Luis Fernando González-Beltrán
(Organizador)

Educação no Século XXI:

Perspectivas Contemporâneas sobre Ensino-Aprendizagem

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PRÓLOGO

El presente volumen de **Educação no século XXI: Perspectivas Contemporâneas sobre Ensino-Aprendizagem** reúne un conjunto de investigaciones que dialogan con uno de los grandes desafíos de nuestro tiempo: repensar los procesos de enseñanza y aprendizaje en un contexto marcado por la transformación tecnológica, la diversidad de trayectorias educativas y la necesidad de innovar en las prácticas pedagógicas.

A través de los trabajos aquí compilados, se pone de manifiesto que la educación superior y los espacios formativos contemporáneos no pueden comprenderse desde enfoques estáticos, sino como escenarios dinámicos en los que convergen metodologías, tecnologías y experiencias que redefinen constantemente el acto educativo.

En este sentido, el volumen se organiza en tres ejes complementarios. El primero aborda el papel de la innovación pedagógica y de las tecnologías educativas en la enseñanza superior, destacando tanto el uso de plataformas digitales (principalmente Moodle) como el desarrollo de estrategias que promueven una participación más activa del estudiantado y una evaluación más significativa de los aprendizajes, incluyendo el formato invertido, la evaluación, y las aplicaciones didácticas.

El segundo eje se centra en las prácticas docentes y en los procesos de aprendizaje, poniendo en relieve la importancia de la didáctica como espacio de construcción, experimentación y mejora continua. Los estudios incluidos evidencian la diversidad de estrategias que pueden implementarse en distintos contextos educativos, así como los retos que enfrentan docentes y estudiantes en su interacción cotidiana y su futuro trabajo profesional.

Finalmente, el tercer eje se orienta hacia la formación docente, la identidad profesional y el desarrollo de competencias, subrayando que la enseñanza no es únicamente una práctica técnica, que debe transferirse a diferentes contextos, sino también una experiencia profundamente humana, atravesada por dimensiones emocionales, reflexivas y éticas, donde los docentes requieren construir una confianza en sus habilidades, que represente su autoeficacia.

En conjunto, este volumen ofrece una mirada amplia y actual sobre la educación, invitando a pensar la enseñanza no solo como transmisión de conocimientos, sino como un proceso complejo, situado y en constante transformación. Se trata, por tanto, de una contribución que busca fortalecer el diálogo entre teoría y práctica, y aportar nuevas perspectivas para la construcción de entornos educativos más pertinentes, inclusivos e innovadores.

Dr. Luis Fernando González Beltrán
Universidad Nacional Autónoma de México (UNAM)

SUMÁRIO

INNOVACIÓN EDUCATIVA EN LA EDUCACIÓN SUPERIOR

CAPÍTULO 15

SCENARIOS TO FOSTER CRITICAL THINKING IN PRE- AND IN-SERVICE TEACHER EDUCATION: INSIGHTS FROM AN INTERNATIONAL COLLABORATION

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ABSTRACT: Critical thinking is a key competency in modern education, essential for teachers in rapidly changing knowledge societies. Teacher education programmes must equip educators not only with pedagogical knowledge but also with reflective, problem-solving, and evidence-based decision-making skills. Despite its recognised importance, integrating and assessing critical thinking remains challenging. This study examines scenario-based learning as a strategy for developing and assessing critical thinking in pre-service and in-service teachers within an international collaborative initiative. Using a qualitative exploratory design, participants engaged with realistic classroom scenarios through written responses, discussions, and reflection. Results show that scenario-based learning promotes deeper engagement, reflective practice, and assessment of higher-order thinking. The study underscores the value of scenario-based approaches for linking theory and practice and offers implications for curriculum design, professional development, and assessment in teacher education.
KEYWORDS: critical thinking; teacher education; scenario-based learning; assessment; professional development.

1. INTRODUCTION

Critical thinking is widely recognised as a fundamental aim of education and an essential skill for navigating the complexities of modern societies. It enables individuals to analyse information, evaluate evidence, question assumptions, and make reasoned decisions in academic, professional, and civic contexts. In teacher education, developing critical thinking is especially vital, as teachers

need these skills for their own practice and also play a crucial role in fostering them among learners. Despite this recognised importance, a growing body of research indicates that many university graduates struggle to demonstrate adequate levels of critical thinking (Ramma et al., 2021; Koklukaya & Demirhan, 2014). This persistent gap raises important questions about whether higher education institutions are effectively promoting the analytical reasoning, reflective judgment, and problem-solving skills that students require.

