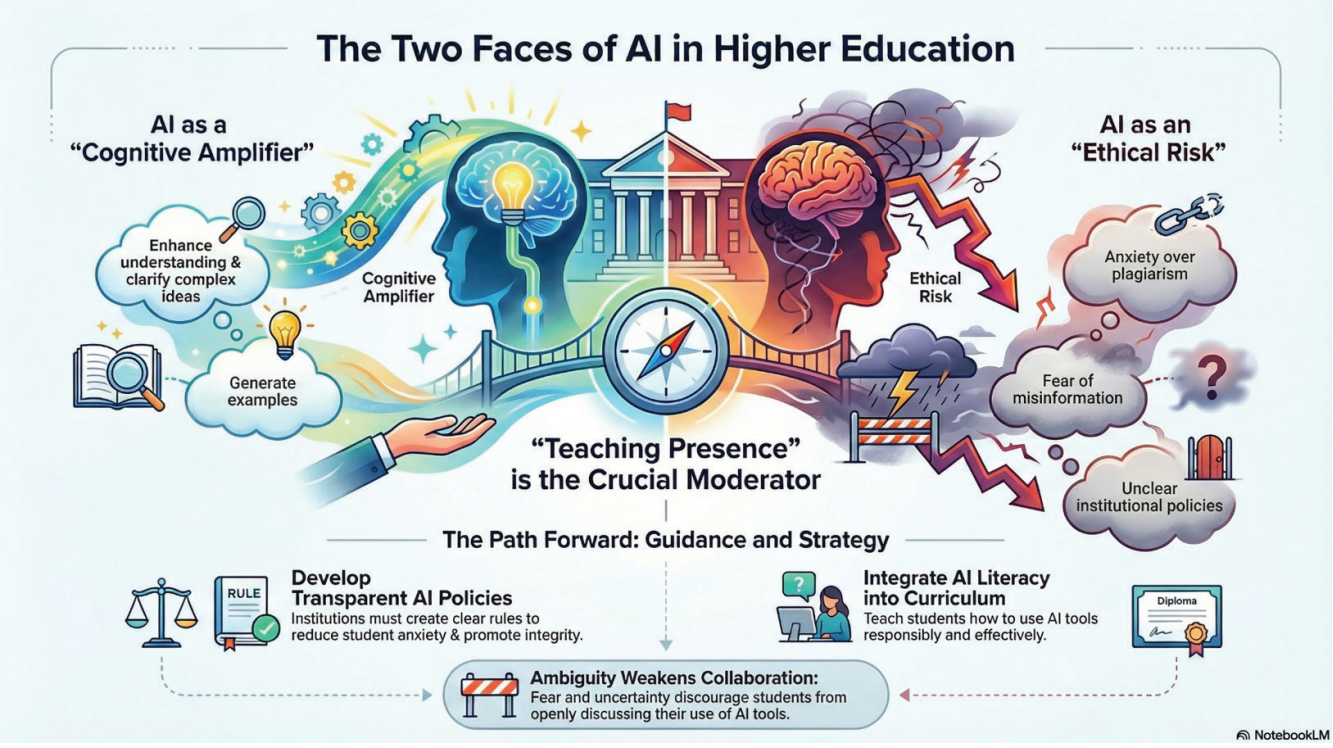
RESUMO | Propósito: Este estudo estende o framework *Community of Inquiry* (CoI) ao teorizar dois construtos derivados da experiência estudantil — *Amplificador Cognitivo* e *Risco Ético* — com o objetivo de compreender como a inteligência artificial generativa molda a aprendizagem em contextos do ensino superior no Caribe. **Metodologia:** Orientado por uma postura pragmatista e socioconstrutivista, este estudo de construção teórica realizou uma análise qualitativa secundária utilizando 68 narrativas abertas provenientes de uma pesquisa maior, de métodos mistos, com 114 estudantes do ensino superior. A codificação dedutiva aplicou as categorias do CoI, enquanto a codificação indutiva identificou temas emergentes. A Presença de Ensino foi interpretada como um fator moderador. **Resultados:** Os estudantes descreveram a IA como um *Amplificador Cognitivo*, enriquecendo a construção de sentido ao esclarecer ideias complexas, gerar exemplos e oferecer suportes multimodais. Também relataram forte percepção de *Risco Ético*, incluindo ansiedade sobre desinformação, plágio e ambiguidade das políticas institucionais — fatores que desencorajavam a divulgação do uso de IA e enfraqueciam a colaboração. Em ambas as dinâmicas, a Presença de Ensino emergiu como um elemento-chave para determinar se a IA era percebida como apoio ou como fonte de estresse, sugerindo seu papel potencial como alavanca moderadora e não como determinante causal. **Contribuição:** O estudo posiciona *Amplificador Cognitivo* e *Risco Ético* como mecanismos transversais, e não como novas "presenças", refinando o CoI para abarcar processos investigativos mediados por IA. Essa contribuição teórica reforça uma compreensão mais globalmente representativa ao destacar perspectivas de estudantes caribenhos, frequentemente sub-representadas na pesquisa sobre IA na educação. **Implicações Práticas:** O framework ampliado sugere estratégias acionáveis para o ensino superior, incluindo políticas institucionais transparentes, currículos de letramento em IA, avaliações estruturadas com foco em integridade e o incentivo ao uso responsável da IA multimodal integrada às práticas pedagógicas.

Palavras-chave | IA na educação; Community of Inquiry (CoI); Amplificador Cognitivo; Risco Ético; Presença de Ensino; Ensino Superior; Caribe; Sul Global.



INTRODUCTION

Generative artificial intelligence (AI) tools such as ChatGPT, Grammarly, and Quillbot are rapidly reshaping higher education. For students, these tools can clarify complex concepts, accelerate tasks, and scaffold independent study. In parallel, concerns about accuracy, academic integrity, and overreliance raise new forms of risk. Despite the accelerating integration of AI into academic life, existing theoretical models, most notably the Community of Inquiry (CoI) framework, were developed in pre-AI contexts and do not yet account for how students themselves experience both the benefits and anxieties of AI, particularly in under-resourced settings such as the Caribbean.

This paper addresses that gap by extending the CoI framework with two constructs grounded in student narratives from a Caribbean higher education study. These constructs capture how AI is experienced simultaneously as an amplifier of inquiry and as a source of ethical tension. By theorising them within CoI, the study refines a widely used framework, foregrounds student perspectives from the Global South[1], and offers practical implications for policy, pedagogy, and future research.

This builds on calls from Southern theory (Connell, 2007) and postcolonial education scholarship (Tikly, 2019) to foreground knowledge from underrepresented regions in rethinking global frameworks.[1]

In the Caribbean, regional analyses (Alexander, Diouf, & Wooding, 2025) also highlight how infrastructural inequities and policy gaps influence the adoption of emerging technologies.

The paper proceeds in five steps. First, the literature review situates current debates on AI, learning, and integrity within the context of higher education. Second, the conceptual framework introduces the proposed extensions to CoI and positions them in relation to existing scholarship. Third, the methodology explains the secondary qualitative analysis of 68 student narratives. Fourth, the findings illustrate how students voiced both opportunities and risks in their accounts of AI use. Ultimately, the discussion highlights theoretical contributions, provides practical strategies for institutions, and outlines directions for future research. Guided by a pragmatist, social constructivist stance, the study positions these constructs as conceptual tools for refining CoI in AI mediated learning, rather than as new presences.

