Lived experiences of metacognitive awareness emerging among teachers in training*

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Abstract

This study examines the transformative experiences of pre-service teachers as they develop metacognitive awareness during their pedagogical practices. Grounded in Husserlian transcendental phenomenology and analyzed using Colaizzi's method, the research explores how these future educators become aware of their own cognitive and reflective processes in authentic classroom settings. Data were collected through in-depth interviews and reflective journals from 12 participants at a Colombian university. The analysis reveals a progression characterized by an initial disruption in routine teaching practices, followed by the emergence of metacognitive awareness, sustained reflection, and the subsequent adaptive management of classroom challenges. These findings indicate that specific moments of self-reflection contribute to the development of a resilient and reflective teaching identity, which, in turn, supports the continuous refinement of pedagogical strategies. The study reveals the necessity for teacher education programs to incorporate structured reflective practices, thereby better preparing pre-service teachers to address

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Investigación

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the complexities of modern, technology-rich educational environments.

Keywords
metacognitive awareness, transcendental phenomenology, teacher identity, pedagogical practice, pre-service teachers

Investigación

Experiencias vividas de la conciencia metacognitiva que emerge entre docentes en formación

Resumen
Este estudio examina las experiencias transformadoras de futuros docentes a medida que desarrollan conciencia metacognitiva durante sus prácticas pedagógicas. Basada en la fenomenología trascendental husserliana y analizada mediante el método de Colaizzi, la investigación explora cómo estos futuros educadores toman conciencia de sus propios procesos cognitivos y reflexivos en entornos de clase reales. Los datos se recopilaron a partir de entrevistas en profundidad y diarios reflexivos proporcionados por 12 participantes de una universidad colombiana. El análisis revela una progresión caracterizada por una disrupción inicial en las prácticas docentes habituales, seguida de un despertar a la conciencia metacognitiva, una indagación reflexiva sostenida y la posterior gestión adaptativa de los desafíos del aula. Estos hallazgos indican que momentos específicos de autorreflexión contribuyen al desarrollo de una identidad docente resiliente y reflexiva, lo que, a su vez, apoya el perfeccionamiento continuo de las estrategias pedagógicas. El estudio revela la necesidad de que los programas de formación docente incorporen prácticas reflexivas estructuradas, preparando así mejor a los futuros docentes para abordar las complejidades de los entornos educativos modernos y tecnológicamente complejos.

Palabras clave
conciencia metacognitiva, fenomenología trascendental, identidad docente, práctica pedagógica, docentes en formación

Experiências vividas de consciência metacognitiva emergentes entre professores em formação

Resumo
Este estudo examina as experiências transformadoras dos futuros professores que desenvolvem a consciência metacognitiva ao longo de suas práticas pedagógicas. Baseada na fenomenologia transcendental husserliana e analisada por meio do método de Colaizzi, a investigação explora como estes futuros educadores se tornam conscientes dos seus próprios processos cognitivos e reflexivos em ambientes de sala de aula autênticos. Os dados foram recolhidos através de entrevistas em profundidade e diários reflexivos fornecidos por 12 participantes de uma universidade colombiana. A análise revela uma progressão caracterizada por uma interrupção inicial nas práticas de ensino de rotina, seguida de um despertar para a consciência metacognitiva, investigação reflexiva sustentada e subsequente gestão adaptativa dos desafios da sala de aula. Estas descobertas indicam que momentos específicos de autorreflexão contribuem para o desenvolvimento de uma identidade de ensino resiliente e reflexiva, o que, por sua vez, apoia o refinamento contínuo das estratégias pedagógicas. O estudo revela a necessidade

de os programas de formação de professores incorporarem práticas reflexivas estruturadas, preparando melhor os futuros professores para lidar com as complexidades dos ambientes educativos modernos e ricos em tecnologia.

Palavras-chave

consciência metacognitiva, fenomenologia transcendental, identidade docente, prática pedagógica, futuros professores

Introduction

The preparation of future educators extends beyond the acquisition of instructional techniques; it encompasses the cultivation of reflective intentionality, metacognitive sensitivity, and the capacity to engage with the inherent complexity of pedagogical situations. In the specific context of technology and computer science education fields, characterized by rapid epistemological evolution and unpredictable classroom dynamics, pre-service teachers are frequently confronted with novel instructional challenges that demand situated judgment and adaptive reasoning.

Within the context of pedagogical practice, the capacity to become aware of one's own thinking, decision-making processes, and instructional actions—referred to in this study as *metacognitive awareness*—emerges as a phenomenon of particular relevance (Flavell, 1979). While much of the existing literature has framed metacognition as a cognitive strategy or skill to be developed and assessed (e.g., Veenman *et al*., 2006, Kramarski & Michalsky, 2010), the present study approaches it as a lived phenomenon. Specifically, metacognitive awareness is not conceptualized here as a discrete or measurable competence, but as an experiential structure that becomes manifest within the intentional arc of consciousness. In line with this perspective, the study adopts the framework of Husserlian transcendental phenomenology (Husserl, 1983; Zahavi, 2003), which seeks to describe how such phenomena are constituted in the first-person experience of the individual.

