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EL EFECTO DE LAS RUTINAS DE PENSAMIENTO CENTRALES COMO POTENCIADORAS DEL PENSAMIENTO CRÍTICO EN EL DESARROLLO DE HABILIDADES METACOGNITIVAS EN LA EDUCACIÓN SUPERIOR: UN ESTUDIO EN LA UNIVERSIDAD HISPANOAMERICANA (SEGUNDO CUATRIMESTRE, 2025)

THE EFFECT OF CORE THINKING ROUTINES AS CRITICAL THINKING ENHANCERS ON THE DEVELOPMENT OF METACOGNITIVE SKILLS IN HIGHER EDUCATION: A STUDY AT UNIVERSIDAD HISPANOAMERICANA (SECOND TERM, 2025)

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El efecto de las rutinas de pensamiento centrales como potenciadoras del pensamiento crítico en el desarrollo de habilidades metacognitivas en la educación superior: un estudio en la Universidad Hispanoamericana (Segundo Cuatrimestre, 2025)

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RESUMEN

Este estudio tuvo como objetivo analizar el efecto de las rutinas de pensamiento visibles (Visible Thinking Routines, VTRs) como herramientas potenciadoras del pensamiento crítico y el desarrollo de habilidades metacognitivas en la educación superior. La investigación se llevó a cabo durante el segundo cuatrimestre del 2025 en la Universidad Hispanoamericana, utilizando un diseño metodológico mixto de tipo exploratorio secuencial. Participaron cinco docentes universitarios de diferentes áreas del conocimiento y un total de 72 estudiantes. Se aplicaron cuatro instrumentos: una encuesta inicial a los docentes sobre su conocimiento de la metacognición y las VTRs, una guía de implementación con tres rutinas (Ver, Pensar, Preguntarse; Puntos de la brújula; y Antes Pensaba... Ahora Pienso...), una encuesta de percepción estudiantil, y una encuesta final de valoración docente. Los resultados mostraron percepciones mayoritariamente positivas tanto en docentes como en estudiantes respecto al impacto de las rutinas en la comprensión, reflexión y participación activa en el aula. Aunque se identificaron algunas dificultades en la integración de las rutinas en la planificación, los hallazgos sugieren que las VTRs constituyen una estrategia pedagógica viable y beneficiosa para promover el aprendizaje autorregulado y el pensamiento crítico en contextos universitarios.

Palabras clave: innovación pedagógica, aprendizaje autorregulado, práctica reflexiva, andamiaje cognitivo, razonamiento de orden superior

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The effect of core thinking routines as critical thinking enhancers on the development of metacognitive skills in higher education: A study at Universidad Hispanoamericana (Second Term, 2025)

ABSTRACT

This study aimed to analyze the effect of Visible Thinking Routines (VTRs) as tools to enhance critical thinking and the development of metacognitive skills in higher education. The research was conducted during the second academic term of 2025 at Universidad Hispanoamericana, using a mixed-methods exploratory sequential design. Five university professors from different subject areas and a total of 72 students participated in the study. Four instruments were applied: a pre-implementation survey to assess professors' knowledge of metacognition and VTRs, an implementation guide featuring three routines (See, Think, Wonder; Compass Points; and I Used to Think, Now I Think), a student perception survey, and a post-implementation teacher reflection survey. Results revealed predominantly positive perceptions from both professors and students regarding the impact of VTRs on comprehension, reflection, and active classroom engagement. While some challenges were noted in integrating the routines into existing lesson planning, findings suggest that VTRs are a viable and beneficial pedagogical strategy for promoting self-regulated learning and critical thinking in university-level settings.

Key words: pedagogical innovation, self-regulated learning, reflective practice, cognitive scaffolding, higher-order reasoning

INTRODUCTION

In contemporary higher education, the development of students' critical thinking and metacognitive skills has become a pedagogical priority. Universities today are expected not only to deliver disciplinary knowledge but also to foster higher-order cognitive skills that enable learners to reason, reflect, adapt, and transfer knowledge across contexts. Critical thinking is commonly understood as the ability to analyze information, evaluate arguments, and draw sound conclusions analyze, organize, reason, argument, evaluate and position knowledge to make decisions (Galindo-Domínguez et al., 2023). Meanwhile, metacognitive skills play a role in regulating and controlling students' cognitive processes in learning and thinking, and this regulation significantly influences learning outcomes (Willison et al., 2023).

