

The RAPID Framework: Cultivating Critical Thinking in Teacher Education amidst the Digital Deluge and AI Proliferation

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Abstract

The unsupervised use of AI-generated content in academic and research settings further raises concerns about information quality and the potential for over-dependence on AI for cognitive tasks (Yusuf et al., 2024) (Walter, 2024) and further necessitates a framework of critical thinking which is flexible and transversal by being responsive to the challenges posed by digital media platforms, artificial intelligence driven content usage and the cognitive functions associated with relentless online engagement creating compelling demands of an increasingly complex information ecosystem (Baskara, 2024). This pervasive integration of generative artificial intelligence into educational landscapes has emphasized upon the critical need for advanced pedagogical frameworks designed to cultivate critical thinking skills among the teacher-trainees in a robust manner

Introduction

In a rapidly evolving digital landscape, particularly with the advent of generative AI (Shen & Han, 2025). This necessitates a re-evaluation of traditional approaches to consider critical AI literacy and prepare the students with the skills to navigate information with sound judgement (McPhee & Jerowsky, 2025). The unsupervised use of AI-generated content in academic and research settings further raises concerns about information quality and the potential for over-dependence on AI for cognitive tasks (Yusuf et al., 2024) (Walter, 2024) and further necessitates a framework of critical thinking which is flexible and transversal by being responsive to the challenges posed by digital media platforms, artificial intelligence driven content usage and the cognitive functions associated with relentless online engagement creating compelling demands of an increasingly complex information ecosystem (Baskara, 2024). This pervasive integration of generative artificial intelligence into educational landscapes has emphasized upon the critical need for advanced pedagogical frameworks designed to cultivate critical thinking skills among the teacher-trainees in a robust manner . This has again necessitated for creating a shift from purely technical AI understanding to fostering critical AI literacy, preparing educators to engage with AI tools effectively and ethically in their future classrooms (McPhee & Jerowsky, 2025). This research proposal outlines the development of RAPID model specifically tailored for teacher-trainees at the IBEC, aiming to enhance their analytical, interpretative, and solution-orienting thinking in the context of AI utilization (Shen & Han, 2025) (Dilek et al., 2025). This framework aims to build upon existing critical digital expertise by incorporating specific considerations for AI, acknowledging that the pervasive nature of AI in mundane life, creating a demand for a revised approach to preparing students (Baskara, 2024) (Joseph, 2023). This

entails not only understanding how AI systems function but also critically examining their ethical implications, including their potential to create biases and power structures (Leander & Burris, 2020).

Literature Review

By examining current research on critical thinking pedagogies, AI literacy, and their integration within teacher education, the literature review below establishes the theoretical underpinnings for the proposed RAPID model adaptation.

The literature review will also contextualize the unique demands placed on IBEC teacher-trainees, who are expected to not only understand but also effectively integrate critical AI literacy into diverse international educational settings.

The review will also be aimed at establishing a theoretical underpinning for the adaptation of the RAPID model, ensuring its relevance and effectiveness in preparing educators for the complexities of AI integration in global classrooms. This review will further explore the methodological challenges and opportunities in assessing critical thinking development concerning AI, thereby informing the empirical validation of the refined RAPID framework. It will also scrutinize current practices in teacher training programmes that address technological shifts, highlighting gaps that the adapted RAPID model aims to equip educators with the skills to foster critical AI literacy among their students, highlighting areas where the proposed RAPID model can offer significant enhancements. This analysis will additionally consider pedagogical approaches that foster metacognitive awareness regarding AI's influence on learning and decision-making, thereby preparing teacher-trainees to guide their future students in discerning AI-generated content and critically evaluating its implications. The synthesis of these insights will culminate in a comprehensive rationale for developing a specialized RAPID model that shall directly address the specific needs of IBEC teacher-trainees in an AI-driven educational context. The review will specifically focus upon the existing competency frameworks for educators concerning AI, identifying key knowledge, skills, and dispositions necessary for navigating the complexities of AI driven educational settings (Mikeladze et al., 2024). Despite increasing research in enhancing AI competencies, a significant void exists in well-defined frameworks that equip educators with the necessary skills to effectively leverage AI for their learners' benefit (Mikeladze et al., 2024). This gap underscores the necessity for comprehensive frameworks, like the proposed RAPID model, which systematically integrate responsible, ethical, and efficient AI implementation within specific learning contexts, addressing content, teaching practices, and technology integration challenges (Ren & Wu, 2025). This has necessitated for creating a process that creates deep understanding of AI's capabilities, and its avoidance of its proliferative usage by applying with the practical skills. The proposed RAPID framework will enable the student-teachers to critically evaluate and effectively utilize AI tools in teaching-learning practices. A comprehensive exploration of AI competent frameworks showcase a lack of defined structures for teachers, highlighting the need for robust models that integrate ethical considerations and practical applications (Mikeladze et al., 2024). As rightly stated by Salhab (2024), "The nascent state of AI literacy exploration further compounds this issue, demonstrating a scarcity of literature on integrating AI literacy into curriculum development and teacher training programs". According to Huynh et al., 2025, "To bridge this critical gap, there is an urgent need to develop pedagogical approaches that not only enhance teachers' understanding of AI technologies but also instill a human-centered mindset and ethical awareness in their application". These ideas are further reiterated by UNESCO that advocates for governmental agencies to build capacity for the using critical judgment while taking AI content.