This phenomenological orientation directs attention to the intentional structures through which pre-service teachers become reflectively attuned to their own cognitive, affective, and pedagogical processes. Metacognitive awareness is thus approached not as a predefined category, but as a situated event—emerging in moments of dissonance, reflective reorientation, or experiential affirmation that arise within the concrete realities of pedagogical practice.

The conceptual sensibilities that inform this study include foundational perspectives on metacognition (Flavell, 1979), reflective practice (Schön, 1983), and professional identity (Beauchamp & Thomas, 2009). These are not employed as theoretical frameworks for deductive analysis, but as orienting horizons that assist in situating the research. In accordance with the methodological principles of transcendental phenomenology, the analysis is guided by the reduction of presuppositions (epoché) and the articulation of eidetic structures as they emerge through participants' first-person descriptions (Husserl, 1983; Zahavi, 2003).

Although the initial focus of the study was the phenomenon of metacognitive awareness, the process of phenomenological reduction revealed the presence of additional intentional structures that co-constitute the lived experience of becoming a teacher. These include affective awareness and the progressive constitution of professional identity through reflective experience. Importantly, these structures were not imposed a priori; they emerged through systematic analysis grounded in the participants' own accounts.

This research responds to the increasing pedagogical complexity of contemporary classrooms, shaped by accelerated technological change and diverse learner profiles (Darling-Hammond et al., 2020). Within this evolving context, the study seeks to describe how moments of metacognitive awareness are constituted in the lived experiences of pre-service teachers as they engage in classroom practice. Drawing on Colaizzi's (1978) method-adapted to align with the principles of Husserlian transcendental phenomenology, the analysis aims to articulate the essential structures of these experiences as they are given in consciousness.

Specifically, the study is guided by the following descriptive aims:

- To describe how pre-service teachers experience and articulate episodes of metacognitive awareness during their pedagogical engagement;
- To elucidate experiential moments in which reflective awareness emerges, shaping the intentional sense of self-as-teacher;
- To explore how such moments of awareness are lived in relation to affective, cognitive, and situational dimensions of teaching.

The findings contribute to current understandings of teacher formation by foregrounding the role of metacognitive awareness as a lived phenomenon in the development of pedagogical intentionality. Rather than presenting prescriptive models, the study articulates eidetic structures that characterize the experiential dynamics through which teacher identity is constituted, thereby underscoring the significance of phenomenologically grounded reflection in teacher education programs.

The central question that orients this research is: *What meanings do pre-service teachers attribute to the moments of metacognitive awareness during their pedagogical practices?*

Rather than seeking to evaluate learning outcomes or assess cognitive performance, this study aims to describe how the phenomenon of metacognitive awareness is constituted in consciousness—how it appears, is lived through, and becomes meaningful in the context of teaching. The findings presented herein offer a phenomenological account of these experiences, as articulated by the participants themselves.

Epistemological and philosophical foundations of the study

The study is grounded in three interrelated conceptual domains—metacognition (Flavell, 1979), reflective practice (Schön, 1983), and professional identity (Beauchamp & Thomas, 2009)—which serve as epistemological orientations for approaching the phenomenon under investigation. These constructs are not treated as fixed analytical categories but rather as orienting sensibilities that frame the intentional structures through which consciousness discloses the phenomenon of metacognitive awareness.

Within the philosophical tradition of Husserlian transcendental phenomenology, the principal aim is to return to the lived experience (*Erlebnis*) and to describe how consciousness intentionally constitutes meaning as it directs itself toward particular phenomena—such as becoming aware of one's own thinking while engaged in pedagogical activity. In accordance with this orientation, the study brackets theoretical assumptions through phenomenological reduction (*epoché*) and undertakes eidetic analysis to elucidate the essential structures of the phenomenon as it is experienced by pre-service teachers.

These eidetic structures are not derived through generalization or inference but emerge from participants' first-person descriptions. The methodological commitment to eidetic variation enables the identification of structural invariants within subjective experience, distinguishing essential structures from incidental ones, without imposing external conceptual frameworks.

Within this framework, metacognitive awareness is not conceptualized as a discrete cognitive skill or measurable trait. Rather, it is understood as a situated, temporally unfolding event in which the subject becomes reflectively aware of their own cognitive, affective, and pedagogical processes while teaching. Such episodes of metacognitive awareness often arise in moments of uncertainty, conflict, or affirmation, prompting the teacher to engage in retrospective reflection on the meaning and intentionality of their actions. These moments contribute to the ongoing constitution of professional identity, which is conceived here not as a stable characteristic but as a dynamic and reflexive process shaped through concrete pedagogical experience.