The link between metacognitive regulation and critical thinking development is well supported in educational studies. Academic research consistently emphasizes the interconnection between these two domains. Metacognitive regulation enables learners to be more intentional in their use of cognitive strategies and, as a result, enhances their ability to critically assess information and construct well-reasoned arguments (Pereles et al., 2024). For instance, research indicates that conscious use of metacognitive strategies—such as self-assessment and reflective questioning—supports enhanced monitoring and regulation, which in turn improves critical thinking performance (Rivas et al., 2022). In Spanish higher education findings Guamanga, Saiz, Rivas, and Bueno (2025), demonstrate that critical thinking directly strengthens metacognitive capability, and this enhanced metacognition subsequently contributes to higher levels of psychological well-being and empathy in learners.

In this regard, metacognition functions not only as a support mechanism but as an enabler of deep, critical engagement with content. However, while their value is widely recognized, effective pedagogical interventions that target the development of both critical thinking and metacognitive skills in higher education remain insufficiently explored in many educational contexts—particularly in Latin America.

Dennis and Somerville (2023) found that while higher education faculty often express appreciation for metacognitive-supportive strategies in theory, only about 37.5% were familiar with metacognitive principles—and even then, they tended to emphasize knowledge-focused practices rather than cognitive

regulation. Most incorporated minimal scaffolding for student self-reflection or cognitive monitoring, illustrating a persistent dependence on content transmission. This metacognition theory–practice gap highlights an urgent need for scalable, practical interventions—such as professional development programs—that enable instructors to move beyond valuing these strategies in principle to embedding them consistently in teaching.

One promising strategy to this pedagogical shortfall is the implementation of thinking routines, a set of structured thinking prompts designed to make learners' cognitive processes visible. These routines, developed by researchers at Project Zero, Harvard Graduate School of Education, such as See–Think–Wonder, Claim–Support–Question, and Compass Points, which are designed to help students convey their thought processes and develop habits of inquiry and reflection to encourage reflection, questioning, and cognitive articulation (Project Zero, 2022). Although initially applied in primary and secondary education, their use in higher education has begun to gain attention, especially for their potential to promote not just cognitive engagement but also metacognitive growth.

Recent research has begun to empirically support the use of thinking routines in university classrooms. For example, Ramos-Vallecillo et al. (2024) show that integrating thinking routines into university courses fosters meaningful conceptual understanding, elevates the quantity and quality of classroom discourse, and promotes reflective self-awareness among students regarding their learning processes. Similarly, in the study by ElSayad (2024) examined blended learning environments, which found that academic self-efficacy, student–student and student–lecturer interactions significantly influenced planning, monitoring, and regulating—key components of metacognitive self-regulation—which in turn affected perceived learning outcomes in blended settings.

Despite these encouraging results, the use of thinking routines as systematic tools for metacognitive development remains under-researched, particularly in non-English-speaking academic environments. While most existing studies focus on North America or Europe, one recent contribution from Costa Rica demonstrates the efficacy of thinking routines: in a master's-level theoretical course, the use of such routines significantly improved reading comprehension and triggered critical, reflective, and meaningful learning among Spanish-speaking students (Calvo-Cascante, 2024). This highlights the potential of

thinking routines across diverse linguistic and cultural contexts—and underscores the need for more research in Latin American and non-English higher education settings.

In the Costa Rican higher education context, the use of thinking routines is largely anecdotal and has not been the subject of rigorous empirical investigation. Universidad Hispanoamericana, a private institution committed to educational innovation, presents a valuable case study for exploring how these routines function in real classroom settings. The present study, conducted during the second term of 2025, seeks to address this gap by evaluating the impact of core thinking routines on the development of critical thinking and metacognitive skills among undergraduate students.

