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Integrating Metacognitive Strategies Through Project Zero's Thinking Routines to Empower 6th Grade Learners

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Abstract

This Final Degree Essay is focused on the use of thinking routines to develop metacognitive competence in 6th grade learners. The main objective was to construct a theoretical framework around the concept of metacognition and thinking routines through deep bibliographic research and then to connect this with a unique didactic proposal entitled "Thinking Step by Step" that aims to apply thinking routines in classroom life by the way of everyday activities in various subject contexts. The theoretical framework examines the concept of metacognition and defines some of its associated terms, as well as expands on the concept of thinking routines, their history and development. The didactic proposal section includes 8 activity sessions designed to give students exposure to basic thinking routines in a variety of subject areas and concludes with an evaluation system for the planned activities, including hetero-, co- and self-evaluation rubrics. This project aims to promote the development of metacognitive abilities in answer to the growing need for independent and critical thinking skills among our students.

Key words:

Metacognition, thinking routines, 6th grade, autonomy, didactic proposal

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1. Introduction

The present Final Degree Essay aims to further general awareness, specifically on the part of Primary Education teachers, about the concept of metacognition and how this can be harnessed in an explicit way to provide 6th grade students tools to improve their motivation, autonomy and "Learn to Learn" competence through the use of the Harvard Project Zero visible thinking routines.

Since the adoption of the competency-based evaluation system by European Union countries in 2006, "learning to learn" has been one of the key competences that students need to have acquired upon graduating Primary Education and moving to Secondary. As such, at least on a theoretical level, the importance of students' autodidactic autonomy has been recognized, however, almost 20 years later, we can still see teachers using an antiquated transmission-reception methodology and students for whom learning is simply synonymous with memorization of facts.

While these approaches seemed to be sufficient during the period of the so-called "information society", with the dawn of the new "knowledge society", it's becoming increasingly clear that we have to reorient our educational strategies away from mere transmission of facts and that instead, the role of the teacher should be to guide students towards awareness and control of their thinking and learning strategies, in short, to help them achieve metacognitive autonomy. In today's society, the facts and knowledge that one possesses are no longer the mark of an intelligent and learned person; the truly valuable intellectual skill is if one is able to synthesize different pieces of knowledge and work with them in an efficient and productive way. For this to be possible, students must have developed the capacity to think autonomously and to manage their learning metacognitively while in school.

A vehicle to achieve the goal of improving students' metacognitive skills are the visible thinking routines designed by Harvard's Project Zero. According to Project Zero, a thinking routine is "any procedure, process or pattern of action that is used repeatedly to manage and facilitate the accomplishment of specific goals or tasks." (*Visible Thinking | Project Zero*, n.d.).

Applicable to any subject and adaptable to virtually all grade levels, the present Final Degree

Essay will be focused on introducing and training 6th grade students to utilize these tools.

2. Objectives

- General Objective: To design an educational proposal that integrates the use of visible thinking routines into daily classroom activities in order to improve students' metacognitive competency.

  - Specific Objective 1: To identify and adapt specific visible thinking routines to fit the needs of 6th grade students and to implement them in general classroom activities.
  - Specific Objective 2: To evaluate the use of visible thinking routines in fostering autonomous learners who are metacognitively aware of their strengths and weaknesses.
  - Specific Objective 3: To evaluate the usefulness of the educational proposal based on student assessment as well as the teacher's self-assessment.

3. Theoretical framework

In this section, we present the research framework that encompasses the topic and provides the foundation of this Final Degree Essay. We start by defining and giving an explanation of the broader key concept of metacognition, then continue by discussing the more specific metacognitive tool of thinking routines and how these tools can be harnessed in the classroom to attain educational goals. Finally, we conclude by covering the benefits to student educational outcomes that can be achieved through the implementation of metacognitive strategies such as visible thinking routines.

3.1. Defining concepts: what is metacognition?

While metacognition is an often-used term in the educational world, its actual significance is far from common knowledge, thus, it's necessary to begin our literature review with a basic definition. From the Greek, the prefix "meta" means "beyond" and paired with "cognition", roughly means "beyond thinking". This term was coined by the American developmental psychologist John Flavell in his 1979 article *Metacognitive Aspects of Problem Solving*. In simpler terms, Flavell (1979) defined metacognition as "thinking about thinking", or the conscious knowledge we have about our thinking abilities and patterns.

It's useful to note, following Livingston (2003), that approximating a definition of metacognition is difficult due to the fact that so many terms are used synonymously throughout the literature, such as "self-regulation", "executive control", etc.

According to Flavell, the broader umbrella term of metacognition can be subdivided in its turn into two complementary categories: metacognitive knowledge and metacognitive experiences. Following Keestra (2024), we will use the term "metacognitive regulation" to refer to these metacognitive experiences.

Metacognitive knowledge, according to Nickerson, Perkin and Smith (1987, cited in Forcén 2017) is "knowledge about knowledge…including knowledge of the capacities and limits of the processes of human thought, what one thinks that humans in general know, as well as the characteristics of specific people." In other words, metacognitive knowledge refers to general knowledge about how humans think as well as particular knowledge about how the specific thinker in question thinks.

Within the category of metacognitive knowledge, three distinct components can be distinguished:

- Declarative knowledge

- Procedural knowledge

- Conditional knowledge

Keestra describes declarative knowledge as "a learner's general understanding of knowing and thinking in general, including different cognitive tasks, strategies and relevant factors." In the words of Verma and Gupta (2023), this type of knowledge refers to "knowledge of what occurs within oneself and the patterns of those occurrences." An example of declarative knowledge would be a test-taker knowing they usually do better at multiple choice tests than essay tests.

According to Keestra (2024), "procedural knowledge entails knowing how to perform cognitive tasks and apply specific strategies." Lai (2011) describes it as involving "awareness and management of cognition, including knowledge about strategies." Schraw reports that "individuals with a high degree of procedural knowledge perform tasks more automatically, possess a larger repertoire of strategies, sequence strategies effectively and use qualitatively different strategies to solve problems." An example of procedural knowledge in play would be a student knowing in which order to use the correct algorithms to solve a math problem.