Reflective practice, likewise, is approached not as a technical procedure or evaluative technique but as a phenomenological mode of being. It is conceptualized as an intentional orientation toward experience—a way of revisiting and interrogating one's pedagogical decisions, considering broader educational purposes. While this view resonates with Schön's, (1) notions of "reflection-in-action" and "reflection-on-action," the emphasis here lies on how such reflection is subjectively experienced and meaningfully articulated, rather than how it is performed or operationalized.

These conceptual orientations are employed not as interpretative frameworks but as philosophical sensibilities that guide the researcher's attunement to participants' descriptions. The study thus adheres to the phenomenological imperative to describe, rather than explain, how the phenomenon of metacognitive awareness appears in the lived experience of pre-service teachers during their pedagogical practice.

Methodology

This study employed a transcendental phenomenological design to capture the authentic, lived experiences of pre-service teachers regarding their metacognitive awareness. This approach was chosen over other qualitative methods because it allows for an in-depth exploration of subjective experiences by intentionally bracketing preconceived notions, thereby focusing on the essence of participants' narratives (Husserl, 1983). This is particularly well-suited to exploring the complex and transformative dimensions of metacognitive awareness in teaching practice.

Participants

A purposive sampling strategy was used to select 12 pre-service technology and informatics teachers in their tenth semester at a Colombian university, of whom 5 were women and 7 were men. These participants were chosen based on their active engagement in pedagogical practices and their willingness to reflect on and articulate their experiences. Additional background information, including prior teaching experience and academic performance, was considered to ensure that participants could offer rich and diverse

accounts of their metacognitive processes. This careful selection confirms the alignment of the sample with the study's objectives and ensures the generation of contextually grounded, phenomenologically meaningful descriptions.

Data collection and interview alignment justification

Data were collected through a combination of in-depth, semi-structured interviews and reflective journals. The interviews were guided by Seidman's (2006) three-step structure—(1) establishing context, (2) reconstructing concrete experiences, and (3) reflecting on meaning—and were conducted across multiple sessions, each lasting approximately 60 to 90 minutes. This structure provided participants with sufficient time to articulate their experiences in depth. In parallel, participants maintained reflective journals throughout their pedagogical practice, documenting the evolution of their thoughts, emotions, and reflections over time. The iterative interplay between data collection and preliminary analysis enabled refinement of interview questions and allowed for deeper exploration of emergent experiential structures. Rapport-building strategies included initial informal meetings and ongoing communication, ensuring participants felt at ease and confident in sharing their lived experiences.

Methodological justification for alignment between the research question and the interview guide

In alignment with the central research question—What are the lived meanings that pre-service teachers attribute to moments of metacognitive awareness during their pedagogical practice?—The interview guide was structured according to the three phases proposed by Seidman (2013): (1) the context of professional life, (2) reconstruction of the lived experience, and (3) reflection on its meaning. This structure is summarized in Table 1. Structure of the Phenomenological Interview According to Seidman and Adapted to the Phenomenon of Metacognitive Awareness.

The development of interview questions was informed by the principles of transcendental phenomenology, aiming to access the eidetic structures of experience as lived by participants, free from prior conceptual imposition (Husserl, 1983; Moustakas, 1994). Accordingly, the questions avoided direct reference to technical constructs such as "metacognition" or "self-regulation," instead inviting participants to offer detailed, reflective descriptions of pedagogical moments in which such phenomena might emerge as personally meaningful.

For instance, the question:

> *" Can you describe a metacognitive awareness moment during your practicum when something didn't go as expected?"* (see Table 1, Phase Two) provides access to metacognitive awareness as a rupture in the intentional flow of teaching, making possible the emergence of reflexivity and self-awareness—an interpretation consistent with the eidetic structures discussed in the results.

Table 1. Structure of the phenomenological interview according to Seidman and adapted to the phenomenon of metacognitive awareness

Seidman's phase	Phenomenological questions	Phenomenological justification
1. Contextualization (construction of the past)	At what point did you begin to feel that you were becoming a teacher?	It enables exploration of how identity arises from initial teaching practice experiences.
	How would you describe your initial experience when facing a group of students?	It describes the initial metacognitive awareness and intentional opening toward the teaching role.
2. Lived Experience (detailed present experience)	Can you describe a metacognitive awareness moment during your practicum when something didn't go as expected?	It accesses disruptive events that trigger the reflective turn toward metacognitive awareness.
	Do you recall a situation that made you stop and think about your way of teaching?	It reveals breaks in pedagogical action that provoke spontaneous metacognitive reflection.
	What emotions do you remember experiencing during those metacognitive awareness moments?	It allows access to the affective dimension accompanying the emergence of metacognitive awareness.
	Can you describe a metacognitive awareness moment when you realized you had to change something about your way of teaching?	It accesses metacognitive awareness moments of conscious decision-making related to pedagogical regulation.
	How did you internally experience that metacognitive awareness moment of change?	It explores the subjective configuration of action and pedagogical self-awareness.
3. Retrospective Meaning-Making (reflection on meaning)	Looking back, how do you now experience that situation you lived during your teaching practicum?	It provides access to the processes of meaning-making and constitution of the "teacher self."
	What meanings emerge for you today from those lived metacognitive awareness moments?	It expresses the reflective intentionality that structures experience in retrospect.