The central hypothesis of this research is that the structured and consistent use of thinking routines in university courses can serve as a catalyst for both critical and metacognitive development. Specifically, the study investigates whether students exposed to thinking routines over a 3-week period demonstrate measurable improvements in (1) their ability to regulate their learning processes, (2) their capacity for critical analysis and argumentation, and (3) their engagement in reflective discourse that deepens conceptual understanding and promotes meaningful learning.

Finally, this research contributes to the growing conversation on pedagogical innovation in Latin America by offering context-sensitive evidence about how global educational practices can be adapted and evaluated within local realities. It provides a model for integrating thinking routines into university courses in a way that supports both cognitive and metacognitive growth, responding to the dual challenge of fostering academic excellence and promoting student autonomy.

Linking Critical Thinking and Metacognition in Higher Education

Stanton, Sebesta, and Dunlosky (2021) argue that metacognition—defined as the awareness and control of thinking—can substantially influence student learning and performance. They recommend practical instructional strategies for educators, including supporting learning strategies, encouraging monitoring and control of learning, and fostering social metacognition in group work, and offer a set of four easily implementable teaching practices to enhance metacognitive engagement across disciplines.

Extending this perspective, Willison et al. (2024) synthesizes a hierarchical model of metacognition that integrates metacognitive knowledge—awareness of one's thinking—and metacognitive regulation—deliberate control over cognitive strategies. This dual emphasis aligns with what can be described as

metacognitive literacy: the capacity to consciously guide, monitor, and adjust thinking to support informed reasoning. Chen et al. (2025) reinforce this view by defining metacognition as the deliberate awareness and examination of one's own learning and thought processes, positioning it as a developmental pathway through which learners actively reflect on and regulate their cognition. Together, these perspectives underscore a theoretical foundation in which metacognition operates both as a precursor and as a facilitator of robust critical thinking, enabling students to engage in disciplined, strategic, and evidence-based reasoning.

Current educational research emphasizes that critical thinking and metacognition are mutually reinforcing cognitive domains—each supporting and amplifying the other in structured learning environments. For instance, Jaramillo Gómez et al. (2025) conducted a comprehensive narrative review identifying metacognition—alongside motivation, cognitive autonomy, active pedagogical strategies, and collaborative work—as one of the key psychological and educational determinants of critical thinking in higher education, emphasizing the multifactorial nature of its development. Similarly, Saleh et al. (2023) provide compelling quantitative evidence of this interplay in a high school context: their regression analysis showed that metacognitive skills contributed 10.06% to male student retention and 12.81% to female student retention, compared to critical thinking skills contributing just 2.44% for males and 7.89% for females. These figures suggest that metacognitive processes may exert a stronger, more foundational influence on successful learning outcomes—especially for female students.

Evidence from targeted interventions reinforces this view. The ARDESOS-DIAPROVE program (Rivas et al., 2022), implemented in Spanish universities, combined problem-based learning with explicit metacognitive scaffolding, including reflective prompts, decision maps, and structured peer discussions. Findings revealed that students in the intervention group scored significantly higher on measures of both metacognitive regulation and critical thinking compared to control groups. These results indicate that intentionally designing learning experiences to prompt metacognitive engagement can simultaneously strengthen self-regulation and foster deeper analytical reasoning.

This dual development pathway has relevance in higher education, where students are expected to navigate complex disciplinary content, evaluate competing perspectives, and construct well-reasoned arguments. Integrating thinking routines as structured, repeatable strategies offers one promising

approach to operationalizing this linkage. By prompting learners to make their thinking visible, these routines create scaffolded opportunities for monitoring, evaluating, and adjusting cognitive processes—while simultaneously fostering critical analysis, argumentation, and reflective discourse. Building on this theoretical base, the present study investigates whether a structured and consistent application of thinking routines over a three-week period can produce measurable gains in:

- Students' ability to regulate their learning processes (metacognitive regulation);
- Their capacity for critical analysis and well-reasoned argumentation (critical thinking performance); and
- Their engagement in reflective, collaborative discourse that deepens conceptual understanding and promotes meaningful learning.