The final classification of metacognitive knowledge, conditional knowledge, is defined by Keestra (2024) as "when and why to use specific cognitive strategies, recognizing the relevant conditions of the context in which the learner is operating." Following Schraw, conditional knowledge can be considered "knowing when and why to use declarative and procedural knowledge." According to Livingston (2003), an example of the use of conditional knowledge would be a student who realizes they have more difficulty with word problems (declarative knowledge), so they then decide to answer the simpler computational problems on their math test first (procedural knowledge).

In his 1979 article, Flavell (1979) associates these three classifications of metacognitive knowledge with the types of variables that they each focus on:

Table 1: Metacognitive Knowledge in relation to Metacognitive Variables

Declarative Knowledge	Procedural Knowledge	Conditional Knowledge
Person Variables	Task Variables	Strategy Variables

Source: own elaboration

Flavell mentions that "most metacognitive knowledge actually concerns interactions or combinations among two or three of these three types of variables. To illustrate a combination involving all three, you might believe that you (unlike your brother) should use Strategy A (rather than Strategy B) in Task X (as contrasted with Task Y)."

Now that we have given some context around what metacognitive knowledge is, we still need to define the second half of Flavell's classification of what metacognition is: metacognitive experiences or metacognitive regulation.

If metacognitive knowledge can be considered the "what", metacognitive regulation can be considered the "how": how a learner can harness the various levels of metacognitive knowledge that they possess and utilize these toward the achievement of goals. Another way to explain this would be to consider it a strategic form of thinking that allows the learner to consciously and deliberately analyze the different metacognitive variables at hand (person, task and strategy), select the most appropriate plan of action to achieve their goal considering these variables, monitor their progress while using their plan of action to achieve the goal and then, upon completion (or not) of the goal, checking to see how the whole process went. In short, we can see before, during and after phases of this implementation of metacognitive regulation: the learner selects their strategy <u>before</u> beginning, <u>during</u> their work, they monitor their progress, and <u>after</u> finishing, they assess whether or not they achieved their goal and how the entire process went.

Most authors (Agrela & Simons, 2025; Cossio-Mercado et al., 2024; Keestra, 2024; Srivastava, 2024) coincide in that the three main processes undertaken by a learner using metacognitive regulation are planning, monitoring and evaluating, however some authors consider other simultaneous processes as forming part of metacognitive regulation as well. Bahuleyan (2016) includes information management and debugging; Caraballo (2024) considers organization a fundamental process; and Fleur & Van den Bos (2021) include setting goals and organizing to be integral to the regulation facet of metacognition.

3.2. What are thinking routines and why are they important?

Now that we've made an approximation to the terminology and main ideas concerning metacognition, for the focus of this Final Degree Essay, it's equally important to give a clear contextualization around the main concepts of thinking routines.

Salmon (2015) defines thinking routines as "short, easy-to-learn mini-strategies that extend and deepen students' thinking and become part of the structure of everyday classroom life." According to Dajani (2016), thinking routines are "structured activities designed to promote and enhance student thinking in the classroom." These routines are essentially "short, engaging patterns of intellectual behavior that are highly transferable across contexts." (*Visible Thinking | Project Zero*, n.d.)

The earliest seeds of thinking routines were planted in 2000-2005, by the Harvard University Graduate School of Education's *Project Zero* (*Visible Thinking | Project Zero*, n.d.) think tank (whose advances in the area of metacognitive thinking routines forms the focus of this present classroom intervention), in an educational study and development initiative carried out at the Lemshaga Akademi in Sweden and at various pilot schools across Europe. The original name of the project was *Innovating with Intelligence*: *Delving into thinking dispositions and how classrooms can promote those skills amongst students*. During the six years this pilot program was conducted, the broad goal was to develop students' ability to think well. Researchers asked themselves the question "what can we, as educators, do to help students become better thinkers?" They originally theorized that teaching thinking skills would be sufficient, but quickly realized that many students, even though they possess a wide variety of thinking skills, fail to identify the opportune moment or situation to use these skills.

At this point, they began to theorize that good thinking comprised a three-pronged set of elements:

1. Ability (to have the thinking skills needed to solve problems)
2. Inclination (to have an open-minded disposition, a willingness to use these skills)
3. Sensitivity (to be attuned to the correct moment when a thinking skill would be useful to use)

Upon reaching this realization, the researchers concluded that in addition to teaching thinking skills, they would better serve their students by encouraging them to develop the

disposition or inclination to put them into practice and, most importantly, by helping to train them in the sensitivity to know when to use these skills. Thus, thinking routines were born.

Over time, an additional objective of the program was developed: to make students' thought processes more tangible, so that they could be analyzed, discussed among peers, reflected on and taken further as a group. This led to the development of the "visible" or "visual" component to thinking routines. According to Project Zero (*Visible Thinking | Project Zero*, n.d.), "at the core of Visible Thinking are practices that help make thinking visible: Thinking Routines loosely guide learners' thought processes and encourage active processing."

In their article "Making Thinking Visible", the authors Ron Ritchart and David Perkins (2008), two of the original researchers on the Project Zero team, lay out a series of six key principles of visible thinking:

1. Learning is a consequence of thinking: students' content acquisition increases when they actively think through and with the concepts they are learning about. The effect is further increased when this thought exercise is undertaken as a group versus on an individual level.

2. Good thinking is not only a matter of skills, but also a matter of dispositions: adults and children alike often underutilize their thinking capabilities by being close-minded, indifferent to new ideas instead of curious and by taking things at face value without questioning them. However, certain qualities such as open-mindedness, imagination, curiosity, skepticism and attention to empirical facts help promote deep quality thinking and as such, these dispositions should be the goal of education to promote.