Thus, the interview guide was not conceived as a tool for hypothesis testing but as a phenomenological instrument for eliciting rich, first-person descriptions of significant experiences. This design ensures strong methodological coherence with the research question and with the philosophical commitments of the study.

Data analysis

The collected data were analyzed using Colaizzi's (1978) rigorous seven-step method. This process involved extracting significant statements, formulating meanings, clustering themes, and developing a comprehensive description of the phenomenon. An audit trail was maintained throughout the analysis to ensure transparency, and multiple data sources (interviews and reflective journals) were triangulated to enhance credibility. In addition to member-checking—where participants reviewed and validated the final themes—peer debriefing sessions were conducted to further bolster the trustworthiness of the findings.

Although Colaizzi's (1978) method was selected for its structured approach to data analysis, the broader philosophical orientation of this study is consonant with Moustakas's (1994) transcendental phenomenology. In Moustakas' (1994) formulation, epoché and intentional reflection are integral to the constitution of meaning, a view that corresponds with the methodological stance adopted in this study.

Ethical considerations

Ethical approval was obtained from the relevant institutional review board, and all participants provided informed consent before data collection. Confidentiality was rigorously maintained by anonymizing all data, and participants were assured of their right to withdraw from the study at any time without penalty. These ethical measures were integral to protecting participants' rights and ensuring the integrity of the research process.

Integration of data collection and analysis

The research design was iterative in nature; preliminary analysis of early interviews and reflective journals informed subsequent data collection. This integration allowed the research team to refine the interview protocol and focus on emerging themes, thereby deepening the exploration of the phenomenon. A continuous cycle of data collection and analysis ensured that the ongoing narrative of metacognitive awareness was comprehensively captured and contextualized.

Findings

This section presents the eidetic structures that emerged through the application of transcendental phenomenological analysis, specifically following Colaizzi's (1978) method adapted to a Husserlian framework. The findings are not derived from or categorized according to prior theoretical constructs but rather grounded in the first-person descriptions offered by participants. Through phenomenological reduction and imaginative variation, essential meanings were identified that reveal how moments of metacognitive awareness were experienced and constituted upon during pedagogical practice. These themes represent invariant structures of the lived experience and reflect the intentional constitution of meaning as described by the participants themselves.

Theme 1. Genesis of professional self-understanding through metacognitive awareness

This theme describes the initial moments in which participants experienced a shift in their intentional relation toward their own teaching activity. These moments were marked by disruptions or unexpected events that redirected their attention inward, making their own pedagogical thinking and reactions present to metacognitive consciousness. Through phenomenological reduction, these descriptions reveal the emergence of metacognitive awareness as a lived event—not premeditated nor structured but arising from within the stream of experience. In this sense, what appears is not a reflection about the self as teacher,

but a consciousness directed toward the meaning of one's own thinking while teaching. The phenomenon of metacognitive awareness thus begins to show itself in its pre-reflective and reflective modalities, prior to any interpretation or identification with a stable identity. In this sense, a gradual self-realization emerges among pre-service teachers. In the words of Participant 1: *"My training as a teacher... I knew it was mainly to be a teacher because since I was in school, I was always interested in teaching."* This early awareness signals the initial spark of a vocation that has been present from the beginning, marking the start of a transformative journey from a personal identity to a professional one.

As these future educators progressed through their academic programs, their understanding of teaching deepened through the merging of theory with practice. Participant 1 remarked, *"As we progressed in the bachelor's program in informatics, I began to realize that there was a branch directly related to pedagogical practice."* They further explained, *"That's why when we begin our practical training in the educational institution, we already have some knowledge of what we are going to face."* These statements illustrate how integrating theoretical learning with hands-on experience promotes the development of their emerging teacher identity.

The evolution of professional identity becomes even more pronounced when teachers encounter real classroom dynamics. Participant 3 expressed this turning point by stating:

> "When I reached the point where I said, 'this is mine, I like this, I truly enjoy it,' it was as if a weight was lifted off my shoulders; I truly discovered what my identity was in this life."

Complementing this, Participant 2 added, *"I feel that adapting is important since the world is constantly changing, and our profession as a technology teacher implies adapting to these new changes."* These reflections reveal the dynamic relationship between self-discovery and the need for ongoing adjustment when confronting practical challenges.