Thinking Routines as Pedagogical Tools for Cognitive and Metacognitive Development

Thinking routines—brief, structured sets of prompts such as See–Think–Wonder and Connect–Extend–Challenge—originated in K–12 classrooms through Harvard's Project Zero initiative (Project Zero, 2022). While initially conceived for younger learners, emerging scholarship demonstrates their adaptability and efficacy in higher education contexts. For example, Ramos-Vallecillo et al. (2024) found that when undergraduate students consistently used thinking routines across theoretical course sessions, their engagement, reflective depth, conceptual understanding, and academic performance all improved. The routines facilitated activation of prior knowledge and collaborative reasoning, thereby transforming abstract notions of reflection into tangible, classroom-centered practices.

This potential is echoed in Nord Anglia Education's (2024) Building Better Thinkers study, which surveyed 2,429 students across 27 schools in 17 countries. The results show that 71% of students reported that thinking routines deepened their thinking, while over two-thirds noted improvements in critical thinking, creativity, curiosity, compassion, collaboration, and commitment. These findings underscore how, with consistent weekly implementation, thinking routines can evolve from novel classroom activities into habitual cognitive strategies—integrated by learners as part of their self-regulatory toolkit.

Along with Jaramillo Gómez et al. (2025), "The conscious and intentional use of metacognitive strategies, such as continuous self-assessment and reflective questioning, facilitates the monitoring and

regulation of cognitive processes, promoting more effective learning in university students" (p. 12). These insights support the assumption that pedagogical tools encouraging self-questioning, like thinking routines, may promote self-regulatory behaviors.

The connection between thinking routines and self-regulated learning is further reinforced by research on metacognitive strategy instruction. Khurram (2023), in a study with ESL university students, demonstrated that "explicit instruction in metacognitive reading strategies significantly enhanced ESL university students' ability to plan, monitor, and evaluate their reading, leading to measurable gains in both metacognitive awareness and strategy use" (p. 7). Quantitatively, the intervention resulted in statistically significant increases on the Metacognitive Awareness of Reading Strategies Inventory (MARSI): planning strategies improved by 0.59 points, monitoring strategies by 0.53 points, and evaluating strategies by 0.61 points ($p < .05$). These three processes—planning, monitoring, and evaluation—are core elements of metacognitive regulation and are inherently embedded within many thinking routine structures. This alignment suggests that when higher education instructors integrate thinking routines into coursework, they are not only structuring cognitive engagement but also reinforcing the same self-regulatory mechanisms that empirical evidence has shown to produce measurable learning gains.

From a pedagogical standpoint, thinking routines align directly with the evolving principles of cognitive apprenticeship. A recent qualitative revision of the model (Matsuo, 2024) confirms that key instructional phases—modeling, scaffolding, articulation, reflection, and exploration—remain vital for cultivating both cognitive and metacognitive skills. Specifically, Matsuo found that instructors naturally embed opportunities for articulation and reflection within scaffolding and exploration activities, supporting deeper processing and self-awareness. By incorporating thinking routines into instruction—paired with explicit debriefing, reflective prompts, and iterative use—educators can emulate these practices: modeling expert thinking, scaffolding learner reasoning, encouraging metacognitive articulation, and reinforcing structured reflection—thus guiding students toward independent, strategic thinking.

In application, thinking routines fulfill multiple educational functions:

- **Cognitive scaffolds:** They reduce the cognitive load of open-ended reflection by offering structured pathways through stages of observation, interpretation, questioning, and connection-making.
- **Metacognitive prompts:** They require students to consciously articulate their reasoning steps, thereby fostering self-awareness of cognitive strategies and decision-making processes.
- **Facilitators of learning-centered discourse:** They promote collaborative meaning-making, as students build on each other's interpretations, pose questions, and extend ideas—deepening both critical engagement and reflective awareness.