Despite the recognized importance of AI literacy and competency, current frameworks often interchange these terms, leading to ambiguity and hindering the development of precise educational objectives for student-teachers and, by extension, their educators (Chiu et al., 2024). The RAPID model, with its emphasis on critical inquiry and iterative refinement, offering a robust framework for clarifying these concepts and establishing clear learning objectives for both AI literacy and competency among IBEC teacher-trainees (Gu & Ericson, 2025). This framework will also enable them to critically evaluate AI tools, understand their ethical implications, and develop effective pedagogical strategies for integrating AI into their future classrooms, thus addressing the current deficit in AI-specific teacher preparation (Pietsch & Mah, 2024) (Mikeladze et al., 2024). Research, Analyze, Plan, Implement, and Develop—provides a structured approach to cultivating critical thinking skills in the context of AI integration for IBEC teacher-trainees. This structured approach will ensure a comprehensive and iterative process for developing AI literacy and competency, moving beyond mere technical understanding to encompass ethical considerations and pedagogical application and will also ascertain that teacher-trainees not only grasp the theoretical underpinnings of AI but also acquire the practical skills necessary to integrate it responsibly into their future teaching practices. To achieve the above result, mixed-methods approach will be employed, combining quantitative measures of AI literacy and critical thinking with qualitative data from focus groups and classroom observations to provide a holistic understanding of the RAPID model's impact on the teacher- trainees' pedagogical practice. Quantitative data will be collected through pre- and post-intervention surveys utilizing validated scales for AI literacy and critical thinking, while qualitative data will capture nuanced perceptions and practical applications through semi-structured interviews and thematic analysis of trainee reflections.

Methodology

The RAPID framework, comprising five distinct but interconnected components—Research, Analyze, Plan, Implement, and Develop—provides a structured approach to cultivating critical thinking skills in the context of AI integration for IBEC teacher-trainees.

This structured approach ensures a comprehensive and iterative process for developing AI literacy and competency, moving beyond mere technical understanding to encompass ethical considerations and pedagogical application (Daher, 2025). This systematic progression ensures that teacher-trainees not only grasp the theoretical underpinnings of AI but also acquire the practical skills necessary to integrate it responsibly and effectively into their future teaching practices (Daher, 2025).

To achieve this, a mixed-methods approach will be employed, combining quantitative measures of AI literacy and critical thinking with qualitative data from focus groups and classroom observations to provide a holistic understanding of the RAPID model's impact (Costello et al., 2024) (Mouta et al., 2024). This design will allow for a comprehensive assessment of how the RAPID framework influences pre-service teachers' self-efficacy regarding AI integration and their overall AI literacy (Costello et al., 2024). Specifically, quantitative data will be collected through pre- and post-intervention surveys utilizing validated scales for AI literacy and critical thinking, while qualitative data will capture nuanced perceptions and practical applications through semi-structured interviews and thematic analysis of trainee reflections.

Implications of the studz

The current study aims to:

- Analyze of how the RAPID framework contributes to a more nuanced understanding of AI literacy versus competency, particularly within an IBEC context.
- Outline the practical recommendations for integrating this refined model into broader teacher professional development programs, emphasizing its role in creating responsible and ethical educators for the evolving digital landscape.
- Provide actionable insights for policymakers and curriculum developers seeking to implement effective AI education strategies at a systemic level.
- Equip future educators with the adaptive skills required to navigate the complexities of AI technologies in the classroom effectively and ethically

Research Timeline

Stage	Month	Key Activities	Details & Rationale	Relevant Sources
Phase 1	December 1. Initial Research Planning & Ethics Approval (Dec 1-10) 	Finalize research questions, identify potential resources, and prepare the ethical review board application.	This phase includes securing necessary permissions for student participation and data collection, ensuring all ethical guidelines are met. This will inform the development of the framework and methodology.	Smith et al., 2024, Costello et al., 2024, Hsu, 2023
Phase 2	Participant Recruitment & Baseline Questionnaires (December 11-31)	Identify 200 IBEC Trainees from diverse educational backgrounds and administer the baseline survey	Gather demographic data and initial perceptions of AI, and pre-tests to assess critical thinking proficiency, metacognitive awareness, cognitive abilities, critical thinking dispositions, and design thinking mindsets	Rashid, 2024, Pereles et al., 2024, Xu, 2024, Patel et al., 2024, Smith et al., 2024, Hsu, 2023
Phase 3	3. January Intervention Phase - Initial Modules (Jan 1-31)	Begin the core intervention. The selected learners will engage with the initial learning modules specifically designed around the RAPID framework,	Teacher surveys on self-efficacy and AI literacy can be initiated.	Costello et al., 2024

		integrating AI tools as a component for analysis		
Phase 4	4. February Intervention Phase - Advanced Modules & Mid-Course Data Collection (Feb 1-28)	Continue with advanced RAPID framework learning modules for the experimental group.	During this phase, qualitative data collection will be done with respect to initial content analysis of student work (e.g., argumentative essays, problem-solving tasks) to start tracing the evolution of cognitive strategies. This helps monitor progress and make any necessary adjustments.	Muñoz et al., 2025
Phase 5	March 5. Intervention Conclusion & Post-Assessments (Mar 1-15)	Administer post-intervention assessments, which include validated critical thinking tests, metacognitive awareness surveys, and post-tests for cognitive abilities, critical thinking dispositions, and design thinking mindsets. Self-surveys on metacognitive strategies and ethical understanding related to AI problem-solving will also be conducted. Conduct semi-structured interviews and focus groups with students to explore their perceptions, attitudes, and experiences with	Continue content analysis of student work. Begin data cleaning and preliminary quantitative and qualitative analysis to identify initial trends and insights.	Pereles et al., 2024, Xu, 2024, Patel et al., 2024, Kong et al., 2024

		the RAPID framework and their interactions with AI as a learning tool.		
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