LITERATURE REVIEW

Research on generative AI in higher education has expanded rapidly, highlighting both its pedagogical potential and its ethical complexities. Existing studies examine how AI tools support meaning making, reshape collaboration, and challenge academic integrity. Simultaneously, the Community of Inquiry (CoI) framework remains a central model for analysing online and blended learning, yet it was developed before the rise of generative AI. This review situates the study within current scholarship by examining three strands of literature most relevant to extending CoI: (1) AI as cognitive and multimodal scaffolding, (2) ethical risks and student anxieties, and (3) the evolving role of teaching presence in moderating AI use.

1 In this paper, the term *Global South* refers to regions historically shaped by colonialism and structural inequities in resources, including digital infrastructure, whereas *Global North* refers broadly to industrialised regions (e.g., Europe, North America, parts of East Asia) that dominate knowledge production and policy discourse (Connell, 2007; Tikly, 2019).

AI as Cognitive and Multimodal Scaffolding

Generative AI is increasingly recognised as more than a text-based assistant, with emerging scholarship highlighting its role in multimodal scaffolding that supports deeper meaning making. While topic-modelling analyses of over 4,000 publications show that text-to-text applications still dominate the field, modalities such as text-to-image and image-to-text remain comparatively underexplored (Heilala, Araya, & Hämäläinen, 2025). This gap is significant evidence given that multimodal AI expands accessibility and engagement by providing multiple entry points into learning (Arar et al., 2025).

Recent case studies demonstrate how multimodal AI can be designed for personalised learning, combining text interaction, diagram interpretation, and image generation to scaffold complex problem solving (Chan, 2023). In teacher education, at the preservice level, teachers engaged with generative AI for multimodal composing, blending textual, visual, and design elements into their work, which shifted both their creative processes and their reflections on authorship (Khalil et al., 2023). Institutional pilots have also shown practical applications. Cooper and Tang (2024) reported that students used AI-generated images for brainstorming, creative writing, and visual research, though they required guidance to evaluate image quality and navigate ethical limitations.

Within this same context, research cautions that not all AI-generated visuals equally support learning. Heilala, Araya & Hämäläinen (2025) distinguish between instructive, decorative, and distracting images, emphasising that visuals enhance comprehension only when they are directly aligned with the learning task. This echoes findings from Jin et al. (2025), Mohammadi et al. (2025), and Qian (2025), which showed that multimodal platforms deepen comprehension when paired with intentional human facilitation.

When viewed together, the literature suggests that multimodal AI holds substantial promises for strengthening Cognitive Presence within the Community of Inquiry framework, but its effectiveness depends on thoughtful design, alignment with pedagogical goals, and the cultivation of AI literacy. Rather than treating AI's multimodal capacity as inherently beneficial, the evidence highlights the need for educators to guide students in discerning when and how multimodal scaffolding contributes meaningfully to inquiry.

Ethical Risks, Academic Integrity, and Student Anxiety

Alongside AI's pedagogical potential, a growing body of research points to the ethical ambiguities that shape how students engage with these tools. A systematic review in Technology in Society underscores that academic integrity in AI-rich environments is increasingly complex, with blurred boundaries between assistance and misconduct (Khalil et al., 2023). Large-scale surveys confirm this tension. Lund, Lee, Mannuru & Arutla (2025) found that students distinguished between "whole-AI writing," widely judged as misconduct, and limited uses such as editing or idea generation, which many perceived as acceptable. These differences reveal a persistent gap between institutional policies and students' intuitions about appropriate use.

Broader sector research amplifies these concerns. Lund et al. (2025) found that students perceive clear distinctions between acceptable and unacceptable uses of generative AI, with strong anxieties about misconduct and uncertainty over institutional readiness. In the Caribbean, limited institutional guidance has compounded this uncertainty, with students reporting heightened anxiety about whether AI use is permissible at all (Bissessar, 2023; Roberts et al., 2024). Together, these studies validate the construct of Ethical Risk: a student-derived expression of anxiety linked to misinformation, plagiarism, and policy ambiguity that discourages disclosure and undermines collaborative trust.

Research also highlights the broader effects of ethical ambiguity. Unclear boundaries do not only shape compliance; they also reshape behaviour, encouraging private or hidden use of AI rather than open, collaborative engagement. Lund, Lee, Mannuru & Arutla (2025) and Roberts et al. (2024) show that uncertainty about acceptable AI use often leads to anxiety, silence, or avoidance. Caribbean findings echo this pattern: students left to self-regulate without guidance become hesitant to share or collaborate (Bissessar, 2023; Roberts et al., 2024). Ethical Risk, therefore, functions not simply as an integrity issue but as a suppressor of Social Presence, weakening the openness and trust that CoI assumes as foundational to inquiry.

Teaching Presence: Policy, Literacy, and Pedagogical Design

Within CoI, Teaching Presence has long been recognised as the design and facilitation of learning processes (Anderson et al., 2001). Recent empirical studies continue to affirm its centrality. For instance, Vietnamese students described Teaching Presence as the most influential factor shaping engagement and satisfaction in virtual learning environments (Pham & Nguyen, 2025). Such findings reinforce the view that clarity, facilitation, and feedback remain decisive components of effective instructional design, even across diverse cultural and technological contexts. Biagini (2025) emphasises the need for curricula that blend technical competence with ethical reasoning, and recent global analyses confirm that higher education institutions are rapidly developing policies and guidelines to govern the responsible use of generative AI (Jin et al., 2024; An et al., 2025).

Policy analyses point to the importance of culturally responsive frameworks to ensure that rules and expectations resonate across diverse student populations (Grab, 2025). At the classroom level, emerging research also shows how generative AI can be designed to support reflective practice and ethical reasoning; for example, ChatGPT and similar tools can promote metacognitive engagement when students are prompted to question, verify, and reflect on outputs (Hsiao & Tang, 2024). Such approaches align with calls to integrate verification and ethical reflection directly into the learning process. Synthesising across these strands, prior studies show that clear policies reduce ambiguity, AI literacy equips students to critically evaluate outputs, and integrity-by-design assessments align incentives with reflective practice (Roberts et al., 2024; Biagini, 2025; Jin et al., 2024). While these studies do not describe this dynamic as moderation, interpreted within CoI they suggest that Teaching Presence may function as a moderating lever, shaping whether AI is experienced as an amplifier of inquiry or as a source of anxiety. In this framing, such practices reinforce Social Presence by establishing shared expectations and strengthen Cognitive Presence by embedding verification and reflection, ensuring that AI serves as a scaffold for meaningful learning rather than a threat to it.

The literature confirms both the opportunities and tensions of AI in higher education. Generative AI offers new pathways for meaning making through multimodal scaffolding, yet unresolved issues of accuracy, misconduct, and policy ambiguity heighten ethical risk and suppress collaborative engagement. Across these dynamics, teaching presence consistently emerges as the decisive factor in shaping whether AI supports or undermines inquiry. However, existing frameworks, including CoI, were developed prior to the rise of generative AI and do not yet account for the dual role of AI as both amplifier and risk. This gap underscores the need for a refined theoretical model that integrates student-derived constructs, positioning teaching presence as the moderating device in AI-mediated learning.

Conceptual Framework

The Community of Inquiry (CoI) framework conceptualises meaningful learning as the interplay of three presences: Cognitive, Social, and Teaching (Garrison, Anderson, & Archer, 2000). While CoI remains robust, the emergence of generative AI introduces dynamics that extend beyond the original model. Students in the present study consistently described AI as both a partner in meaning making and a source of ethical tension.