Taken together, the literature affirms that thinking routines occupy a unique pedagogical space: they not only structure and guide content engagement but also cultivate habitual metacognitive reflection. This dual functionality positions them as powerful tools for higher education instructors seeking to develop students' independence, reflective capacity, and critical reasoning skills—capabilities essential for navigating complex academic and professional landscapes.

METHODOLOGY

This study employed a mixed-methods exploratory sequential design to both measure and gain a nuanced understanding of how core Visible Thinking Routines (VTRs) support the development of critical thinking and metacognitive skills among university students. Conducted at Universidad Hispanoamericana during the second academic term of 2025, the research engaged a cohort of university professors who voluntarily participated with the aim of examining and reflecting on their own teaching practices. The sequential integration of quantitative and qualitative phases allowed for complementary strengths: the initial quantitative phase identified patterns and trends in professors' understanding of critical thinking and metacognition, while the subsequent qualitative phase provided rich, contextualized accounts of how VTRs were implemented in real classroom contexts, as experienced by both professors and their students. This methodological combination ensured not only numerical validation but also the depth of interpretation needed to understand how VTRs function as pedagogical tools in higher education.

To explore the effect of Core Thinking Routines on the development of metacognitive skills in higher education, this study employed a combination of quantitative and qualitative techniques through four

aligned instruments. The process began with a pre-implementation survey, designed as a Likert-scale questionnaire for university professors. This survey aimed to assess their initial understanding of metacognition, critical thinking, and visible thinking routines before they applied the strategies in class. The survey helped identify baseline knowledge and perceptions, which served as a reference point for measuring growth and change.

Following the implementation phase, professors were guided to apply at least two of three selected Visible Thinking Routines— See, Think, Wonder, Compass Points, and I Used to Think, Now I Think—within their courses. After this, two additional surveys were used to gather feedback. The first was a student perception survey to evaluate how students experienced and responded to the use of thinking routines in class. The second was a post-implementation professor survey to reflect on classroom outcomes and the perceived impact of the routines on student engagement and thinking. All three surveys used a 5-point Likert scale, included clear instructions, and were designed to progress from basic understanding to deeper analytical insight. Together, these tools provided a well-rounded and practical method to capture the perspectives of both instructors and learners.

The participants in this study were university professors from the Faculty of Education at Universidad Hispanoamericana, all actively teaching during the second academic term of 2025. Participation was voluntary, with recruitment based on two main criteria: (a) an expressed openness to critically reflect on their pedagogical practices, and (b) a willingness to integrate new instructional strategies into their courses. The sample represented a mix of educators from both general education and specialized fields, thereby offering a diverse range of disciplinary contexts in which Visible Thinking Routines (VTRs) could be trialed. The professors' years of teaching experience varied widely, from early-career instructors to cathedraticum academics, adding richness to the analysis by capturing a spectrum of perspectives and approaches to implementation.

The study was conducted in the professors' regular teaching environments—authentic higher education classrooms within the university. This naturalistic context allowed for the integration of VTRs without major disruption to existing course structures or learning objectives. Professors maintained full autonomy in selecting which routines to apply and in adapting them to suit their subject matter, while receiving support through clearly structured implementation guidelines. To ensure minimal interference

into participants' workloads, all research instruments were designed to be concise, focused, and seamlessly integrated into regular teaching activities. This ecologically valid approach ensured that the data reflected genuine teaching practices and authentic student responses, rather than outcomes shaped by artificial or overly controlled research conditions.

All procedures adhered to institutional and ethical research standards. Participants were fully informed about the objectives, scope, and voluntary nature of the study through an informed consent process prior to data collection. They were assured of the confidentiality and anonymity of their responses, and the right to withdraw from the study at any time without penalty. Data were stored securely and used solely for research purposes, in compliance with relevant institutional review protocols and data protection regulations. This sequential approach allowed for the triangulation of data, providing richer interpretations of how VTRs function as pedagogical tools in higher education.