The concept of critical thinking has sparked considerable academic debate. Some scholars argue that the term is often used rhetorically in educational policies and mission statements without being truly integrated into teaching methods (Vincent-Lancrin, 2023; Wagner, Baum, & Newbill, 2014). Nevertheless, critical thinking remains essential for addressing the complex challenges of modern life. One explanation for the gap between objectives and outcomes could be the dominance of content-focused teaching methods that emphasise knowledge transfer rather than the development of higher-order thinking skills (Snyder & Snyder, 2008). When curricula focus on what to think rather than how to think, students may graduate with solid technical knowledge but limited capacity for independent, critical analysis.

In recent years, scenario-based learning has become an effective pedagogical approach for promoting critical thinking across various professional fields. By immersing learners in realistic, complex situations that demand analysis, interpretation, and decision-making, scenarios offer opportunities to apply knowledge in contexts that mirror real-world professional practice. For teachers, engaging with such scenarios can enhance their capacity for reflective practice and for considering multiple solutions to pedagogical challenges. This paper shares initial findings from an international collaboration among teacher educators exploring the potential of scenario-based methods for identifying, developing, and assessing critical thinking among pre-service and in-service teachers, thereby supporting ongoing efforts to reinforce this vital competency within teacher training programmes.

2. REVIEW OF LITERATURE

Despite being recognised as a core educational outcome, many university graduates lack critical thinking skills, posing significant challenges for students, faculty, and institutions. Recent research by Burton, Faller, Haniki, and Ntshoe (2022, p. 24) raises concerns that “our students are not well-prepared,” questioning whether universities effectively support independent learning and problem-solving. It is possible for graduates to possess strong technical knowledge but still be deficient in critical thinking skills.

Critical thinking is a rational, reflective process aimed at determining what to believe or do (Ennis, 1987). It is purposeful and goal-directed (Davies, 2015), involving not only cognitive skills but also dispositions and attitudes. As such, it engages the cognitive, psychomotor, and affective domains. Decisions based on logic must be supported by sound arguments and justification.

Thinking is inherently context-specific. McPeck (2017, p. 4) asserts that "thinking is always thinking about X," and critical thinking must relate to a particular subject. Proficiency in one area does not guarantee it in another. One contributing factor is the instructional emphasis on content transmission rather than on how students process information (Snyder & Snyder, 2008). Clement (1979) advocates teaching students *how* to think, not *what* to think, and Snyder and Snyder (2008) emphasise that critical thinking is cultivated through the application of content via engaging instructional strategies. Motivation – both intrinsic and extrinsic – also plays a role. Byrne and Johnstone (1987) note that learners are more likely to develop critical thinking when coursework is aligned with real-world problems that require conceptual application.

Everyday problems require holistic thinking and the ability to connect ideas across different contexts. As Bloom (1956) and Wiggins and McTighe (1998) noted, moving beyond memorisation to higher-order thinking is crucial. Isolated learning can cause confusion, especially when overlapping concepts – such as the term "power" in English and science – are taught without proper integration. Chrzanowski et al. (2018) warn that such discrepancies can impede understanding. Similar issues are evident across various disciplines. Despite its significance, critical thinking is often not fully incorporated into teaching strategies at primary and secondary levels (Kurfiss, 1988), and assessing it remains an ongoing challenge (Burton et al., 2022).

Learning outcomes are typically divided into three domains: cognitive, psychomotor, and affective. The affective domain – covering values, attitudes, emotions, and behaviour – is often overlooked in both teaching (Tan, Heng, & Tan, 2013; Shephard, 2008) and assessment (Forrest & Blick, 2017). Noddings (1996) argues that this neglect diminishes student and teacher engagement, while Shephard (2008, p. 88) describes the affective domain as encompassing the ability to listen, respond, demonstrate appropriate values, and adjust judgments in light of new evidence. The connection between critical thinking and social skills is vital, as collaborative learning encourages creativity and emotional development. Esmaeili and Bagheri (2015) and Bareviciute, Dadelo, and Asakaviciute (2023) confirm that critical thinking supports emotional regulation, forming a foundation for creative expression.