3. The development of thinking is a social endeavor: the classroom, being a microcosm of the "real world", is in constant flux between the individual and the collective. Well-developed thinking skills cannot be the product solely of an individual's experience but, instead, result from the interaction between the individual and the group. We learn from each other, not in an isolated way.

4. Fostering thinking requires making thinking visible: Thinking is a cognitive process and occurs inside our minds, therefore, it's invisible to others and sometimes even to ourselves, if we don't consciously attend to it. The most developed thinkers manage to somehow externalize their cognition, be it through drawing, writing, verbalizing or other methods. Another important facet of the visible thinking routine strategy is to

record our thoughts in writing so that we can come back later and analyze what we previously thought.

5. Classroom culture sets the tone for learning and shapes what is learned: The researchers identified eight variables shaping classroom culture that can influence learners' thinking in a positive or a negative way.

   a. Classroom routines and structures for learning

   b. Language and conversational patterns

   c. Implicit and explicit expectations

   d. Time allocation

   e. Modeling by teachers and others

   f. The physical environment

   g. Relationships and patterns of interaction

   h. The creation of opportunities

6. Schools must be cultures of thinking for teachers: Teachers' professional learning communities are vital environments to foster discussion, reflection and shared observation among teaching professionals, so it's fundamental that school administrative teams offer teachers the time and opportunity to take part in these professional development circles.

3.3. Classroom applications and student benefits of metacognition and thinking routines

The easiest and most intuitive place to start gathering information about thinking routines is the Project Zero thinking routine toolbox (*Visible Thinking | Project Zero*, n.d.). Here, the thinking routines are classified into ten different categories:

Table 2: Types of Thinking Categories

Core thinking routines	Introducing and exploring ideas
Digging deeper into ideas	Synthesizing and organizing ideas
Investigating objects and systems	Perspective-taking
Considering controversies, dilemmas, and	Generating possibilities and analogies

perspectives	
Exploring art, images, and objects	Global thinking

Source: own elaboration

For the purposes of this classroom intervention proposal, we will focus only on the "core thinking routines" category, as these routines are easily transferable across different disciplines, age groups and subjects and, as such, Project Zero recommends starting here. The core thinking routines are the following:

Table 3: Core Thinking Routines

Circle of Viewpoints
Claim, Support, Question
Compass Points
Connect, Extend, Challenge
I Used to Think…Now I Think…
See, Think, Wonder
Think, Pair, Share
Think, Puzzle, Explore
What Makes You Say That?

Source: own elaboration

Following the small study conducted by Gholam (2018), thinking routines are useful because they can be applied at any time during the session: at the beginning, during the lesson, or at the end of the lesson. They can also be used for a variety of different dynamics, such as debates, to start discussions or to provoke reflection after reading a story, seeing an artifact, watching a video or observing an image. They can even be used for assessment purposes, including initial, formative and summative evaluations.

One of the key elements to keep in mind when attempting to use thinking routines in a lesson is that, in order to be beneficial to students, they cannot be used in isolation; to be a

successful pedagogical intervention, teachers have to help train students in the use of these routines and this implies focusing on one routine and working on it multiple times through repeated practice (Gholam, 2018). The same as with a mathematics algorithm, students will gradually gain independence and autonomy in the use of thinking routines the more they practice with them. This gradual practice will build up the thinking pattern into a habit, and in a short time, students will begin to follow the patterns they've learned in the thinking routine with little or no scaffolding from the teacher.

An example of how to integrate thinking routines in class is the case study of teacher Roz Marks (Ritchart & Perkins, 2008) and her first grade class in Melbourne, Australia. Ms. Marks implemented the thinking routine "What makes you say that?" to help guide her students toward justifying their arguments with regards to the 2006 Beaconsfield Mine collapse. She first asked students to make their thinking visible by drawing what they thought they knew about the accident. Then, upon asking each student to share their drawing and present it verbally, when each child explained what they thought, she asked them what made them say that. At each turn, the children provided some justification for their arguments. After seeing the teacher prompt the first few students to justify their thoughts, the following students quickly picked up on the routine and offered justification for their points of view with no prompting needed.

Another specific example of a thinking routine used in practice in the classroom is the application of the routine "I used to think…now I think…" (*Visible Thinking | Project Zero*, n.d.). Designed to be applied at the end of a unit or a particular topic of study, this routine allows students to reflect on learning, consolidate their learning and to become conscious of how their thinking has evolved and changed throughout the course of the topic studied. The teacher asks students to write down one belief related to the topic of study that they held prior to learning about the topic, along with their thoughts and beliefs about the topic now that they have studied it, noting the differences between the two ideas and how their beliefs have changed and evolved.

As far as benefits gained from introducing in the classroom intentional metacognitive training in the form of thinking routines, the advantages are numerous:

- Metacognitive practice increases students' abilities to transfer and adapt their learning to new contexts and tasks (Finlayson, 2024).

- Metacognitive skills allow students to better select and use strategies to solve problems (Agrela & Simons, 2025).

- Upon regulating one's own learning in a metacognitive way and successfully solving a problem, one's engagement and motivation to solve subsequent problems increases (Borrás, 2016).

- Using metacognitive techniques, especially monitoring one's learning, increases the likelihood that students will continue to employ critical thinking practices in future learning (Lai, 2011).

- Developing metacognitive strategies in students helps guide them towards lifelong learning (Finlayson, 2024).

4. Contextualization

The educational intervention developed for this Final Degree Essay is based on the need to reformat the current teaching-learning process to make it less about traditional, rote memorization of facts and more about giving students transferable skills and strategies that will empower them to take their learning into their own hands in a conscious and deliberate way.

Too often, even during the 6th and final year of Primary Education, when students have arguably reached the highest levels of maturity and cognition among children of this educational stage, some students still have a tendency to engage with the curricular contents in a superficial and memorization-based way, not in the more strategic and deeper way focused on through metacognitive thinking routines.

By introducing this more skilled and strategic way of thinking to students and by giving them opportunities to practice it, the following didactic proposal aims to make learners more autonomous and independent, capable of knowing and managing their own thought processes and more motivated to engage actively in their own learning journey.