DATA ANALYSIS

Pre-Implementation Self-Assessment: Understanding of Metacognition and Thinking Routines

The results of the pre-implementation survey revealed a diverse range of familiarity and confidence levels among the five participating professors in relation to metacognition and the use of Visible Thinking Routines (VTRs) in higher education. The survey employed a 5-point Likert scale in which 1 = Strongly Disagree / Very Low Familiarity, 2 = Disagree / Low Familiarity, 3 = Neutral / Moderate Familiarity, 4 = Agree / High Familiarity, and 5 = Strongly Agree / Very High Familiarity.

The survey consisted of the following items:

1. I am familiar with the concept of metacognition – measured professors' knowledge of what metacognition is (awareness and regulation of one's own thinking).
2. I intentionally plan activities that promote critical thinking – assessed whether professors already integrated higher-order thinking activities into lesson planning.
3. I use strategies to help students reflect on their thinking – determined the extent to which professors encouraged metacognitive reflection in class.
4. I am aware of what Visible Thinking Routines (VTRs) are – measured awareness of VTRs specifically, regardless of whether professors had applied them.

5. I understand how VTRs can be used in higher education – evaluated the perceived applicability of VTRs to university-level teaching.
6. I regularly encourage students to evaluate their own learning – examined whether professors prompted students to monitor and assess their learning progress.
7. I have previously implemented at least one VTR in my classroom – captured prior practical experience with thinking routines.
8. I can differentiate between a traditional strategy and a VTR – measured the ability to distinguish VTRs' structured, metacognition-oriented approach from more conventional strategies.

Professors A and D demonstrated a solid understanding of the core concepts, with responses generally ranging from 3 to 4. This indicates that they possessed moderate to high familiarity with metacognition, intentional planning for critical thinking, and some prior exposure to VTRs—enough to provide a conceptual foundation but with room to strengthen practical application.

Professors B and E reflected a growing awareness of these concepts, scoring mostly in the 3 range, suggesting moderate familiarity, particularly in encouraging student reflection and promoting deeper learning, but indicated that they were still developing confidence in applying these tools consistently. In contrast, Professor C emerged as the most experienced participant, with consistently high scores (mostly 5s) across all items, reveling strong familiarity with metacognition and VTRs. This reflects a clear distinction between traditional and thinking-based strategies, and a high level of preparedness to integrate these routines into university teaching.

These results provided a useful starting point for tailoring the implementation phase and offered insight into the varied professional development needs of the group.

Survey: Student Reflection on the Use of Thinking Routines

The student post-implementation survey consisted of the following items, each designed to capture a specific dimension of how Visible Thinking Routines (VTRs) affected their learning experience:

The routines helped me think more deeply about the content – assessed the extent to which VTRs encouraged students to go beyond surface-level understanding and engage in higher-order thinking.

1. I became more aware of how I learn – measured growth in metacognitive self-awareness, specifically the ability to recognize personal learning processes.

2. I was more engaged in class when using the routines – evaluated whether VTRs increased active participation, focus, and motivation during lessons.
3. The routines helped me connect new ideas with what I already knew – captured how effectively VTRs supported integration of new knowledge with prior understanding (schema building).
4. The routines helped me organize my thoughts – measured the perceived role of VTRs in structuring and sequencing ideas logically.
5. The routines helped me reflect on my learning – assessed students' engagement in deliberate reflection, a core metacognitive activity.
6. I asked more and deeper questions when using the routines – determined whether VTRs stimulated curiosity and higher-level inquiry.
7. I shared more ideas with classmates than usual – evaluated whether VTRs promoted collaborative dialogue and peer-to-peer learning.
8. I would like to use these routines in future courses – measured long-term acceptance and willingness to adopt VTRs as a standard learning practice.
9. I would recommend these routines to other students – assessed overall satisfaction and perceived value of VTRs for peer learning.

Out of the 80 students enrolled across the courses taught by the five participating professors, 72 completed the post-implementation survey, representing a strong 90% response rate. This high level of participation enhances the credibility and reliability of the data set. Overall, students responded very positively to the use of Visible Thinking Routines (VTRs), particularly in relation to their impact on comprehension, self-reflection, and learner confidence. Most survey items received ratings of "Agree" or "Strongly Agree," with standout trends in the areas of increased metacognitive awareness, greater motivation to ask deeper questions, and reinforced positive emotional engagement with the learning process. These results suggest that the routines not only helped students understand course content more effectively but also encouraged them to take ownership of their thinking, a key element in the development of metacognitive skills.