To capture these dual dynamics, two constructs are proposed: Cognitive Amplifier and Ethical Risk[2]. Figure 1 illustrates the original CoI framework, highlighting how meaningful learning emerges from the intersection of Cognitive, Social, and Teaching Presences.

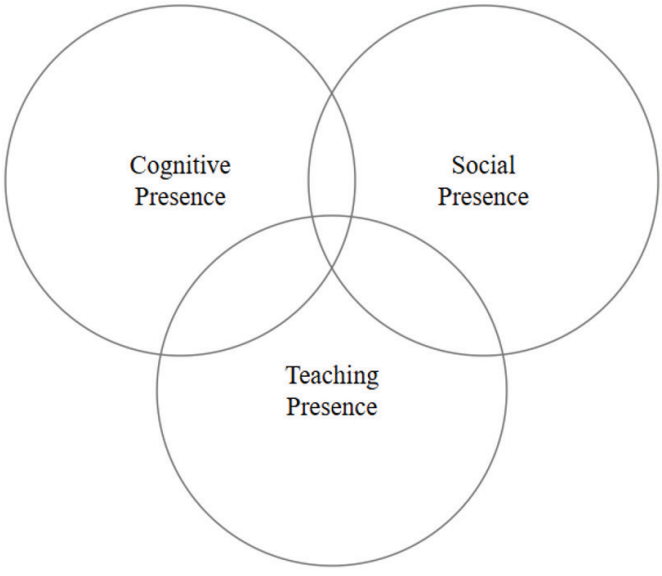


Figure 1. Original Community of Inquiry (CoI) framework, illustrating the interplay of Cognitive, Social, and Teaching Presences.

Adapted from Garrison, Anderson, and Archer (2000). Re-created by the author.[2]

2 *Cognitive Amplifier* refers to the ways AI enhances meaning making by clarifying concepts, generating examples, and providing multimodal scaffolding (e.g., visuals, diagrams). *Ethical Risk* refers to student anxieties about misinformation, plagiarism, and policy ambiguity. It does not denote actual misconduct or institutional rules, but the lived uncertainty that suppresses openness and collaboration.

Cognitive Amplifier refers to the ways in which AI enhances meaning making by clarifying concepts, generating examples, and offering multimodal scaffolding such as diagrams and visualisations. This construct extends CoI by specifying how AI augments the processes of exploration, integration, and resolution that underpin Cognitive Presence. Ethical Risk captures students' anxieties around misinformation, plagiarism, policy ambiguity, and the erosion of independent thinking. These concerns suppress openness and collaboration, thereby constraining Social Presence.

Importantly, these constructs are not proposed as new "presences" but as cross cutting, technology mediated mechanisms. Their influence is shaped by Teaching Presence, which students identified as the decisive factor determining whether AI functioned as a supportive amplifier or as a source of stress. This moderating role is interpreted here as a theoretical proposition for future testing, rather than a causal claim established by the present data.

Positioning and Boundary Conditions

To ensure clarity, the constructs are positioned against existing CoI elements, related extensions, and broader digital education literature (see Table 1). Cognitive Amplifier overlaps with but is not equivalent to Cognitive Presence. It specifies AI's role as a mediating partner, not the student's meaning making itself. Ethical Risk overlaps with but is not reducible to issues of academic integrity. It captures the lived anxiety and hesitancy that suppresses collaboration. Related proposals, such as Learning Presence or self-regulation, highlight metacognition and agency, while the constructs here foreground AI's mediating role. In digital ethics, concerns such as misinformation and misconduct are well-documented, but Ethical Risk specifies how these translate into suppressed Social Presence within CoI.

Together, the constructs can be understood as bidirectional continua: Amplification ↔ Attenuation of cognitive engagement, and Ethical Risk ↔ Ethical Assurance. Framing them in this way underscores that AI's effects are contingent on pedagogical and institutional design.

Table 1 summarises how the constructs are positioned in relation to CoI, related extensions, and digital education literatures.

Table 1. Positioning of Student-Derived Constructs within and beyond the Community of Inquiry (CoI).

Construct	Definition	Core Attributes	Boundaries (Not-This)	Evidence Anchors	Consequences	Instructional Implications	Related Proposition(s)
Cognitive Amplifier	AI as a partner that enriches student meaning making within inquiry processes	Clarifications, concrete examples, multimodal scaffolding (text, visuals, diagrams)	Not identical to Cognitive Presence; not ease of use or performance expectancy	Student quotes (R7, R9, R14); multimodal AI studies (Heilala et al., 2025)	Deeper integration of knowledge; enhanced self-efficacy	Encourage multimodal AI use; integrate verification and reflective activities	P1, P4
Ethical Risk	Student anxiety about misinformation, plagiarism, and unclear policies	Ambivalence; fear of misconduct; reluctance to disclose use	Not equivalent to actual misconduct; not institutional rules themselves	Student quotes (R19, R27, R41); integrity/ anxiety studies (Bissessar, 2023; Roberts et al., 2024)	Suppressed Social Presence; hidden use; heightened anxiety	Publish transparent AI policies; normalise disclosure; embed ethics in teaching	P2, P3
Teaching Presence (as moderating lever)	Instructional design and facilitation of AI-mediated learning shape whether AI is experienced as support or stress	Policy clarity; AI literacy scaffolding; integrity-by-design assessments	Not a new presence; remains within CoI design or facilitation	Student quotes (R12, R21, R33, R45); teaching presence research (Anderson et al., 2001; Biagini, 2025)	Amplifies benefits of Cognitive Amplifier; attenuates harms of Ethical Risk	Redesign assessments; embed AI literacy; provide explicit policy guidance	P3, P4, P6

Developed by the author.
Note: Table 1 positions the student-derived constructs of Cognitive Amplifier and Ethical Risk within the broader Community of Inquiry (CoI) framework. Core attributes and mechanisms were derived from prior CoI scholarship (Garrison, Anderson, & Archer, 2000; Anderson et al., 2001) as well as recent studies of AI-mediated learning. Evidence for Cognitive Amplifier draws on multimodal scaffolding research (Heilala, Araya, & Hämäläinen, 2025; Mohammadi et al. 2025; Qian 2025) and qualitative student accounts from Caribbean contexts (Baksh, 2025). Evidence for Ethical Risk reflects studies documenting student anxiety, policy ambiguity, and reluctance to disclose AI use (Bissessar, 2023; Roberts et al., 2024; Lund et al., 2025).

While these studies do not use CoI terminology, they describe concealed or anxious engagement with AI. In this paper, these patterns are theorised as suppressed Social Presence, hidden use, and heightened anxiety. The moderating role of Teaching Presence is supported by research on instructional design and AI literacy practices (Biagini, 2025; Jin et al., 2024). Collectively, the table demonstrates boundary conditions, i.e., the constructs are not new presences, nor rebranded versions of existing categories, but cross-cutting mechanisms that operate transversally across CoI. Their positioning clarifies antecedents, mechanisms, and consequences, making them amenable to further theoretical refinement and empirical testing. As shown in Figure 2, the extended framework proposed in this study illustrates how Cognitive Amplifier and Ethical Risk act as cross-cutting mechanisms across the presences, with Teaching Presence moderating their influence.