Finally, the transformative impact of pedagogical practice is evident in the continuous process of self-reflection and evaluation. Participant 1 captured this sentiment by stating, *"Pedagogical practice in institutions changed me completely... it has prepared me to know myself in a real context and has allowed me to understand myself as well, it has allowed me to evaluate myself, my processes, and to know that things won't always be the same."* Through these reflective moments, pre-service teachers consolidate their professional identity, realizing that the process of becoming a proficient educator is dynamic and requires continuous growth and self-improvement.

Theme 2: Disruption and the lived turn toward metacognitive awareness

This theme describes moments in which participants experienced a disruption in the natural attitude of teaching—a rupture in the pre-reflective flow of pedagogical engagement. These disruptions became phenomenologically salient as they redirected attention toward the act of thinking itself. From within these lived moments, participants described a shift in intentionality: their consciousness turned back upon their own acts of planning, evaluating, or acting. Through phenomenological reduction, these descriptions reveal the emergence of metacognitive awareness not as a function or strategy, but as an intentional relation in which thinking becomes an object of thought. This awareness is not always verbalized or fully formed; rather,

it appears as a tacit or intuitive orientation toward one's own cognitive experience as it unfolds in teaching contexts.

Increasing self-awareness emerges among pre-service teachers as they gain classroom experience. They continuously reflect on their teaching methods and seek ways to improve them. As Participant 1 stated, *"I said I feel calm because since I had already had the experience, I had already lived the experience once, I knew that I was prepared to live it again."* This statement reveals how prior teaching experiences contribute to increased confidence and readiness for addressing future challenges. This participant remarked that adaptability is important, acknowledging that although ideal resources may not always be available, flexibility remains a relevant factor: *"I am always focused on the fact that I have to do this, I have to present this. Well, there are no resources in the institution, I have to adapt to what is available."* This gradual transformation allows them to become more adaptable, modifying their strategies based on students' needs and the realities of the classroom environment.

As they progress in their training, pre-service teachers undergo a deeper transformation in how they perceive themselves and their role in education. Participant 7 described this shift, stating, *"That experience, I believe, had to happen no matter what in order for one to move forward... first, one has to create infinite strategies and take control of the learning process with the students."* This reflection shows that teaching practice requires strategic thinking and decision-making, resulting in active engagement in pedagogical development. In this context, Participant 8 emphasized the importance of metacognitive awareness: *"During this experience, we as teachers are required to develop this metacognitive awareness in order to achieve educational objectives."* This awareness enables them to assess their own thinking and learning processes, refining their ability to improve instructional methods.

Pre-service teachers recognize that metacognitive awareness develops over time through continuous reflection and self-evaluation. Participant 8 expressed the personal satisfaction gained through this process:

> "It is very satisfying because as I gain more experience with students, I strengthen my knowledge and skills, and that also contributes to strengthening and developing my metacognitive awareness."

Similarly, Participant 9 affirmed, *"I am learning more and more, acquiring more knowledge, and little by little, through all this experience, I am contributing to the development of my metacognitive awareness."* This continuous evolution leads them to view their professional identity as an ongoing transformation, influenced by each lived experience. Participant 8 further reflected, *"I believe that we are all subject to a constant evolution of this metacognitive awareness over time and according to the experiences we live."* These statements indicate the role of metacognition in supporting their professional growth and equipping them to manage the complexities of teaching.

The development of metacognitive maturity is highly valued among pre-service teachers, as it enables them to take greater control over their pedagogical process. Participant 7 reflected on this progression, stating, *"I believe that at this moment, I am more mature at a metacognitive level; I think I have more control and knowledge of what I think, what I do, and what I try to do."* This sense of control, however, is not about rigidly managing the classroom but about engaging in thoughtful reflection and adaptation. Participant 4 stated:

> "Something that helped me a lot in this process of maturity was looking back at myself as a student—how I viewed teachers at that time, what my perspective was then, and contrasting it with my perspective now as a teacher."

The transformation of pedagogical consciousness, therefore, involves continuous monitoring and evaluation, leading pre-service teachers to engage deeply with their own learning processes. Through reflection and self-assessment, they refine their strengths, address areas for improvement, and increase the impact of their teaching, thereby contributing to a more robust educational practice.

Theme 3: Re-encountering pedagogical experience and the intuitive structuring of consciousness

This theme describes how certain pedagogical moments, previously lived by participants, reappeared in consciousness not as memories to be evaluated, but as meaningful episodes that invited renewed attention. These returns to experience do not reflect deliberate reflection, but rather a redirection of intentionality in which prior acts of teaching become newly salient. What emerges is not a rational analysis or self-directed strategy, but the intuitive structuring of meaning across temporally dispersed events. The phenomenon thus appears in consciousness as a horizon of sense-making, anchored in the lived act of teaching, revealing essential structures of how awareness of thinking unfolds in pedagogical contexts.