4.1. Characteristics of the environment

The environment around the school contemplated in this didactic proposal is that of a fairly large-sized village located in the center of the Region of Murcia, the town of Alhama de Murcia. The school itself is located on the northwest edge of the town and, to the south and east, is surrounded by row homes and new building lots, while to the north and west, it is bordered on by agricultural zones (fields and citrus trees). The Sierra Espuña regional park is located in the mountains to the north of the school. A short walk from the school is the municipal sports center and indoor swimming pool, along with several parks, playgrounds and green areas.

The town has prospered thanks to the large industrial park to its south and the El Pozo factory to the east, creating job opportunities that have led the majority of the 23,000 inhabitants of the town to work in the industrial sector and most of the families in the school to enjoy a middle-class standard of living.

During the past few decades, the town has experienced waves of migration adding to its population, with the main immigrant groups coming from Morocco and Northern Africa and Eastern Europe.

The town has a rich cultural patrimony including several important historical sites. Among the most important are the Museum of Los Baños (a small museum dedicated to the Roman baths located in its foundations which were later appropriated and reused during the Islamic period of the town) and the castle (possibly of Roman origin but whose remaining structures have been dated to the 11th century, coinciding with the Islamic period).

Additionally, the police station, health center, fire department and Town Hall are located near the school, as well as non-governmental and charitable organizations such as Cáritas, Manos Unidas and the Red Cross.

4.2. Description of the school

The school is located in the Ral neighborhood of the town of Alhama de Murcia and first opened for students in the 2005-2006 academic year.

According to its Educational Project, the school strives to encourage a a number of values and principles, including: promoting an environment of conflict resolution, tolerance and coexistence in the school and community, developing students' linguistic, social and civic, technological, mathematic and foreign language competences, preparing students to achieve success in secondary school, encouraging students to take care of the environment and helping students to participate democratically in the school community and to engage in society in a respectful way.

The school prides itself on its commitment to innovative methods and continuing professional development and uses a project-based methodology. Every year, all grades carry out projects related to the overarching theme that the school council has decided for that academic year. For the 2024-2025 school year, the theme is "Activa-mente", emphasizing the harmony between our minds and bodies and how, in order to be holistically healthy, we have to take care of and exercise both of them.

4.3. Characteristics of the students

The school is a combined infants and primary school and serves all students in all three courses of Early Years Education and the six courses of Primary Education. There are two

groups per grade level with approximately 25 students in each group, making the exact total of students enrolled in the school 421. In the target age group specifically (6th grade), there are two groups with 25 and 26 students, respectively.

There is a small but important presence in each class group of students with special needs. In the target 6th grade class, there are two students with special needs: one has a low degree of Autism Spectrum Disorder and Attention Deficit Disorder and the other has a low cognitive level.

The school is a relatively small school, contributing to a school climate in which the students interact with other students in different grade levels and there is a family-like ambience.

5. Proposal for classroom didactic programming

The following didactic proposal has been developed in accordance with the curriculum stipulated by the current educational legislation, commonly referred to as the "LOMLOE", and ties together objectives, basic knowledge, key and specific skills, evaluation criteria and the operational descriptors of the graduate profile for the target group, 6th grade.

The proposal has been designed to allow students to develop their metacognitive skills through the specific vehicle of the "thinking routine". To give students ample time as well as a variety of different contexts in which to familiarize themselves with thinking routines, the focus of the present didactic proposal is that of general didactics, including sessions that cover the subject areas of Natural Sciences, Music, Spanish Language and Social Science/Civics.

5.1. Thinking step by step

The title of this didactic proposal emphasizes two things to students: first, that we will be focusing on developing their thinking skills and that, instead of learning contents based on a specific didactic area, we will instead work on metacognitive and highly transferable critical thinking "umbrella skills", developing these skills by using specific subjects as a vehicle to achieve our goal. Secondly, the title indicates to students that we will learn to follow a step-by-step pattern to help us automatize the thinking process.

The proposal aims to help students realize that not only can thinking routines be highly useful tools to help us visualize, organize and automatize our thinking and that we can use thinking routines in an almost limitless number of situations and subjects, but also that they hold the keys to take control of and unlock their own thinning and learning potential.

5.2. Curricular legislative basis

The present didactic proposal adheres to both the national and regional curricular laws, ensuring that its contents, methodology and other curricular aspects are up to date and in accordance with the educational standards required by the government of Spain. On the national level, the didactic proposal is in accordance with the following legislation:

- Royal Decree 157/2022, of March 1, which establishes the structure and minimum teaching requirements for Primary Education
- Organic Law 3/2020, of December 29, which modifies Organic Law 2/2006, of May 3, of Education (LOMLOE)

On the level of the Region of Murcia, the proposal is sustained by the following regional legislation:

- Decree No. 209/2022, of November 17, which establishes the structure and curriculum for Primary Education in the Region of Murcia

5.3. Target audience

The didactic proposal has been designed according to the characteristics, needs and idiosyncrasies of the target group of 6th grade students. The group is made up of 26 students in total (14 girls and 12 boys), including the two students we have mentioned earlier who have special educational needs. While there are some small groups of closer friends, the class in general is a cohesive and friendly group. With few exceptions, the students have known each other since they were in Early Years Education in the school and many participate in extracurricular activities together like football, swimming or dance. While the students respond well to individual work, they show a preference to small group work due to their social and team-oriented personalities.

5.4. Didactic objectives

Upon completion of the didactic proposal, the students should have successfully met the following series of objectives:

- Reflect on the basic structure, use and benefits of thinking routines and recognize the learning situations they can be applied in and record this information in a journal.
- Develop critical thinking skills by learning to pause, analyze an image and think step by step to organize the thought process.
- Strengthen creativity skills through group discussion and dialogue to invent a creative solution to a challenge.