Scenario-based learning provides a practical way to develop critical thinking by immersing learners in realistic situations that require analysis and decision-making (Volpe, 2025). These scenarios, often based on real-world contexts, imitate professional challenges. In teacher education, for example, scenarios might involve classroom dilemmas or ethical questions, enabling educators to consider multiple perspectives and reflect on possible responses (Klassen et al., 2021).

This approach aligns with constructivist learning theories, which emphasise the importance of meaningful context and active participation. By working through realistic problems, learners develop a deeper, more comprehensive understanding and transferable skills. Scenarios also encourage collaborative discussion and reflection, allowing participants to compare interpretations and assess courses of action. Wagner, Baum, and Newbill (2014) emphasise the value of collaborative, transdisciplinary environments for higher-order thinking. Scenario-based tasks promote such dialogue and debate. Additionally, they act as effective assessment tools, providing insights into learners' reasoning, problem-solving, and reflective skills.

3. METHODOLOGY

This study utilised an exploratory research design combining qualitative and quantitative methods. The exploratory approach was selected because the research aimed to examine an emerging pedagogical practice and generate insights that could guide future studies. The research was part of an international collaboration involving teacher educators from two countries interested in fostering critical thinking within teacher education programmes.

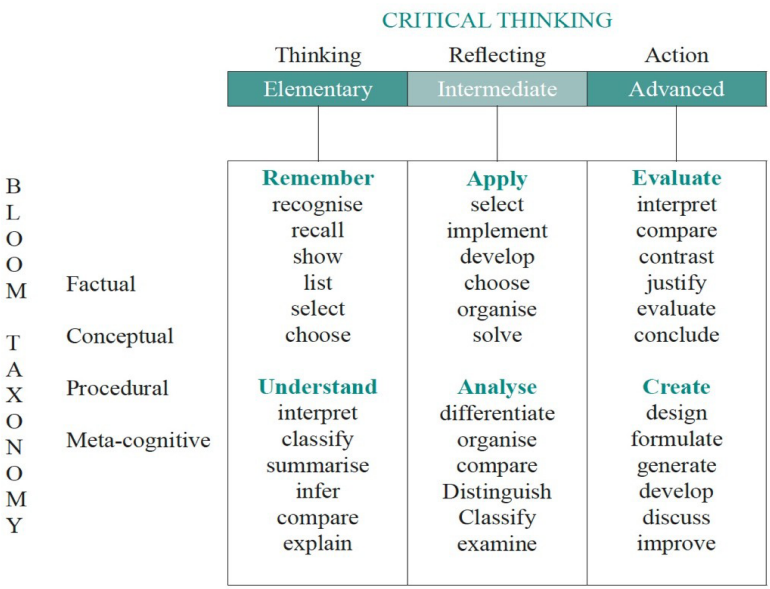
A framework, initially developed by Ramma and colleagues (2021; 2023) and further refined in their later work, has laid the groundwork for recognising and assessing participants' innate critical thinking abilities within their reasoning processes. This framework employs scenarios to illustrate the core of critical thinking. In these scenarios, real-world problems are presented, and participants are tasked with applying their conceptual knowledge to tackle them effectively. The evaluation of critical thinking is guided by a set of criteria closely aligned with factual, conceptual, and procedural knowledge (Table 1), as well as the ability to draw meaningful conclusions (Braithwaite & Sprague, 2021; Antharjanam, 2021).

Table 1: Knowledge Category and Key Criteria.