The transformation of the teaching self in educational practice unfolds as a complex process for pre-service teachers, characterized by moments of dissonance between expectation and reality. For instance, Participant 6 described this initial shock by stating, *"At that moment, it felt like there was a clash between what I had already done, what I had planned, and what my mind had imagined."* Similarly, Participant 12 recalled, *"It was a very big shock because one thing is theory as we are told in university, and another is actually facing the classroom."* These reflections reveal that the encounter with real teaching scenarios often challenges the idealized notions formed during theoretical studies.

This clash, however, is not seen as an insurmountable obstacle but rather as the catalyst for meaningful change. Participant 4 remarked, *"Then that clash arises, and it is a clash in which we must also adapt and decide our metacognition,"* such challenges prompt reflective adaptation. In the words of Participant 5,

> "These are experiences from which you will generate learning; instead of avoiding them, I would say that you have to live them."

Participants 2 and 9 noted that as they gained more classroom experience, they not only acquired technical skills but also developed increasing confidence in their ability to adapt to unforeseen challenges.

As pre-service teachers immerse themselves in practice, they begin to integrate their theoretical knowledge with lived experiences, leading to a profound reconfiguration of their pedagogical approach. Participant 3 explained, *"As you progress, you learn, you gain experience, and you come to understand what works and what doesn't."* Participant 9 added:

> "Then I would tell myself... what do you have to prove here?... That's when you see that you must create new strategies; I saw everything as a challenge for me as a professional teacher."

Furthermore, Participant 2 observed that *"Adaptations had to be made to those lesson plans so that the needs and challenges of this new group could be addressed,"* indicating that these adjustments play a significant role in the formation of their teaching identity. The process of becoming a teacher is recognized as more than the acquisition of technical competencies; it also involves embracing the inherent insecurities and challenges of teaching. Participant 4 shared, *"I feel a satisfaction... that feeling is that every effort and every moment, whether good or bad, was worth it because not only do good experiences nourish us but bad experiences do as well."* This sentiment is echoed by Participant 11, who stated, "I feel that my training was quite privileged because of that direct contact with the educational environment," and by Participant 12, who mentioned, *"I also learned that both university teachers and school teachers were very specific in advising us on how to act in those situations and not get carried away."* Reflecting on his experience, Participant 12 further commented,

> "You can see the changes and the difference between the first time I faced a classroom and the last time when I was more aware of the importance of planning, monitoring, and evaluating in order to improve and reflect on the teaching-learning process."

adding that he still sees himself as being *"in the middle of the road... still with much to learn, more experience to gain, and new things to explore."*

Theme 4. The essence of self-awareness in teaching practice

These descriptions indicate that metacognitive awareness, in its temporal unfolding, discloses invariant structures of pedagogical experience that are progressively constituted within consciousness. Such structures, as they become thematically apprehended, contribute to the intentional configuration of teaching as a lived and reflective act. Pre-service teachers depict self-awareness as progressive process that accompanies their professional development. They note that as they encounter complex situations in their teaching practice, moments of introspection arise that help them better understand their strengths, limitations, and instructional strategies. In the words of Participant 1, *"That awareness allowed me, during my teaching practice, to evaluate my process as a teacher—the methods, the methodologies, the strategies I used in the classroom."* Similarly, Participant 2 stated, *"To be self-aware means recognizing that there are things to improve, while others are fine and can remain, though some could certainly be enhanced."* These reflections suggest that self-awareness is not static but continuously unfolds through ongoing professional and personal growth. The commitment to teaching effectiveness is a central aspect of their self-awareness. Many pre-service teachers express a constant concern about how their decisions and strategies impact student learning. Participant 8 shared that:

> "At first, it felt like a sense of worry. But after overcoming that challenge, it transformed into a feeling of satisfaction because I was able to handle a class without technology."

He further noted his biggest challenge, saying:

> "The toughest problem I faced was managing the group, as I worked with students who came with inappropriate behavior, and through my metacognitive awareness, I tried to propose strategies to improve the situation."

These observations indicate that overcoming classroom challenges contributes to enhanced resilience and a more robust engagement in reflective practice.

Looking back, many pre-service teachers recalled key moments of self-assessment marked by intense positive and negative emotions that facilitated their learning and informed future changes. Participants 1, 6, 8, and 11 noted this evaluative process, with one remarking, *"In that moment, once you have some classroom experience and face a new educational context, you end up evaluating your process."* Another participant described it as, *"I could define it as an awareness that has experienced many moments but has reached a point where good practice with good results is realized."* Additional reflections included, *"That concrete moment made me realize that the way I plan classes must include disruptive moments."* This ongoing cycle of reflection and evaluation constitutes an important element in the formation of their teaching identity.