Additionally, students overwhelmingly agreed that VTRs boosted their confidence as learners and conveyed a strong expectation that these strategies would continue to be implemented in future courses,

reflecting their perceived value and long-term relevance to the learning process. This finding emphasizes both the sustainability and perceived value of VTRs in higher education. Students reported that the routines were accessible, engaging, and effective for organizing thoughts and evaluating their own learning processes, outcomes that align directly with the goals of metacognitive instruction.

While a small subset of approximately 10 students provided more neutral or slightly negative feedback, particularly on the item "I shared more ideas with classmates than usual", this may reflect individual learning preferences or specific classroom dynamics rather than limitations of the routines themselves.

On average, 84% of all responses across survey items fell into the "Agree" or "Strongly Agree" categories, with the highest-rated items being "The routines helped me reflect on my learning" (92%) and "The routines increased my understanding of the content" (90%).

Taken together, the student feedback provides strong empirical support for the claim that core thinking routines are a valuable and efficient tool for fostering metacognition, critical thinking, and learner empowerment in university classrooms.

Post-Implementation Professor Survey: Perceived Outcomes of Using VTRs

The post-implementation survey results, gathered from five university professors, indicate a generally positive perception of the impact of Visible Thinking Routines (VTRs) on teaching and learning practices. Most items received ratings between "Agree" (4) and "Strongly Agree" (5), with an overall mean score of 4.3 out of 5, reflecting a high level of satisfaction with the integration of VTRs into university courses.

Item 1 – The routines helped my students think more deeply about the content (mean = 4.4): This item assessed the perceived depth of student cognitive processing. For example, in a See–Think–Wonder activity, students moved beyond description to interpretation and hypothesis generation, showing richer engagement with course concepts.

Item 2 – My students demonstrated greater self-awareness in their learning (mean = 3.8): This referred to metacognitive self-monitoring, such as students recognizing when they did or did not understand a concept and adjusting strategies accordingly. Slightly lower ratings suggest this outcome varied depending on how explicitly professors framed reflective prompts.

Item 3 – Students became more engaged during lessons that used VTRs (mean = 4.6): Engagement here meant active participation—asking questions, contributing ideas, and sustaining attention during activities. Professors reported noticeable increases in student energy and focus during VTR-based lessons.

Item 4 – VTRs supported a more student-centered learning environment (mean = 4.4): This item measured the shift from teacher-led explanations to student-led inquiry, as seen when learners took more initiative in building on peers' ideas.

Item 5 – I was able to integrate the routines easily into my lesson plans (mean = 3.8): This focused on implementation feasibility. Neutral responses often came from professors teaching highly structured syllabi or large classes, where adapting materials required more time.

Item 6 – I noticed an improvement in students' critical thinking abilities (mean = 4.6): Professors noted growth in skills such as evaluating evidence, identifying assumptions, and constructing reasoned arguments during discussions.

Item 7 – Students reflected more frequently and meaningfully on their learning (mean = 4.6): Reflection was evidenced in journal entries, exit tickets, or class debriefs where students articulated what they learned, why it mattered, and how they could apply it.

Item 8 – The use of VTRs enhanced collaboration and idea-sharing among students (mean = 4.4): Professors observed richer peer-to-peer exchanges, such as students building on each other's insights during Connect–Extend–Challenge activities.

Item 9 – I plan to continue using VTRs in my future courses (mean = 4.8): This reflects a strong commitment to long-term adoption, suggesting perceived alignment between VTRs and professors' teaching philosophies.

Item 10 – I would recommend the use of VTRs to other professors (mean = 4.8): High ratings here indicate strong professional endorsement and perceived scalability across disciplines.