Knowledge Category	Key Criteria
Factual Knowledge The basic elements that must be known about a discipline. It includes isolated pieces of information.	Based on verifiable information and empirical evidence. Can be easily checked for accuracy and correctness. Generally accepted as true within a specific domain or discipline.
Conceptual Knowledge The interrelationship among the basic elements within a broader context that enables them to function harmoniously as a whole.	Understanding of abstract concepts, principles and theories. Comprehending underlying frameworks and structures. Recognising and identifying patterns and generalisations.
Procedural Knowledge (Logical and Analytical) The ability to perform tasks using skills, algorithm, techniques and methods.	Knowing how to perform specific tasks, actions or procedures. Following established rules or algorithms. Identifying cause-effect relationships and drawing logical inferences. Applying critical thinking and problem-solving strategies.
Metacognitive Knowledge Knowledge of cognition as well as awareness of one's own cognition.	Awareness and understanding of one's own thought processes and biases. Ability to monitor and regulate cognitive processes. Being conscious of one's own learning strategies and approaches.
Drawing Conclusions	Synthesising information from various sources and perspectives. Evaluating the credibility and reliability of sources. Applying logical reasoning and critical thinking. Considering potential implications and consequences.

To systematically identify the components of critical thinking in participants' cognitive processes, this study employs the revised Bloom's Taxonomy (Krathwohl, 2002) alongside the frameworks outlined in Tables 1 and 2.

Table 2: EIA-CT Framework for Assessing Critical Thinking.



For example, the scenario shown below includes three elements: Thinking, Reflecting, and Action (adapted from Barnett, 1997). To identify critical thinking, these elements are organised into basic, intermediate, and advanced stages, creating a detailed, connected framework.

> At night, you wake up suddenly, feeling thirsty. However, you realise that there is no power, and you are surrounded by total darkness. You cannot locate your mobile phone to use its flashlight, and regrettably, there is no other source of light in the room. You decide to tread carefully to the kitchen in search of a matchbox, hoping to find some light that will let you pour water into a cup for drinking. While entering the kitchen in the dark, you unexpectedly slip and fall onto the floor. What crosses your mind at that particular moment while you lie on the floor? Enumerate all the thoughts that occur to you. For each of these thoughts, how do you endeavour to verify their validity, if at all? What actions do you envision taking to be better prepared for facing such a situation in the future?

Participants were pre-service and in-service teachers enrolled in *Post Graduate Certificate in Education* and *Bachelor's in Education* programmes in Mauritius and India. They completed a pre-test and post-test as part of the study. To maintain anonymity, the two countries are referred to as Country X (n = 75) and Country Y (n = 55). The post-tests followed three-day workshops on critical thinking and its assessment held in both locations. Ethical approval was obtained prior to data collection, and participants were informed that they could withdraw at any time without academic penalty.

Initially, we set up a power outage scenario based on the model by Ramma et al. (2021), as highlighted in the previous paragraph. We then organised a workshop to promote detailed discussion of the framework and the critical-thinking elements we aimed to explore. To gather data, we employed Microsoft Forms for both pre- and post-tests. For analysis, we utilised Microsoft Excel. The primary author assessed participants' feedback by identifying key aspects of critical thinking, as shown in Table 1 and elaborated in Table 3. These scores were then carefully reviewed and adjusted. The other co-authors contributed to validating the final scores. Table 4 presents a sample participant response along with its corresponding score.

Table 3: Key Elements for Assessing Critical Thinking.

Process of Criticality	Critical Thinking Stage	Description & Rubrics [an insight]	Assessment Rubrics [some examples]	Marks
Thinking	**Elementary** [What is the issue/dilemma?]	Am I hurt? How do I confirm that I am not hurt?	• Yes I'm hurt • No I'm not hurt; If so, I call for help etc.	0 – not present ½ – partially present 1 – adequately present
Reflecting (During the reflection phase, ideas from thinking phase may be reviewed.)	**Elementary** [What course of action to follow?] **Intermediate** [How to confirm the premises? What to conclude?]	What do I do after confirming that I got/did not get hurt? What is the cause of this mishap? How do I confirm any premises?	• To confirm by using the sense of sight/touch and to proceed depending on the outcomes. • I have fallen most probably because of water spillage; worn out slippers; I've not worn out slippers at all and the floor was slippery. The sense of touch may be helpful. • If not injured, to look for a source of light or to seek help?	
Action (During the action phase, ideas from reflection phase may be reconsidered)	**Intermediate Advanced** [If the issue is within my reach, how to proceed to solve it? If not, what alternatives exist?]	What can I do to avoid such a situation in the future? What other alternative(s) exist to minimise such incidence? Where do I get help if necessary?	• To ensure that the floor is clean and dry before going to sleep. • When waking up, to use a source of light. • To walk carefully.	