- Improve reading comprehension skills through the use of short texts read in class.
- Improve writing skills through the use of journals and creative writing activities.
- Enhance digital skills through the production of a small group presentation using ICT programs.
- Design and carry out basic scientific tests on different materials and come to reasoned conclusions by analyzing the results.
- Effectively use body language and movement to convey ideas and emotions through original group choreography.

5.5. Basic knowledge

Following the LOMLOE, the didactic proposal *Thinking Step by Step* will include the following basic knowledge for 6th grade:

Table 4: Basic Knowledge (organized by area and content block)

Content Area	Content Block	Subsection	Basic Knowledge
Natural and Social Sciences	Scientific Culture	Initiation in scientific activity	1. Phases of scientific investigation
Natural and Social Sciences	Scientific Culture	Initiation in scientific activity	2. Appropriate instruments and devices to make observations and measurements
			3. Promoting curiosity, initiative, perseverance, and a sense of responsibility in conducting various investigations.
	Technology and Digitalization	Digitalization of the Personal Learning Environment	4. Digital devices and resources in accordance with the needs of the educational context
	Societies and Territories	Ecosocial Conscience	5. Climate change from the local to the global: causes and consequences. Measures for mitigation and adaptation

			6. Sustainable development. Human activity in the environment
Artistic Education	**Reception and Analysis**		7. Active reception strategies
	Plastic, visual and audiovisual arts		8. Visual Culture. The Image in Today's World: Techniques and Strategies for Reading, Analysis, and Interpretation
	Music and performing arts		9. Sound and its qualities: visual and auditory identification, classification and representation of a variety of sounds and rhythmic-melodic structures through different spellings
			10. Basic drama and dance techniques. Basic concepts of biomechanics. Expressive languages. Introduction to interpretive methods. Experimentation with performance acts. Guided and creative improvisation
			11. Expressive and creative abilities of corporal and dramatic expression
Spanish Language and Literature	**Communication**	**Processes**	12. Oral comprehension
			13. Reading comprehension
Spanish Language and Literature	**Communication**	**Processes**	14. Written production
	Literary Education		15. Strategy for the accompanied and shared interpretation of works through literary conversations
			16. Creation of texts with literary intention in a free manner and from the recreation and appropriation of given models

Source: own elaboration based on Royal Decree 157/2022 and Organic Law 3/2020

(LOMLOE). Structure based on Ribera (2024).

5.6. Key and specific skills

Following the LOMLOE, the didactic proposal *Thinking Step by Step* will develop the following key and specific skills:

Table 5: Key skills developed in the didactic proposal in relation to operational descriptors of the graduate profile

Key Skills	Description	Operational Descriptor
Linguistic Competence	The student can interact orally, in writing, signed or multimodally in a coherent and appropriate manner in different areas and contexts and with different communicative purposes.	CCL1, CCL2, CCL3, CCL4, CCL5
Digital Competence	The student can make a safe, healthy, sustainable, critical, and responsible use of digital technologies for learning, work, participation in society, and interaction with them	CD1, CD2, CD3, CD4, CD5
Personal, Social and Learning-to-Learn Competence	The student has the ability to reflect on themself in order to achieve self-awareness, self-acceptance, and ongoing personal growth; managing time and information effectively; collaborating constructively with others; maintaining resilience; and managing lifelong learning.	CPSAA1, CPSAA2, CPSAA3, CPSAA4, CPSAA5
Citizenship Competence	The student can exercise responsible citizenship and participate fully in social and civic life, based on an understanding of social concepts and structures, economic, legal and political skills, as well as knowledge of global events and active commitment to sustainability and the achievement of global citizenship.	CC1, CC2, CC3, CC4
Competence in Cultural Awareness and Expression	The student understands and respects the way in which ideas, opinions, feelings and emotions are expressed and communicated creatively in different cultures and through a wide range of artistic and cultural manifestations	CCEC1, CCEC2, CCEC3, CCEC4
Entrepreneurial Competence	The student develops a life-focused approach to acting on opportunities and ideas, using the specific knowledge needed to generate valuable results for other people.	CE1, CE2, CE3
STEM Competence	The student understands the world using scientific methods, mathematical thinking and representation, technology and engineering methods to transform the environment in a	STEM1, STEM2, STEM3, STEM4, STEM5

		committed, responsible and sustainable way	

Source: own elaboration based on Royal Decree 157/2022 and Organic Law 3/2020

(LOMLOE). Structure based on Ribera (2024).

Table 6: Specific skills developed in relation to subject area

Area	Specific Skills	Description
Natural and Social Sciences	CE 1	Use digital devices and resources safely, responsibly, and efficiently to search for information, communicate, and work individually, as a team and in a network, and to rework and create digital content according to the digital needs of the educational context.
	CE 2	Raise and answer simple scientific questions, using different techniques, instruments and models of scientific thinking, to interpret and explain facts and phenomena that occur in the natural, social and cultural environment.
	CE 9	Participate in the environment and social life in an effective and constructive manner, respecting democratic values, human and children's rights, and the principles and values of the Spanish Constitution and the European Union, valuing the role of the State and its institutions in maintaining peace and comprehensive citizen security, to generate respectful and equitable interactions and promote the peaceful and dialogue-based resolution of conflicts.
Artistic Education	CE 3	Express and communicate ideas, feelings and emotions creatively, experimenting with the possibilities of sound, image, body and digital media, to produce one's own works
	CE 4	Participate in the design, development and dissemination of individual or collective cultural and artistic productions, highlighting the process and assuming different roles in achieving a final result, to develop creativity, the notion of authorship and a sense of belonging.
Spanish Language and Literature	CE 4	Understand and interpret written and multimodal texts, recognizing the overall meaning, main ideas and explicit and implicit information, and carrying out basic reflections with help on formal and content aspects, to acquire and build knowledge and to respond to diverse communicative needs and interests.
	CE 5	Produce written and multimodal texts, with basic grammatical and spelling correction, correctly sequencing the contents and applying basic planning, textualization, review and editing, to build knowledge and to respond to specific communicative demands.
	CE 8	Read, interpret and analyze, in an accompanied manner, literary works or fragments appropriate to their development, establishing relationships between them and identifying the literary genre and its fundamental conventions, to begin to recognize literature as an artistic manifestation and a source of pleasure, knowledge and inspiration to

		create texts with literary intention.