Finally, as pre-service teachers gain more experience, they develop a growing sense of comfort and confidence in the educational environment. This comfort does not imply complacency but reflects increased trust in their pedagogical decisions and abilities. Participant 7 expressed this sentiment by saying, *"I feel calm knowing that what I experienced, lived, and developed propelled me and served me well."* Participant 5 agreed, adding, *"I would describe it in one word: calm, because in retrospect, all those experiences, even the challenging ones, are not bad at all—they are simply part of the learning process."* Moreover, Participant 7 also mentioned, *"Doing it differently gave me tranquility, made me happy, and helped me overcome my previous thoughts that strategies don't apply to everyone,"* underscoring how the acceptance and adaptation of their unique teaching style are integral to their professional self-awareness.

Understanding the fundamental structure of the phenomenon

The fundamental structure of the phenomenon reveals itself as a transformative awakening in which pre-service teachers become suddenly aware of their own cognitive and pedagogical processes. In these critical moments—often arising from disruptions in routine classroom practices—participants report a shift from passive teaching to active, reflective engagement with their roles. This awakening marks the beginning of a process in which the initial spark of metacognitive awareness stimulates deeper introspection and self-questioning, fundamentally altering their self-perception as emerging educators.

Building on this initial realization, reflection emerges as a central mechanism driving pedagogical growth. Through continuous self-assessment and deliberate contemplation of their teaching strategies, these future educators begin to reframe their instructional methods, aligning their practices with the evolving needs of their students. This reflective process is not merely a momentary pause for evaluation but becomes an ingrained habit, whereby each classroom experience feeds into a cycle of analysis, adaptation, and refinement. The ongoing commitment to reflective practice indicates the important role of metacognition in developing a resilient and responsive teaching identity.

In parallel, the experience of managing uncertainty within dynamic classroom environments further reveals the fundamental structure of the phenomenon. Faced with unpredictable student responses and the complexities of real-time decision-making, pre-service teachers utilize metacognitive strategies to evaluate and adjust their approaches on the fly. This ability to manage ambiguity not only enhances their problem-solving skills but also strengthens their emotional regulation and confidence. The relationship between uncertainty and reflective adjustment reveals an important aspect of the phenomenon: the dynamic integration of cognitive monitoring with adaptive action in response to shifting challenges.

Integrating these findings, the detailed description of the phenomenon converges into a coherent framework that characterizes the experiences of these pre-service. The fundamental structure is characterized by an emergent self-awareness that evolves through moments of disruption, continuous reflective practice, and adaptive responses to uncertainty. Together, these interconnected dimensions form the core of metacognitive awareness in pedagogical practice, revealing a transformative process that not only refines teaching strategies but also solidifies a professional identity rooted in resilience, self-reflection, and an ongoing commitment to excellence in education.

Discussions

The purpose of this study was to describe the lived meanings that pre-service teachers attribute to moments of metacognitive awareness during their pedagogical practice. Guided by the framework of Husserlian transcendental phenomenology, the discussion that follows does not aim to interpret participant experiences through theoretical constructs but rather to articulate the eidetic structures that emerged from the analysis of first-person descriptions. These structures reveal how metacognitive awareness is lived, constituted, and experienced in the process of becoming a teacher.

Brief structural recapitulation

This study aimed to describe the lived meanings that pre-service teachers attribute to moments of metacognitive awareness during their pedagogical practice. Four eidetic themes emerged through phenomenological analysis: (1) the emergence of professional identity amid reflective disruption, (2) the disruption that initiates metacognitive awareness, (3) the situated structuring of self-regulation through reflective engagement, and (4) the reconfiguration of teaching identity through adaptive meaning-making.

Dialogue with existing literature

These findings resonate with prior research on metacognition in teacher education, particularly those that recognize its role in adaptive teaching and reflective decision-making (e.g., Veenman *et al*; 2006; Kramarski & Michalsky, 2010). However, unlike studies that operationalize metacognitive awareness as a measurable skill or competency, this investigation reveals it as a situated, affectively charged, and experientially grounded phenomenon. Metacognitive awareness appears not as a deliberate strategy but as a rupture or turning point that compels the subject to interrogate the meaning of their actions.

Likewise, professional identity, often framed as a developmental construct (Beauchamp & Thomas, 2009), here emerges as a dynamic configuration shaped by pedagogical encounters and affective tensions. Reflective practice, rather than being treated as a procedural mechanism (Schön, 1983), is described as a mode of being—an intentional orientation toward pedagogical experience that enables the emergence of new meaning and professional reconfiguration.

Philosophical interpretation of the essences

From a Husserlian perspective, the findings reveal intentional structures of consciousness through which the subject becomes aware of itself in action. These structures reflect the redirection of intentionality toward the self, particularly in moments of dissonance or ambiguity. The use of **epoché** allowed for the suspension of presuppositions, enabling the emergence of previously unthematized experiences.

Metacognitive awareness is shown not as a purely cognitive process but as an embodied and emotional phenomenon that unfolds temporally within teaching. The participants' narratives reveal how consciousness constitutes a sense of self—"I as teacher"—through iterative acts of reflection, hesitation, and resolution. The process of **eidetic variation** helped identify the invariant features of these lived moments, anchoring them within the broader horizon of becoming a teacher.