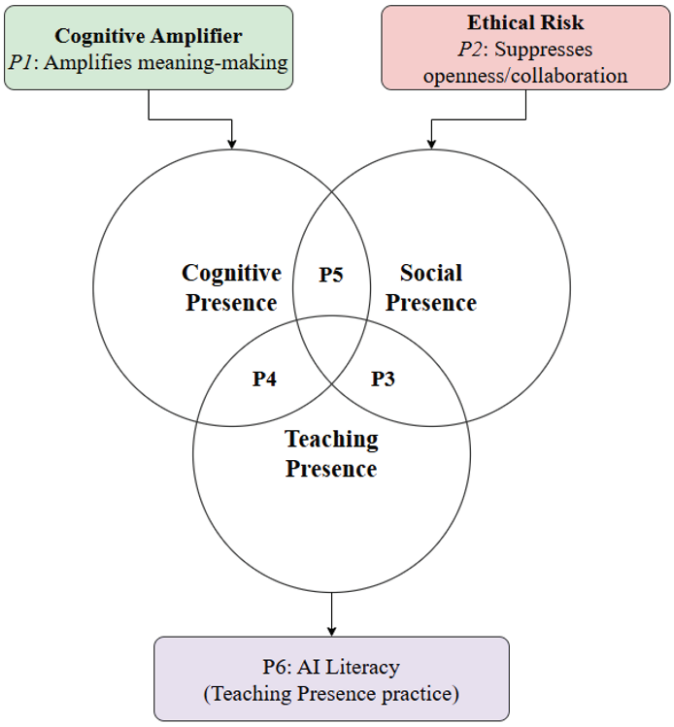


Figure 2. Extended CoI framework with student-derived constructs. Cognitive Amplifier and Ethical Risk act as cross-cutting mechanisms across presences, while Teaching Presence moderates their influence. Developed from Garrison et al. (2000) with new extensions proposed in this study.

Developed by the author.

Propositions: Extending the Community of Inquiry

Two student-derived constructs, Cognitive Amplifier and Ethical Risk, extend the Community of Inquiry (CoI) framework by specifying how generative AI reshapes learning presences. The following propositions articulate these relationships, grounded in both prior scholarship and student narratives.

P1. Cognitive Amplifier → Cognitive Presence

Generative AI clarifies complex concepts, generates examples, and scaffolds reflection, aligning with the phases of exploration, integration, and resolution central to Cognitive Presence (Garrison et al., 2000). As illustrated in student reflections (see Table 3, e.g., R7, R9, R14), AI often clarified concepts and supported multimodal meaning making. Prior studies confirm that AI enhances comprehension, self-regulation, and meaning making (Haidar et al., 2024; Wang et al., 2025; Yang et al., 2025).

Proposition 1 (P1): Perceptions of AI as a Cognitive Amplifier will be positively associated with Cognitive Presence.

P2. Ethical Risk → Social Presence (negative)

Concerns about misinformation, plagiarism, and uncertainty over acceptable use suggest a tendency to create hesitation in disclosure. Such anxieties may reduce collaborative engagement, thereby constraining Social Presence (Lund, Lee, Mannuru & Arutla, 2025; Bissessar, 2023; Roberts et al., 2024). As shown in student accounts (see Table 3, e.g., R19, R27, R41), concerns about plagiarism and misinformation led to reluctance to disclose AI use.

Proposition 2 (P2): Perceptions of Ethical Risk will be negatively associated with Social Presence.

P3. Teaching Presence × Ethical Risk

Policy clarity and instructional design suggest they may reduce uncertainty around the ethical use of AI. Teaching Presence, understood as the design and facilitation of learning processes, may therefore attenuate the negative effects of Ethical Risk on Social Presence (Anderson et al., 2001; Roberts et al., 2025). This is consistent with student reflections (see Table 3, e.g., R21, R33, R45), where policy clarity and lecturer guidance reduced uncertainty.

Proposition 3 (P3): Strong Teaching Presence will attenuate the negative relationship between Ethical Risk and Social Presence.

P4. Teaching Presence × Cognitive Amplifier

Instructional scaffolding that emphasises verification and reflective use suggests it may strengthen the contribution of Cognitive Amplifier to Cognitive Presence (Biagini, 2025).

Proposition 4 (P4): Strong Teaching Presence will strengthen the positive relationship between Cognitive Amplifier and Cognitive Presence. Student experiences (see Table 3, e.g., R12, R14) highlight how instructional scaffolding enabled them to use AI outputs more effectively.

P5. Social Presence → Cognitive Presence

Within the CoI framework, reduced Social Presence is theorised to limit collaborative inquiry, thereby constraining the integration and resolution phases of Cognitive Presence (Garrison et al., 2000). Evidence from Caribbean contexts supports this interpretation. Roberts et al. (2024) show how policy ambiguity and student anxiety led to concealed AI use and reduced collaboration. Student reflections (see Table 3, e.g., R19, R33) further illustrate how disclosure anxiety suppressed openness, indirectly weakening Cognitive Presence.

Proposition 5 (P5): Reduced Social Presence due to Ethical Risk will indirectly diminish Cognitive Presence by limiting collaborative inquiry.

P6. AI Literacy as Teaching Presence Practice

Embedding AI literacy into instructional design suggests it may equip learners to use AI responsibly, thereby potentially strengthening the benefits of Cognitive Amplifier while reducing the negative effects of Ethical Risk (Biagini, 2025; Jin et al., 2024). As student reflections indicate (see Table 3, e.g., R21, R45), explicit classroom guidance and AI literacy practices provided assurance and encouraged responsible use.

Proposition 6 (P6): AI literacy practices embedded within Teaching Presence will enhance the positive effects of Cognitive Amplifier and reduce the negative effects of Ethical Risk.

Table 2. Propositions Extending the CoI Framework (P1–P6).

Proposition	Construct Relationship	Evidence Anchors	Instructional Implications
P1	Cognitive Amplifier → Cognitive Presence	Student quotes (R7, R9, R14); Haidar et al. (2024); Wang et al. (2025)	Encourage multimodal AI use; integrate verification & reflection
P2	Ethical Risk → Social Presence (–)	Student quotes (R19, R27, R41); Bissessar (2023); Roberts et al. (2024)	Publish transparent policies; normalise disclosure
P3	Teaching Presence × Ethical Risk	Student quotes (R21, R33, R45); Anderson et al. (2001); Roberts et al. (2025)	Embed AI literacy; design clarity into assessments
P4	Teaching Presence × Cognitive Amplifier	Student quotes (R12, R14); Biagini (2025)	Scaffold verification; promote reflective use
P5	Social Presence → Cognitive Presence	Roberts et al. (2024); Garrison et al. (2000)	Foster collaboration; support peer dialogue
P6	AI Literacy as Teaching Presence Practice	Biagini (2025); Jin et al. (2024)	Embed AI literacy; model ethical AI use

Developed by the author.

Collectively, these six propositions (Figure 3) illustrate the theorised pathways: Cognitive Amplifier enhances Cognitive Presence (P1), Ethical Risk suppresses Social Presence (P2), Teaching Presence moderates both relationships (P3, P4), reduced Social Presence diminishes Cognitive Presence (P5), and AI Literacy strengthens benefits while mitigating risks (P6).