Source: own elaboration based on Royal Decree 157/2022 and Organic Law 3/2020

(LOMLOE). Structure based on Ribera (2024).

5.7. Methodology

The methodology that the present didactic proposal hinges on is an active methodology that intends to shift the focus away from the teacher and onto the students themselves as protagonists of their own learning journey. Each activity contemplated in the sessions involves some element of small-group collaborative work and, with the exception of the introductory activity, each activity falls under the umbrella of "project-based learning", since the students work together to come up with a kind of "product" that demonstrates the knowledge that they have acquired through completion of the activity.

By giving students the freedom to experiment, discuss and work collaboratively, the didactic proposal aims to increase student autonomy and motivation, switching from the traditional teacher-centered methodologies of the past and moving to the new paradigm of student-centered dynamics.

5.8. Timing

As the present didactic proposal has been designed to be able to offer students a variety of different thinking routines with the objective that they will be able to understand and identify different academic settings in which the employment of a determined thinking routine could be useful, the proposal is anchored by activities designed to be carried out in different subject areas. Therefore, the exact timing of the sessions could be quite flexible and could be adapted to each teacher's needs; the sessions could conceivably be carried out throughout the course of a week or they could be carried out one at a time, progressively over the course of a month or even a trimester. For the general purposes of this Final Degree Essay, we suggest that the 8 sessions be carried out over the course of a 6-week period.

5.9. Sessions and activities

The following sessions have been designed for *Thinking Step by Step* and have been developed as a way for students to obtain the basic knowledge and to develop the key and

specific skills detailed in the LOMLOE for 6th grade by achieving the didactic objectives planned.

Table 7: Session 1: Introduction to thinking routines

Programming unit 1 Thinking Step by Step	TITLE Introduction to thinking routines	TIMING 1 hourlong session
Didactic/Learning objectives: ● **Start working with thinking routines by identifying and using the steps in the "See, Think, Wonder" routine** ● **Foster critical thinking and creativity skills** ● **Develop oral skills by sharing and discussing different viewpoints as a group** ● **Begin to understand the usefulness of thinking routines and identify situations where a thinking routine could be put into practice**		
Basic knowledge		
7, 8, 14		
Specific skills	**Evaluation criteria**	**Operational descriptors of graduate profile**
CE 4, CE 5	**1, 2, 5**	**CPSAA4, CPSAA5, CCEC2**
Evaluation tools		
Direct observation, evaluation of thinking routine journals, co-evaluation, self-evaluation		
Individualized educational inclusion measures		
Heterogenous collaborative pairings		
Description of activities ● **Introduction**: The teacher will show the students an image from the *New York Times* "What's Going on in This Picture?" series (The New York Times Company, 2022). The teacher will write three columns on the board: See, Think and Wonder. The teacher will elicit an answer from each student, either about what they objectively **see** in the image, what they hypothesize and **think** the image is about or questions that occur to them that make them **wonder** about what's going on in the image, and then write the response in the appropriate column. **(10 minutes)** ● **Development:** The teacher will use the initial activity to segue into the topic of **thinking routines** and will start by telling students that they've just put into practice a thinking routine called "See, Think, Wonder". The teacher will show students the short video from Project Zero that explains what thinking routines are and how we can use them to help us think carefully and deeply about different ideas. The teacher tells students that thinking routines are applicable to all subjects and that the class will practice using different thinking routines in various different subjects. **(10 minutes)** ● **Partner practice**: The teacher will assign another photo from the series and, in partners, students will have to discuss what they see, think and wonder about the photo with their partner. They will write down their responses. After 15 minutes, each pair will present their notes to the class and the class will compare and contrast the different ideas from each pair. **(25 minutes)** ● **FInal reflection**: Give each student a journal to record their responses to the thinking routines. Have them reflect on the concept of thinking routines, what new ideas they've learned, how they feel about it and what contexts do they think		

thinking routines could be useful or applicable in. Explain that this journal will serve as a portfolio in which students can record their experiences with the thinking routines and that the teacher can later observe their progress in. **(15 minutes)**	
Resources	
Digital board, projector, Internet, photo series, thinking routine journals, pens	

Table 8: Sessions 2 & 3: Identify the mysterious substances

Programming unit 1 Thinking Step by Step	TITLE Identify the mysterious substances	TIMING 2 hourlong sessions
Didactic/Learning objectives: ● **Practice using the thinking routine "What Makes You Say That?" and identifying situations where it could be useful** ● **Respectfully discuss different theories and possible ways of investigating in a group setting, choosing decisions democratically** ● **Improve digital skills through the group use of ICT programs to create a presentation** ● **Improve oral, written and visual communication skills by presenting project to the class**		
Basic knowledge		
1, 2, 3, 4, 14		
Specific skills	**Evaluation criteria**	**Operational descriptors of graduate profile**
CE 1, CE 2, CE 5	**1, 3, 5, 6, 7**	**STEM2, STEM4, CD2, CD3, CE1, CE3**
Evaluation tools		
Direct observation, evaluation of thinking routine journals, evaluation of digital presentations, co-evaluation, self-evaluation		
Individualized educational inclusion measures		
Heterogenous collaborative groups		
Description of activities ● **Introduction**: The teacher shows students a variety of containers with different substances in them: salt, sugar, baking soda, flour and cornstarch. The teacher explains that while the students have no idea what the materials are, their goal is to use the other materials at their disposal (water, vinegar, droppers, mixing bowls, spoons) to try to test the substances and find out what they are. At the same time, they will use the thinking routine "What Makes You Say That?": they will experiment, make claims and use the evidence discovered through their experiments to justify their claims. **(5 minutes)** ● **Development**: The 26 students will divide into groups (4 groups of 5 and 1 group of 6) and will rotate around a circuit of 5 tables, 1 for each mysterious substance. The students will have approximately 5-7 minutes to experiment and record their findings at each station. They will record their answers to the thinking routine steps in their journals. **(30-35 minutes)** ● **Create digital presentation**: For the remainder of the session and the first 20 minutes of the following session, the students will have to create a short slideshow presentation and present it to the rest of the class, explaining the tests they ran,		

what their conclusions are and the evidence they discovered to back up these claims. **(35-50 minutes)**
- **Group presentation**: The final 40 minutes of the 2nd session will be devoted to the students presenting their slideshows. **(40 minutes)**