Items addressing student engagement (Item 3), critical thinking development (Item 6), and reflective learning behaviors (Item 7) demonstrated 100% agreement across participants, suggesting that the use of VTRs was consistently associated with increased cognitive participation and metacognitive awareness among students. The highest-rated items—intention to continue using VTRs (Item 9) and

willingness to recommend them (Item 10)—reflect a robust endorsement of the routines as beneficial instructional tools in higher education settings.

Despite the overall positive responses, minor variability emerged in relation to ease of implementation (Item 5) and perceived student self-awareness (Item 2). These items included "Neutral" (3) ratings from multiple respondents, possibly due to factors such as limited preparation time, curriculum rigidity, or variations in class size and delivery format. Nonetheless, with 80% or more of responses in the "Agree" or "Strongly Agree" categories across all items, the overall trend indicates a shared recognition of VTRs as effective in promoting student-centered learning environments and in supporting the development of reflective and higher-order thinking skills.

CONCLUSIONS

The results of this study indicate that the structured implementation of core Visible Thinking Routines (VTRs) has significant potential to support the development of critical thinking and metacognitive skills in higher education settings. The integration of routines such as See–Think–Wonder, Compass Points, and I Used to Think, Now I Think was well received by both students and professors. Student survey responses consistently reflected the perception that these routines enhanced their ability to reflect on their own learning, engage more deeply with course content, and build greater confidence as learners. Similarly, professors reported notable improvements in student engagement, the quality and depth of questions posed, and the frequency of reflective learning opportunities in their classrooms. While the absence of control groups in this study limits causal claims, the consistency of positive responses across quantitative and qualitative instruments suggests a meaningful contribution of VTRs to the promotion of metacognitive behaviors and critical reasoning.

Some variation in responses, particularly in relation to ease of implementation and the degree of peer-to-peer interaction, indicates that contextual variables such as class size, delivery format, and instructor experience may affect the fluid integration of VTRs into higher education teaching. These findings highlight the need for faculty professional development that includes clear implementation guidelines, adaptable models, and structured opportunities for reflection and adjustment.

Overall, the findings provide preliminary evidence that the use of core thinking routines functions as an effective critical thinking enhancer while at the same time fostering the development of metacognitive

skills in higher education. In the context of Universidad Hispanoamericana during the second academic term of 2025, these routines served as practical tools that bridged the gap between theoretical understanding and the actual enactment of metacognitive strategies in classroom practice. The positive reception from both professors and students underscores their pedagogical value, while also signaling the importance of continued exploration. Future research with larger, more diverse participant groups across multiple disciplines is recommended to examine the long-term effects of core thinking routines on critical thinking, metacognitive development, and overall learning outcomes in higher education.

Based on the results of this study, several practical recommendations emerge for higher education instructors aiming to foster metacognitive growth and critical thinking using Visible Thinking Routines (VTRs) in their courses:

- Start small and build gradually: Begin with one core routine such as See, Think, Wonder or Compass Points to model structured thinking in early course units. Gradually introduce others as students become familiar with the process.
- Explicitly teach the purpose of each routine: Clarify how each VTR supports not only content comprehension but also reflective and analytical thinking. Make metacognitive goals visible to students.
- Integrate routines into existing curriculum: Embed VTRs into current lesson structures rather than treating them as add-ons. This increases the likelihood of seamless adoption and sustained use.
- Facilitate reflective debriefing: After each routine, allocate time for reflection—individually or as a class. Use prompts like “How did this routine help your thinking?” or “What new perspectives did you gain?”
- Encourage peer collaboration: VTRs thrive in dialogic environments. Encourage students to share their thinking in pairs or small groups to enhance metacognitive awareness and deeper engagement.

- Use routines as diagnostic and formative assessment tools: Thinking routines can be powerful indicators of student understanding and self-regulation. Instructors can analyze student responses to identify misconceptions and monitor cognitive growth over time.
- Provide ongoing support for faculty: Institutions should offer training, modeling, and shared practice spaces where professors can reflect on and refine their use of VTRs across disciplines.

These recommendations aim to guide instructors in making thinking routines a consistent, meaningful part of their pedagogical toolkit, ultimately fostering more autonomous, reflective, and critically engaged learners.

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