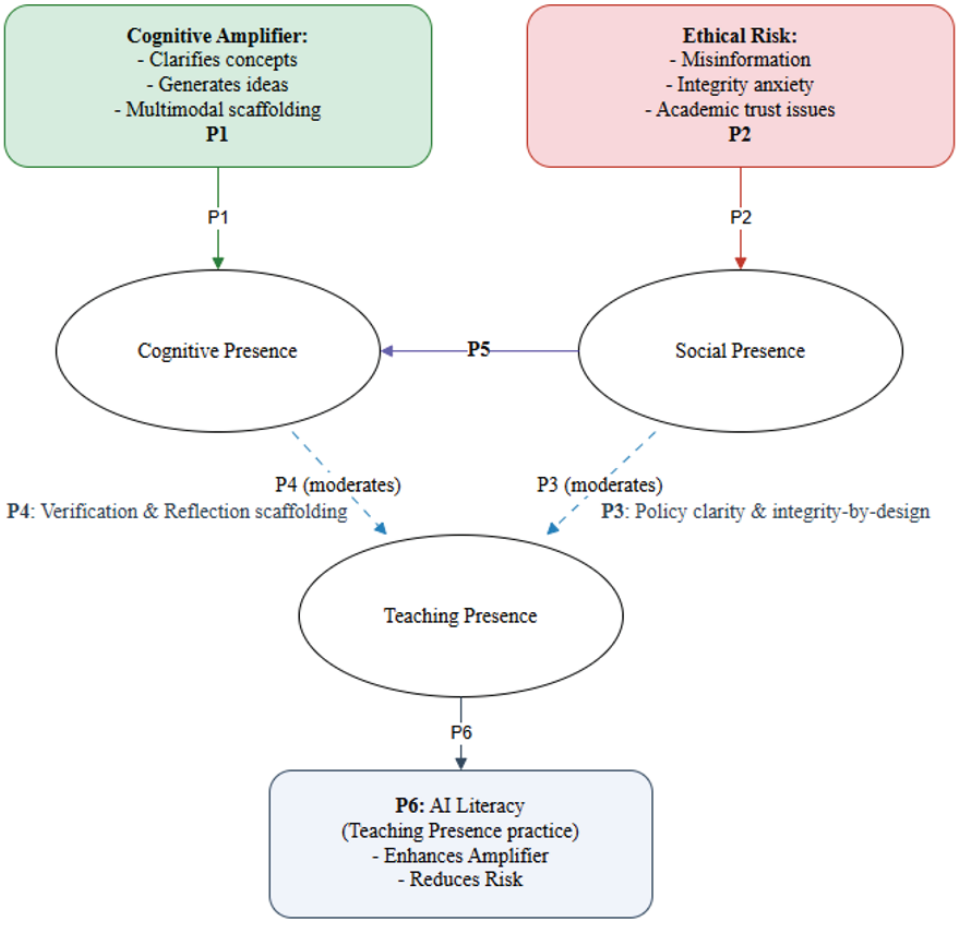


Figure 3. Analytical logic of the extended CoI framework (Propositions P1–P6). Solid arrows indicate direct effects; dashed arrows indicate moderating influences.

Developed by the author.

METHODOLOGY

Dataset and Participants

This study undertook a secondary qualitative analysis of narrative data originally collected as part of a mixed-methods investigation of student AI use in the Caribbean (Baksh, 2025). The parent study surveyed 114 tertiary students across multiple institutions, disciplines, and academic levels. Of these, 68 provided complete narrative responses that included substantive reflections on AI use; the remaining 46 were excluded because their responses were partial or lacked sufficient detail. Students reported engaging with a range of tools, including ChatGPT, Quillbot, Grammarly, Gemini, and Copilot, with ChatGPT most frequently cited. While variation across disciplines and academic levels was captured in the broader study, the present analysis did not undertake subgroup comparisons, focusing instead on theorising cross-cutting constructs. All data were collected under the scope of the original institutional ethics approval, with no re-contact or additional data collection for this paper. Table 3 provides an overview of the narrative dataset, including the number of respondents,

excluded cases, and the range of AI tools described. This approach aligns with recommended best practices for secondary qualitative analysis, which emphasise analytic fit, transparency of data provenance, and ethical reuse (Chatfield, 2020).

Table 3. Participant Overview (Narrative Dataset for Secondary Analysis)

Category	Description	N	% of Total (114)
Total survey respondents	Students in a parent mixed-methods study	114	100%
Complete narrative responses analysed	Substantive reflections on AI use	68	59.6%
Excluded responses	Partial / non-substantive narratives	46	40.4%
Institutions/Levels	Multiple Caribbean tertiary institutions, disciplines, and levels represented	–	–
AI tools mentioned	ChatGPT (most frequent), Quillbot, Grammarly, Gemini, Copilot	–	–

Note: Percentages are calculated against the full survey sample (N = 114).

The analysis is guided by a pragmatist, social-constructivist stance. Pragmatism treats theories as tools whose value lies in their ability to illuminate problems and generate actionable implications, while social constructivism foregrounds meaning making as co-constructed through learners' engagement within cultural and institutional contexts. Within this framing, the study is positioned as theory-building rather than hypothesis-testing, with the aim of refining the Community of Inquiry (CoI) framework to account for AI-mediated dynamics. The constructs of Cognitive Amplifier and Ethical Risk are therefore advanced as conceptual mechanisms derived from student accounts, while Teaching Presence is interpreted as a moderating lever.

Analytic Approach

The analysis proceeded through a stepwise process designed to move from raw student narratives to theorised propositions. First, all 68 complete responses were anonymised and prepared for analysis, consistent with the scope of the original ethics approval. Second, deductive coding applied the Community of Inquiry (CoI) categories of Cognitive, Social, and Teaching Presence, providing a baseline for interpreting students' accounts in relation to established theory. Third, inductive coding identified patterns beyond CoI, with recurring references to AI as both an amplifier of meaning making and a source of ethical anxiety consolidated into the emergent codes Cognitive Amplifier and Ethical Risk.

Fourth, the codebook was iteratively refined through memo writing, peer debriefing, and the maintenance of an audit trail, ensuring reflexivity and transparency. Definitions were operationalised in Table 4, with exemplary excerpts illustrating coding application. Fifth, deductive and inductive codes were interpreted at a higher level to articulate the constructs of Cognitive Amplifier and Ethical Risk. Finally, these constructs were integrated with CoI theory to generate six middle-range propositions (P1 - P6).

Consistent with theory-building traditions, the analysis emphasised information power, the breadth and conceptual richness of the 68 narratives, rather than seeking formal saturation. This orientation reflects the aim of generating propositions to refine theory, rather than testing hypotheses. Figure 4 illustrates the analytic flow, showing how deductive and inductive coding informed construct development and proposition building.

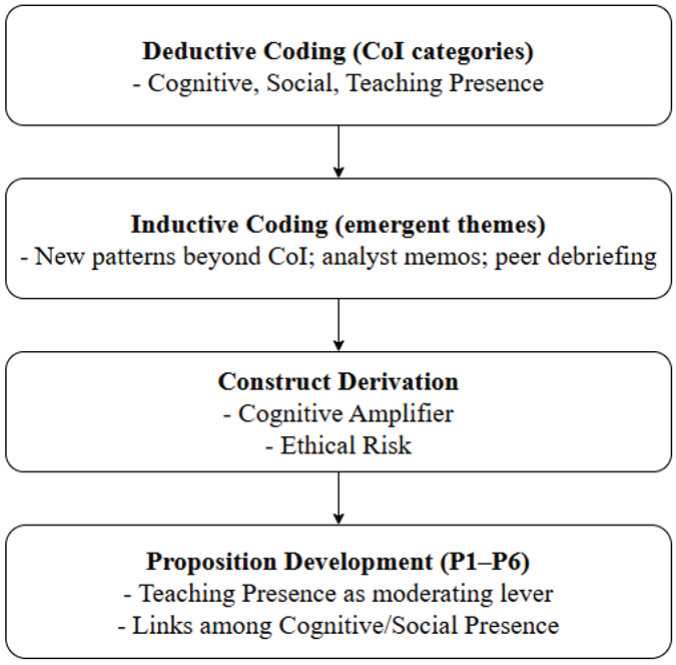


Figure 4. Analytic flow of the secondary qualitative analysis, showing progression from deductive coding to inductive themes, construct derivation, and proposition development.