Resources
Salt, sugar, baking soda, flour, cornstarch, water, vinegar, droppers, mixing bowls, spoons, laptops, digital board and projector, pens, thinking routine journals

Table 9: Sessions 4 & 5: Interpretive Choreography

Programming unit 1 Thinking Step by Step	TITLE Interpretive choreography	TIMING 2 hourlong sessions
Didactic/Learning objectives: ● Listen actively while trying to identify music elements that transmit emotions ● Practice using the thinking routine "Hear, Think, Wonder" and identifying situations where it could be useful ● Work collaboratively in a group to develop a choreographic presentation ● Improve nonverbal communication skills through facial expressions, gestures and body movements		
Basic knowledge		
9, 10, 11, 14		
Specific skills	**Evaluation criteria**	**Operational descriptors of graduate profile**
CE 3, CE 4, CE 5	1, 3, 5, 8	CEC2, CEC3, CEC4
Evaluation tools		
Direct observation, evaluation of thinking routine journals, evaluation of group choreography, co-evaluation, self-evaluation		
Individualized educational inclusion measures (example of reinforcement and extension activities)		
Heterogenous collaborative groups		
Description of activities ● **Introduction**: The teacher explains to students that the thinking routine they will practice is a variation on **"See, Think, Wonder"** and that instead of seeing a visual work of art, they will instead listen to different pieces of music. The music in question will be the pieces *Hens/Roosters*, *The Elephant*, *The Aquarium*, *Donkeys* and *Swans* from Camille Saint-Saëns's *Carnival of the Animals* (Melody Classical, 2015), although at first, the teacher will just play the music without telling the students the name of the piece. **(10 minutes)** ● **Development**: In groups of 5 (and one group of 6), students will choose one of the pieces of music and discuss together what they heard, what they thought about the music, the emotions it made them feel and any questions the music makes them wonder about. They will record their answers in their journals. After discussing, the groups will each have to come up with a short choreography that they feel fits the music and describes the answers they provided in their thinking routine journals. The teacher will provide each group with a laptop to be able to listen to the composition as many times as they need. **(final 50 minutes plus 20 minutes of 2nd session)** ● **Final activity**: The students will present their choreography together with the music for the rest of the class. After each class has presented their choreography,		

the teacher will tell students that the music is from a suite called *Carnival of the Animals* and that each piece is supposed to represent a different animal/s. Just for fun and as a motivating activity, each group will have to try to guess which animal their piece represented. **(40 minutes)**

Resources
Internet, speakers, music tracks, laptops, pens, thinking routine journals

Table 10: Sessions 6 & 7: Discussing different perspectives in a story

Programming unit 1 Thinking Step by Step	TITLE Discussing different perspectives in a story	TIMING 2 hourlong sessions
Didactic/Learning objectives: ● **Improve reading comprehension skills** ● **Practice using the thinking routine "Circle of Viewpoints" and identifying situations where it could be useful** ● **Foster collaborative skills and respectful discussion skills** ● **Promote creativity by designing a new ending to the story**		
Basic knowledge		
12, 13, 14, 15, 16		
Specific skills	**Evaluation criteria**	**Operational descriptors of graduate profile**
CE 4, CE 5, CE 8	**1, 3, 4, 5**	**CCL1, CCL2, CCL3, CCL4**
Evaluation tools		
Direct observation, evaluation of thinking routine journals, evaluation of creative writing product, co-evaluation, self-evaluation		
Individualized educational inclusion measures (example of reinforcement and extension activities)		
Heterogenous collaborative groups		
Description of activities ● **Introduction**: The teacher will give students copies translated into Spanish of the short story *All Summer in a Day* by Ray Bradbury (Bradbury, 1954). The class will participate in a group reading and each student will have a chance to read a part of the story. Once finished, the teacher will ask students to identify the characters and the main ideas of the story and write their answers on the board. **(25 minutes)** ● **Development**: Using the jigsaw group technique, the students will divide into 4 groups. Each group will be the "experts" and will have to use the **"Circle of Viewpoints"** ("I am thinking about the story from _____'s point of view", "I believe _____ because…" and "A question I have from this viewpoint is _____") thinking routine to discuss the perspective of each of the characters in the story: Margot, her teacher, her classmates and her family. After 5 minutes, the expert groups will be rearranged into new jigsaw groups so that each new group is made up of a mix of "experts" and each of these new mixed groups will have to talk amongst themselves about what was discussed in the "expert" groups and will then have to come up with a creative new ending for the story and write this down on paper. **(final 25 minutes of 1st session, plus 20 minutes of 2nd session)** ● **FInal activity**: Each group will take turns reading their new ending out loud for the rest of the class. The teacher will lead a reflective discussion asking students how		

they would feel if they considered each character's viewpoint. The teacher will give students time to write down the steps of the thinking routine and the answers to the questions in their journals. **(40 minutes)**

Resources
Board, copies of *All Summer in a Day* translated into Spanish, pens, papers, thinking routine journals