Implications for teacher education

The findings suggest that metacognitive awareness, understood as a lived phenomenon, holds educational value beyond its instrumental role in improving performance or planning. It functions as a formative dimension of teaching identity, arising from pedagogical ambiguity, emotional engagement, and reflective struggle.

The results suggest that teacher education curricula should include structured opportunities for students to engage reflectively with their pedagogical experiences, supporting the development of professional judgment and self-awareness. This includes creating reflective spaces where future teachers can articulate and examine their experiences, engage with ambiguity, and narrate the constitution of their professional selves.

Methodological reflection

The transcendental phenomenological approach enabled access to the depth and complexity of experiences that are often overlooked in positivist or behaviorist research designs. The study employed phenomenological reduction and imaginative variation to remain faithful to the participants' first-person accounts while revealing essential structures of consciousness. The adaptation of Colaizzi's (1978) method within a Husserlian framework ensured systematic rigor without compromising the philosophical integrity of the phenomenological process. This methodological orientation affirms the value of transcendental phenomenology in educational research, particularly when the goal is to describe—not explain or measure—how consciousness lives through teaching and learning.

Limitations and future directions

While this study offers a rigorous phenomenological description of the lived experience of metacognitive awareness among pre-service technology and computer science teachers, certain limitations should be acknowledged. First, as is characteristic of transcendental phenomenology, the findings are not intended to be generalizable to broader populations. The focus is on revealing the essential structures of experience rather than producing empirical claims concerning prevalence or distribution. Accordingly, the results should be interpreted as contextually situated and eidetic in nature, rather than as statistical generalizations.

Second, the data collection was based exclusively on retrospective self-reports derived from in-depth interviews. While this method is consistent with the phenomenological emphasis on first-person meaning, it inherently depends on the participant's capacity for recall and articulation. As such, moments of tacit or pre-reflective awareness may not have been fully captured, and the linguistic mediation of experience remains an unavoidable constraint.

Third, the study was conducted within the particular context of a teacher education program in technology and computer science. Although this focus enhances contextual depth, it also narrows the scope of applicability to similar disciplinary settings. The interaction between disciplinary epistemologies and the constitution of metacognitive awareness merits further exploration across other domains.

Future research could build upon these findings by adopting longitudinal designs that trace the evolution of metacognitive awareness across different stages of teacher preparation and into professional practice. Additionally, studies that incorporate multimodal approaches—such as reflective journaling, classroom observation, or think-aloud protocols—may enrich the phenomenological understanding of how metacognitive awareness is lived in situ and in real time. Further investigations might also engage comparative phenomenological analysis between disciplines, cultural contexts, or pedagogical models, to examine how the intentional structures of awareness and professional identity vary across educational landscapes. Lastly, it would be valuable to explore the pedagogical implications of these findings more directly, particularly in terms of how teacher education curricula might be designed to cultivate reflective intentionality and support the emergence of lived metacognitive awareness as a constitutive dimension of professional formation.

Conclusion

This transcendental phenomenological study sought to describe the lived meanings that pre-service teachers in the field of technology and computer science attribute to moments of metacognitive awareness during their pedagogical practice. Through the rigorous application of Colaizzi's (1978) method, adapted to the principles of Husserlian phenomenology, eidetic structures were identified that describe how such awareness emerges, is lived through, and becomes constituted within the concrete context of pedagogical experience.

The findings indicate that metacognitive awareness does not manifest as a predefined skill, but rather as a situated event that interrupts the intentional flow of teaching activity, prompting a reflective reorientation of the subject toward their own cognitive, affective, and pedagogical processes. These disruptive experiences create conditions for the recognition of the self as a teaching agent, thereby contributing to the progressive configuration of professional identity.

Furthermore, the study revealed that metacognitive awareness emerges in close relation to reflective practice and nascent forms of situated self-regulation. These are not always expressed explicitly or rationally but also encompass affective elements, intuitive gestures, and decisions made amid uncertainty. In this way, metacognition, identity, and praxis do not constitute isolated domains but rather interwoven intentional structures within the lived experience of teaching.

From an educational perspective, these findings suggest the need to reconsider teacher education programs by incorporating spaces that enable phenomenological reflection, cultivate emotional awareness, and acknowledge lived experience as a legitimate source of pedagogical knowledge. Rather than promoting a technical-rational model of teaching, this proposal advocates for cultivating a reflective, ethical, and contextually sensitive disposition in response to the complexities of contemporary educational environments.

Finally, the study contributes to the field of teacher education by offering a phenomenological description of how metacognitive awareness is constituted in the lived experiences of future educators. In doing so, it proposes a deeper and more situated understanding of professional development—one grounded in lived experience, intentionality, and the emergence of meaning in the act of teaching itself.

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