Developed by the author.

Codebook and Trustworthiness

The codebook was developed through a hybrid strategy that combined deductive and inductive approaches. Deductive codes were drawn directly from the Community of Inquiry (CoI) framework (Cognitive, Social, and Teaching Presences), ensuring continuity with established theory. Inductive codes (Cognitive Amplifier and Ethical Risk) were derived from recurring patterns in students' narratives that extended beyond existing CoI categories. Each code was defined operationally and accompanied by exemplary excerpts to demonstrate how it was applied in practice.

Table 4 summarises the codes, providing their operational definitions and illustrative quotes from the dataset. Deductive codes are aligned with the original CoI constructs, while inductive codes capture student-derived mechanisms that informed the theoretical extensions advanced in this paper. Given that this was a single-coder project, no intercoder reliability coefficient was calculated. Instead, trustworthiness was established through memo writing, peer debriefing, and an audit trail, consistent with qualitative standards for reflexive qualitative research (Braun & Clarke, 2021). These

procedures supported transparency and reflexivity in the analytic process, serving a role comparable to validity checks in quantitative research.

Table 4. Deductive and Inductive Codes with Operational Definitions and Exemplar Excerpts.

Code	Operational Definition	Exemplar Excerpt
Cognitive Presence (deductive)	Code when a student explicitly describes using AI to explore, integrate, or resolve ideas (e.g., clarifying concepts, connecting knowledge, deepening understanding).	"*AI helped me connect concepts more quickly and understand the data better*" (R14).
Social Presence (deductive)	Code when a student refers to openness, collaboration, or reluctance to disclose AI use in peer or classroom interactions.	"*I didn't want to share my AI use with classmates because of fear*" (R32).
Teaching Presence (deductive)	Code when a student mentions instructional design, facilitation, or policy guidance shaping their use of AI.	"*The lecturer's guidance made me confident that my use of AI was acceptable*" (R21).
Cognitive Amplifier (inductive)	Code when a student describes AI enriching meaning-making by clarifying concepts, generating examples, or providing multimodal scaffolding (e.g., diagrams, visuals).	"*I used AI to generate pictures to explain abstract ideas, and that made the content clearer*" (R7).
Ethical Risk (inductive)	Code when a student expresses anxiety, mistrust, or hesitation due to misinformation, plagiarism concerns, or unclear institutional policies.	"*I feel more anxious submitting work because I don't know if AI is allowed*" (R48).

Developed by the author.
Note: Deductive codes reflect established Community of Inquiry (CoI) categories. Inductive codes capture student-derived extensions that informed the theoretical framework. Exemplar excerpts are anonymised student responses.

The analysis is situated within the Caribbean higher education context, shaped by structural inequities, cultural dynamics, and institutional diversity. As a researcher embedded in this context, insider familiarity with pedagogical and policy realities informed the interpretation of the data. While this perspective provided contextual sensitivity, it also risked reinforcing taken-for-granted assumptions. To mitigate this, memo writing, peer debriefing, and an audit trail, explicitly linking reflexivity to coding decisions were employed. Recognising that institutional variation in infrastructure, policy frameworks, and AI access may influence experiences, the findings are framed as indicative patterns rather than uniform across all Caribbean settings.

Ethical Considerations

This secondary qualitative analysis was conducted using 68 open-ended narrative responses drawn from a previously approved mixed-methods study of tertiary students in the Caribbean (Baksh, 2025). The original study received institutional ethical approval, and participants were informed that they would be asked about their use of digital and AI tools for the study and assessment. For the present paper, no new data were collected, and no participants were re-contacted. All analysis was carried out on anonymised responses, consistent with the scope of the original ethics approval.

Findings: Evidence for Inductive Extensions

The secondary qualitative analysis of 68 narrative responses revealed two constructs that extend the Community of Inquiry (CoI) framework: Cognitive Amplifier and Ethical Risk. These constructs, voiced directly by students, illustrate how generative AI reshapes learning presence, with Teaching Presence consistently emerging as the moderating force.

Cognitive Amplifier

Students consistently portrayed AI as a Cognitive Amplifier that enriched the phases of exploration, integration, and resolution central to Cognitive Presence (Garrison et al., 2000). Many described how AI clarified complex concepts and allowed them to redirect time toward deeper engagement: "*It allowed me to spend more time reading and examining complex information and data, rather than searching for it, improving my analytical skills and the quality of work I submit*" (R14). Another explained: "*AI tools can articulate complex information in a more digestible and memorable way, depending on the prompt used*" (R9). Students also highlighted multimodality as a distinctive benefit: "*I used AI to generate pictures to explain abstract ideas, and that made the content clearer*" (R7).

Students attributed different amplifier effects to specific tools. ChatGPT was often described as a "*conversational explainer*", Grammarly as a writing assistant, and Quillbot as a paraphrasing aid. Copilot and Gemini were less commonly cited but noted for coding or alternative explanations. These tool-specific functions collectively shaped the broader construct of Cognitive Amplifier. In tandem, not all accounts were unambiguously positive. Some students noted that AI could confuse rather than clarify, "*Sometimes AI gave me the wrong explanation, and I felt more lost*" (R28). This ambivalence suggests that, while AI-enriched Cognitive Presence, for many, its contribution was contingent on accuracy, prompting, and verification.

These excerpts show how students directly described AI, clarifying concepts, providing examples, and offering multimodal scaffolding. The analysis interprets these accounts as evidence of a broader construct, Cognitive Amplifier, which extends Cognitive Presence beyond text-based support to include multimodal meaning making. Importantly, this emphasis on multimodality was explicitly reported by students themselves (e.g., R7), not only inferred from prior scholarship.

Ethical Risk

Alongside these benefits, students expressed significant ambivalence about AI use, captured in the construct of Ethical Risk. Concerns focused on misinformation, plagiarism, and fear of crossing unclear institutional boundaries. As one student explained, *"AI tools … can sometimes generate false or fabricated sources … it's important to double-check the output" (R27).* Ethical Risk also varies by tool. ChatGPT raised concerns about misinformation and fabricated citations, Quillbot triggered anxieties about plagiarism detection, and Grammarly, while widely used, was sometimes viewed as a

grey area where policy clarity was lacking. Such distinctions suggest that Ethical Risk is not uniform but mediated by the perceived institutional legitimacy and function of different AI tools. Other students emphasised anxiety, *"I feel more anxious submitting work because of the fear that comes with using AI for assignments" (R19).* One student admitted, *"I think it can diminish your chances to be able to think for yourself" (R41).*

Yet not all students rejected AI. Some acknowledged its potential while simultaneously expressing fear,*"I don't think AI is all bad, but I am afraid to rely on it too much" (R46).* This mixture of recognition and caution illustrates how Ethical Risk does not eliminate use but suppresses openness and disclosure, thereby weakening Social Presence.