Table 4: Response and Subsequent Marking.

Stages of Critical Thinking	Thinking	Reflecting	Action
i) *I wonder if I have been injured and how did I slip as I was walking carefully.* *ii) I tried to get up and check if there is any part of my body that has been hurt then I noticed it was a leaking roof that led to a slippery floor.* *iii)To always keep my phone near my bed so as to have the flashlight and also, I can bring a bottle of water in my bedroom so that whenever I'm thirsty it will not be necessary to go to the kitchen.*	1	1	0.5

4. DATA ANALYSIS & DISCUSSIONS

This section presents the results of the Friedman tests comparing three critical thinking categories – "Thinking," "Reflection," and "Action" – between Country X and

Country Y. We analysed data collected before and after the intervention. Initially, 75 participants from Country X and 55 from Country Y completed the pre-test. However, only those who attended the workshop took part in the post-test, resulting in smaller sample sizes: 27 from Country X and 30 from Country Y. We used the Friedman test to identify significant differences among the three dependent categories within each country. The test examined whether to reject the null hypothesis (H_0), which assumed no significant differences between "Thinking," "Reflection," and "Action" scores.

4.1. PRE-TEST RESULTS

The pre-test results reveal statistically significant differences among the three critical thinking categories – "Thinking," "Reflection," and "Action" – within both Country X and Country Y. As shown in Table 5, the Friedman tests produced low p-values for both countries ($p < 0.0025$ for Country X; $p < 0.0001$ for Country Y), leading us to reject the null hypothesis. This confirms that in each country, at least one of the three categories differs significantly from the others.

Table 5: Friedman tests pre-test results.

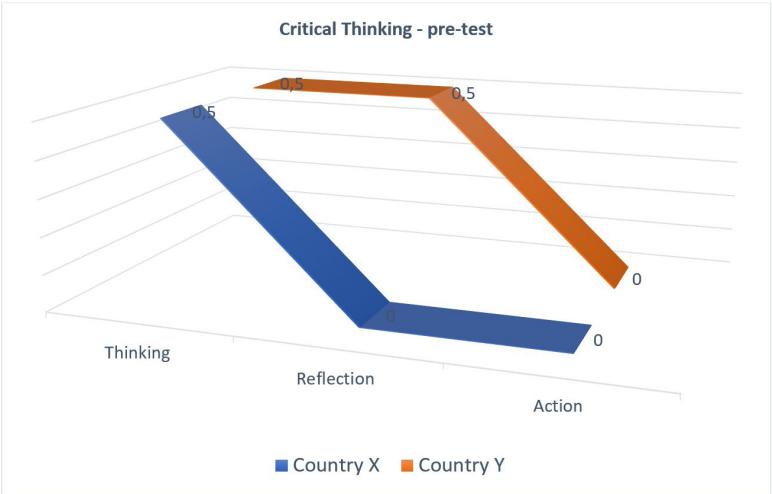
Country	$\chi^2_{(2)}$	p value	Conclusion
X (n=75)	11.95	0.0025	Reject H_0
Y (n=55)	29.85	0.0001	Reject H_0

To understand the nature of these differences, we examined the median scores for each category (see Figure 1). The results show distinct patterns of critical thinking across countries before the intervention. In **Country X**, the pre-test data show a median score of **0.5** for the «Thinking» category. This suggests a balanced level of cognitive engagement among participants in this area. However, the median scores for both «Reflection» and «Action» are **0**. This indicates that at least half of the participants in Country X showed minimal evidence of reflective or action-oriented critical thinking during the pre-test. In **Country Y**, the pattern is different. Similar to Country X, the median score for "Thinking" is **0.5**, indicating well-rounded participation in this cognitive domain. The median for "Reflection" is also **0.5**, suggesting that half of the participants demonstrated a propensity for reflective thinking. However, the median score for "Action" is **0**, indicating that at least half of the participants showed limited engagement with the action-oriented dimension of critical thinking.

These pre-test results establish a baseline, revealing that while participants in both countries engage with the cognitive aspects of critical thinking, their engagement

with reflection and action varies, with action-oriented thinking being the least developed across both groups.