These student accounts highlight anxiety, uncertainty, and mistrust as recurring experiences. While the narratives provide direct evidence of hesitation and disclosure reluctance, the analysis interprets this pattern as the construct of Ethical Risk, a suppressor of Social Presence within the CoI framework. While these risks were described broadly, it is possible that perceptions may also vary by discipline or academic level. For example, students in writing-intensive programmes may experience higher anxiety around paraphrasing tools than those in technical fields. This study does not disaggregate responses by subgroup, but such variation represents an important line of inquiry for future work.

Teaching Presence as Moderator

Across both dynamics, students consistently pointed to Teaching Presence as an important influence on whether AI was experienced as empowering or anxiety-inducing. Some described how clear instructional guidance amplified AI's benefits, *"Honestly, it has broken down certain topics for me to understand and even given a step-by-step process on how to solve it" (R12).* Others emphasised that clarity about acceptable use reduced anxiety, *"The lecturer's guidance made me confident that my use of AI was acceptable" (R21).* By contrast, in the absence of such guidance, anxiety was heightened, *"I feel anxious submitting work because I don't know if using AI is considered wrong" (R33).* Another student added, *"AI helped me, but only because my teacher explained when it was allowed" (R45).*

Students' reflections demonstrate how instructional clarity and policy guidance directly shaped their confidence and openness in using AI. Building on these observations, the analysis interprets Teaching Presence as the moderating lever that determines whether AI is experienced as a Cognitive Amplifier or as a source of Ethical Risk.

Table 5. Exemplar Quotes by Theme: Evidence, Ambivalence and Inference.

Theme	Illustrative Quote	Insight
Cognitive Amplifier	*"AI allowed me to spend more time analysing instead of searching for data" (R14).*	Evidence
	"AI's diagrams made abstract concepts clearer" (R7).	Evidence
	"AI tools can articulate complex information in a more digestible way" (R9).	Evidence
	"Sometimes AI gave me the wrong explanation, and I felt more lost" (R28).	Ambivalent
Ethical Risk	*"AI tools sometimes generate false or fabricated sources — I double-checked everything" (R27).*	Evidence
	"I feel more anxious submitting work because I don't know if AI is considered wrong" (R19).	Evidence
	"I think it can diminish your chances to be able to think for yourself" (R41).	Evidence
	"I don't think AI is all bad, but I am afraid to rely on it too much" (R46).	Ambivalent
Teaching Presence	*"The lecturer's guidance made me confident that my use of AI was acceptable" (R21).*	Evidence
	"Honestly, it has broken down certain topics for me to understand…" (R12).	Evidence
	"I feel anxious submitting work because I don't know if using AI is considered wrong" (R33).	Evidence
	"AI helped me, but only because my teacher explained when it was allowed" (R45).	Inference

Developed by the author.
Note. Quotes are categorised to distinguish between (a) Evidence, where student accounts directly supported the theme; (b) Ambivalent, where students expressed mixed or contradictory views, and (c) Inference, where the researcher's interpretation connects student accounts to broader constructs such as moderation.

DISCUSSION

From a theory-building, pragmatist perspective, the study extends the Community of Inquiry (CoI) framework by theorising two student-derived constructs, Cognitive Amplifier and Ethical Risk, that illuminate how generative AI mediates learning in higher education. These constructs are advanced not as new "presences" but as conceptual tools, offered to refine CoI in contexts where AI reshapes meaning making and ethical risk taking. Their articulation reflects the pragmatic emphasis on generating propositions that are useful for guiding both future research and educational practice. These propositions are offered as conceptual tools rather than asserting definitive causal claims. Rather than treating these constructs as new "presences," the analysis positions them as cross cutting mechanisms that operate across Cognitive, Social, and Teaching Presences. Their emergence from student narratives underscores the need to refine CoI for contexts shaped by AI technologies. These insights are offered as theoretically informed propositions rather than empirical proofs, contributing to the ongoing evolution of CoI as a framework for understanding digitally mediated inquiry.

Cognitive Amplifier: Expanding Cognitive Presence

Students frequently described AI as a partner in meaning-making. It clarified complex ideas, provided concrete examples, and offered multimodal scaffolding such as diagrams and visuals. These accounts suggest that AI can function as a Cognitive Amplifier, enriching the exploration, integration, and resolution phases that define Cognitive Presence. Concurrently, some students reported confusion or misinformation, indicating that the contribution of AI is contingent on prompting, accuracy, and verification. Cognitive Amplifier should therefore be understood as a potential mediator of meaning

making, not a uniform or guaranteed enhancement. These patterns illustrate the Amplification ↔ Attenuation continuum: while many students experienced AI as enriching inquiry, others reported confusion or misinformation, indicating that its impact is contingent on accuracy, prompting, and verification.

Ethical Risk: Suppressing Social Presence

Alongside perceived benefits, students voiced significant anxieties about misinformation, plagiarism, and policy ambiguity. Prior studies confirm that such ambiguity promotes anxiety and reluctance to disclose AI use (Bissessar, 2023; Roberts et al., 2024). While these studies do not frame their findings in CoI terms, interpreted within CoI they suggest the construct of Ethical Risk, in which uncertainty suppresses openness and trust, thereby constraining Social Presence. Unlike academic misconduct itself, Ethical Risk reflects the lived experience of uncertainty that discourages disclosure and collaboration. Recognising this dynamic refines CoI by showing that ethical ambiguity functions not only as a compliance concern but also as a suppressor of presence within learning communities. This reflects the Risk ↔ Assurance continuum. In contexts of policy ambiguity, students gravitated toward concealment and anxiety, whereas clear guidance provided ethical assurance that sustained trust and collaboration.

Teaching Presence as a Moderating Lever

Across both dynamics, Teaching Presence consistently appeared as an influence shaping whether AI was experienced as supportive or stressful. Students highlighted that clear instructional guidance, transparent policies, and integrity by design assessments reduced Ethical Risk while amplifying cognitive benefits (Roberts et al., 2024; Biagini, 2025). While these studies and student accounts do not frame their findings in terms of moderation, interpreted within CoI they suggest that Teaching Presence may act as a moderating lever, influencing the balance between amplification and risk. This interpretation is conceptually compelling but not empirically tested. It is therefore advanced here as a theoretical proposition that warrants future examination.

Theoretical and Practical Contributions

Theoretically, the study demonstrates that the Community of Inquiry (CoI) remains a robust framework but requires refinement to capture AI-mediated learning. Cognitive Amplifier enriches CoI's explanatory power by specifying AI's role in multimodal meaning making. Ethical Risk sharpens the model by identifying how anxiety and policy ambiguity can constrain collaboration. Teaching Presence is reconceptualised to include governance of AI use through clarity, scaffolding, and assessment design.

Practically, these refinements point toward actionable strategies that operate across multiple levels of higher education. At the institutional level, universities can publish transparent policies

on AI use, embed AI literacy within curricula, and create recognition systems that reward ethical and creative engagement with AI. At the faculty and departmental level, programs can redesign assessments to emphasise process and originality, provide professional development on AI literacy, and encourage communities of practice to share effective pedagogical designs. At the instructor level, Teaching Presence can be enhanced by clarifying classroom expectations, integrating multimodal scaffolding into teaching, and modelling responsible prompting and evaluation. Finally, at the student level, practices can encourage open disclosure of AI use, provide opportunities to develop reflective strategies for evaluating AI outputs, and promote peer dialogue to establish shared norms of integrity and collaboration.

Contextually, by foregrounding Caribbean student voices, the analysis underscores how structural inequities and policy gaps shape AI adoption in ways that are underexplored in Global North dominated research. This contribution resonates with broader Global South scholarship advocating for epistemic justice in digital education (Connell, 2007; Tikly, 2019). By situating Cognitive Amplifier and Ethical Risk in the lived experiences of Caribbean tertiary students, the study aligns with regional analyses (Alexander, Diouf, & Wooding, 2025) that call for culturally grounded approaches to AI governance and pedagogy.

Limitations and Future Research

As a secondary qualitative analysis, the study carries several limitations that should be acknowledged. First, the coding was conducted by a single researcher, which may limit intersubjective reliability. While trustworthiness was enhanced through memo writing, peer debriefing, and an audit trail, no intercoder coefficient was calculated. Second, although the dataset included variation across disciplines and academic levels, the present study did not undertake systematic subgroup analysis. The findings should therefore be interpreted as cross-cutting patterns rather than discipline-specific insights. Third, the narratives were drawn from Caribbean tertiary students, whose experiences are shaped by regional inequities and policy gaps. As such, findings may not generalise globally, underscoring the importance of comparative research across Global North and Global South contexts. Finally, the study was designed as theory building rather than hypothesis testing. The constructs of Cognitive Amplifier and Ethical Risk should therefore be treated as conceptual tools for further refinement, rather than empirically verified categories.

Future research can extend this work through a staged agenda. Expert content validation (e.g., Delphi panels) could refine construct boundaries and evaluate their applicability across diverse contexts. Quantitative testing using exploratory and confirmatory factor analysis (EFA/CFA) and structural equation modelling (SEM) would enable empirical assessment of the proposed relationships, particularly the moderating role of Teaching Presence. Recent CoI-based SEM research has shown that Teaching and Cognitive Presences significantly predict satisfaction and persistence, with moderating effects of learner characteristics such as gender and prior online experience (Paris, Lakhal, & Mukamurera, 2025). Comparative studies across regions and disciplines, including recent analyses of Teaching Presence in Vietnamese higher education (Pham & Nguyen, 2025), would further

strengthen the generalisability of Amplifier and Risk dynamics and contribute to a more globally representative theorisation of AI in education.

CONCLUSION

This paper has extended the Community of Inquiry (CoI) framework to account for the dynamics of generative AI in higher education. Drawing on qualitative narratives from Caribbean tertiary students, two constructs were theorised. Cognitive Amplifier, which highlights how AI can enrich Cognitive Presence through clarifications, examples, and multimodal scaffolding; and Ethical Risk, which captures anxieties about misinformation, plagiarism, and policy ambiguity that can suppress Social Presence. Across both, Teaching Presence consistently appeared as a moderating influence on whether AI was experienced as supportive or uncertain, interpreted within CoI, this role can be understood as a potential moderating factor.

The study makes three contributions. Theoretically, it refines CoI by positioning Cognitive Amplifier and Ethical Risk as cross cutting mechanisms rather than additional presences, clarifying how AI mediates inquiry processes. Practically, it identifies strategies that institutions can adopt, including transparent AI policies, embedded AI literacy, integrity-by-design assessments, and the use of multimodal scaffolding to deepen meaning making. Contextually, it amplifies Global South perspectives, illustrating how structural inequities and policy gaps shape AI adoption in ways often overlooked in Global North dominated research. In parallel, subgroup variation across disciplines and academic levels was not analysed here, representing an important limitation and future direction for testing the generalisability of Amplifier and Risk dynamics.

These insights should be understood as a contribution to theory building rather than a definitive empirical test. Framing these dynamics as Amplification ↔ Attenuation and Risk ↔ Assurance highlights that AI's educational role is not fixed, rather, it depends on how institutional design and teaching presence shape its use. Future research can build on this foundation through expert content validation (e.g., Delphi panels) to sharpen construct boundaries, followed by quantitative testing using methods such as exploratory and confirmatory factor analysis (EFA/CFA) and structural equation modelling (SEM). Comparative studies across Global South and Global North institutions would further strengthen the generalisability of findings and advance a more globally representative theorisation of AI in education.

In closing, the extended CoI framework developed here offers both conceptual refinement and actionable guidance. It underscores that AI is neither inherently an amplifier nor a risk. Instead, it is a mediating force whose educational value depends on how teaching presence, institutional design, and cultural context shape its use.

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APPENDIX 1

Summary Table of Qualitative Themes and Frequencies

Theme	Key Codes	Frequency (total code hits)
AI as a Cognitive and Performance Amplifier	Cognitive Presence, Performance Expectancy, Teaching Presence	60, 43, 11
Effort, Access, and the Student Experience	Effort Expectancy, Infrastructure/Access, Social Influence	40, 8, 5
Navigating Trust, Accuracy, and Ethics	Ethical Concerns, Trust in AI	13, 12
Social and Emotional Dimensions of AI Use	Social Presence, Emotional Impact	10, 3
Adaptive and Personalised Learning Paths	Personalised Learning, Metacognitive Change	10, 10

Adapted from Baksh, S. (2025). Investigating Students' AI Usage Through the Community of Inquiry (CoI) Framework: A Mixed-Method Study in the Caribbean Region. *SDGs Studies Review*, *6*(studies), e036. https://doi.org/10.37497/sdgs.v6istudies.36

APPENDIX 2

Integrated Joint Display Showing Alignment of Quantitative Variables (CoI, UTAUT) with Qualitative Themes and Codes

Construct	Quantitative Evidence	Qualitative Evidence
Cognitive Presence	High means for AI clarifying concepts and connecting ideas (M = 4.24–4.17); strong correlation with perceived learning outcomes ($\rho = 0.73$, $p < .001$).	Students describe AI as a "cognitive amplifier" aiding understanding and reflection (60 code hits).
Performance Expectancy	AI is seen as academically useful (M = 4.07); frequency of use correlated with usefulness ($\rho = 0.51$, $p < .001$).	AI enhances performance, efficiency, and productivity; boosts revision and quality of work (43 hits).
Teaching Presence	Moderate mean score (M = 3.96); significant predictor of perceived usefulness ($\beta = 0.437$, $R^2 = 0.261$, $p < .001$).	AI used as "digital tutor," offering step-by-step guidance (11 hits).
Effort Expectancy	High ease-of-use ratings across levels (M = 4.08); no significant difference by academic level (U = 4306, p = .842).	Most found AI tools intuitive and timesaving; some noted access limitations (40 hits).
Social Presence / Collaboration	Lower agreement that AI supports peer interaction (M = 3.22).	Limited references to AI-enabled collaboration (10 hits); some mention improved expression.
Ethical Concerns / Trust	Moderate concern about ethical implications (M = 3.59).	Concerns about plagiarism, misinformation, and appropriate use (13 hits).
Personalised/ Adaptive Learning	Not directly measured in survey items.	AI is viewed as a personalised study partner that adjusts to student needs and supports metacognitive development and learner autonomy (10 hits each: personalised, metacognitive). Insights extend beyond CoI/UTAUT.

Adapted from Baksh, S. (2025). Investigating Students' AI Usage Through the Community of Inquiry (CoI) Framework: A Mixed-Method Study in the Caribbean Region. *SDGs Studies Review*, *6*(studies), e036. https://doi.org/10.37497/sdgs.v6istudies.36