Figure 1: Pre-test median scores comparison.



4.2. POST-TEST RESULTS

The post-test phase re-evaluated the three critical thinking categories to determine any changes following the intervention (see Table 6). For both Country X and Country Y, the p-values from the Friedman tests exceeded the significance level of 0.05. Consequently, we accept the null hypothesis (H_0), indicating no statistically significant differences among the "Thinking," "Reflection," and "Action" categories after the intervention.

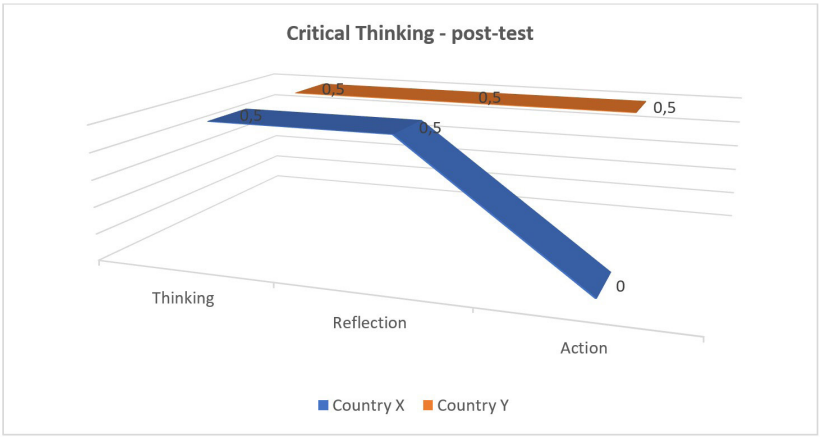
Table 6: Friedman tests post-test results.

Country	$\chi^2_{(2)}$	p value	Conclusion
X (n=27)	3.722	0.9272	Do not reject H_0
Y (n=30)	0.15	0.1555	Do not reject H_0

Although the Friedman tests indicate no overall significant difference among the three categories, analysing the median scores reveals meaningful patterns of change (see Figure 2). For Country X, the median score for "Action" remained at 0, suggesting that even after the intervention, at least half of the participants continued to display minimal engagement in action-oriented critical thinking. In Country Y, the post-test results show both consistency and development. The median scores for "Thinking" and "Reflection" remained steady at 0.5, aligning with the pre-test results and implying sustained engagement in these areas. Notably, the median score for "Action" increased from **0** in the pre-test to 0.5 in the post-test, indicating that a subset

of participants in Country Y became more inclined towards action-oriented critical thinking following the intervention.

Figure 2: Post-test median scores comparison.



5. CONCLUSION

This study offers a deeper insight into critical thinking in educational settings by analysing pre-test and post-test data from two different countries, Country X and Country Y. The findings reveal significant differences in trainees' critical thinking profiles within and across these contexts, highlighting how cognitive tendencies differ across cultures. The results point to a considerable gap in critical thinking skills among participants in both countries. This supports extensive research (e.g., Kurfiss, 1988; Ramma et al., 2021) that stresses the importance of developing these skills through supportive learning environments. Such environments should promote intellectual growth while reducing unnecessary constraints that can impede development.

A key insight from this study is the measurable impact of targeted interventions. The post-test shifts, particularly the increased engagement in action-oriented thinking among Country Y participants, demonstrate that well-designed programmes can influence critical thinking profiles. Notably, the findings highlight the role of metacognitive skills – thinking about one's own thinking – in facilitating these changes. Educators and institutions should, therefore, prioritise cultivating metacognitive abilities as a core component of instruction. These implications call for a comprehensive re-evaluation of pedagogical practices. Teaching must move beyond merely transmitting factual knowledge to actively fostering critical thinking and metacognitive awareness. Curricula and methodologies should evolve to encompass the full range of critical thinking across cognitive domains, including reflection and action.

By fostering a culture of active reflection, open-mindedness, and adaptive problem-solving, educational systems can prepare learners to navigate a complex world. Critical thinking is not merely an academic exercise; it is a lifelong skill that empowers individuals to make informed decisions, engage in constructive dialogue, and contribute meaningfully to society. As both educators and learners recognise its importance, critical thinking becomes an essential foundation for holistic education and personal development.

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