Table 11: Session 8: Solving a shady problem

Programming unit 1 Thinking Step by Step	TITLE Solving a shady problem	TIMING 1 hourlong session
Didactic/Learning objectives: ● **Practice using the thinking routine "Compass Points" and identifying situations where it could be useful** ● **Foster collaborative skills and respectful discussion skills** ● **Develop democratic principles and decision-making processes**		
Basic knowledge		
3, 5, 6, 14		
Specific skills	**Evaluation criteria**	**Operational descriptors of graduate profile**
CE 9, CE 5	**1, 3, 5**	**CCL1, CPSAA3, CE1**
Evaluation tools		
Direct observation, evaluation of thinking routine journals, evaluation of debate performance, co-evaluation, self-evaluation		
Individualized educational inclusion measures (example of reinforcement and extension activities)		
Heterogenous collaborative groups		
Description of activities ● **Introduction**: The teacher tells students that the school has a problem and that it's up to the class to solve it: the playground is too sunny and there's no shade! The teacher explains that the students will have to use the thinking routine **"Compass Points"** to analyze the situation and come up with a proposal for a solution. **(5 minutes)** ● **Development**: The students break up into groups of 5 (with one group of 6). In each group, they discuss the issue using the thinking routine where each compass point stands for a different idea or thinking step: N is for "need to know", where the students make a list of things they'd need for their proposal; E is for "excited", where the students list of the exciting things or potential benefits of their proposal; W is for "worrisome", where students try to anticipate problems and make a list of potential obstacles to their proposal; and S is for "stance", or the final position or conclusion the students reach after having discussed the other points and exchanged opinions. Finally, the students will record their thought process and the thinking routine steps they took in their journals. **(20 minutes)** ● **FInal activity**: After discussing the issue in small groups, the class will reassemble and discuss their ideas together. Based on the groups' proposals, the teacher will organize a small, informal debate between the students and an eventual vote, where each student will be able to choose the best proposal to solve the problem. **(35 minutes)**		

Resources
Pens, paper, thinking routine journals

5.10. Organization of learning spaces

All of the activities and sessions designed for *Thinking Step by Step* will take place in the group's regular classroom, with the exception of sessions 3 and 4, the interpretive choreography, in which the activity will be developed in the gym or another open space that gives the students enough room to properly prepare their choreographies. For the rest of the activities, the students' desks will be arranged in small groups to favor collaborative learning. For the mysterious substances activity, spare desks will be brought in from another class to be used as the experiment stations.

5.11. Human and material resources

The human resources involved in the development of the activities will be the teacher and the class of 26 students. As far as material resources, the sessions designed will make use of the following:

- Session 1: digital board, projector, Internet, *New York Times* photo series, thinking routine journals and pens. The students' desks arranged in pairs.

- Sessions 2 & 3: salt, sugar, baking soda, flour, cornstarch, water, vinegar, droppers, mixing bowls, spoons, laptops, Internet, digital board and projector, pens, thinking routine journals. The students' desks arranged in small groups of 5-6 as well as spare desks to put the materials on.

- Sessions 4 & 5: Internet, speakers, music tracks, laptops, pens, thinking routine journals.

- Sessions 6 & 7: board, copies of *All Summer in a Day* translated into Spanish, pens, papers, thinking routine journals. The students' desks arranged in small groups of 5-6.

- Session 8: pens, paper, thinking routine journals. The students' desks arranged in small groups of 5-6.

5.12. Attention to diversity and inclusion measures / Universal Design for Learning

To ensure that each student is able to take part in the activities in a way that allows them to reach their potential and fully benefit from the realization of the activity, the didactic proposal has been designed with certain inclusion measures. As the two students with special needs in the target group have conditions of a relatively low severity, within the curriculum they have been assigned curricular adaptations that require "ordinary measures" instead of "extraordinary measures", meaning that the evaluation criteria and other curricular elements cannot be modified. We can, however, ensure that the students are actively included in the dynamics by manipulating the group organization. By creating heterogeneous groups (mixing students with higher levels and/or faster learning rhythms with students who have lower levels and/or a slower rhythm), we can ensure that these students are able to participate, interact with their classmates and follow along with the pace of the sessions and don't get left behind.

The organization of groups is one of the most important ways that the teacher can control the variables involved in a didactic session and by organizing groups with a mix of students with different levels and abilities, the students are encouraged to help each other mutually and collaborate to ensure that the whole team reaches the learning goals.

5.13. Evaluation system

A series of different techniques and tools have been designed to evaluate the students' progress as well as the quality of the didactic proposal and the teacher's personal reflection on its effectiveness. The main observation technique to be used is that of direct observation, with the teacher observing the students as they take part in the various activities and recording these observations in an observation journal.

Apart from observing the students closely, the teacher has designed the activities in the sessions to be formative in nature, acting not only as a vehicle to provide students with quality learning situations in which to acquire knowledge and skills but also as a means for the teacher to provide the students with feedback. This formative evaluation will be used to evaluate the digital presentation in sessions 2 & 3, the choreography in sessions 4 & 5, the creative writing in sessions 6 & 7 and the debate in session 8, as well as to collect and

evaluate the thinking routine journals upon completing the didactic proposal. The tool used to evaluate these student products will be a rubric.

In addition to using formative evaluation techniques, the teacher will give students the opportunity to co-evaluate each other, also using a rubric.

Finally, the teacher will also complete a rubric as a way to self-evaluate/evaluate the usefulness of the didactic proposal and if it achieved its aims.

5.13.1. Evaluation criteria

The following evaluation criteria have been established for each of the didactic objectives planned in this didactic proposal. The evaluation criteria and objectives have been linked with the basic knowledge and specific skills to be acquired, as well as the operational descriptors of each key skill that will be developed in the didactic proposal and that will contribute to the students' eventual graduate profile.

Table 12: Relation between objectives and evaluation criteria and connection with basic knowledge, specific skills and graduate profile descriptors

Didactic objectives	Basic knowledge	Specific skills	Evaluation criteria	Graduate profile descriptors
Reflect on the basic structure, use and benefits of thinking routines and recognize the learning situations they can be applied in and record this information in a journal.	14	CE 5	1. Understands and applies the steps of the thinking routine, making appropriate use of the journal to record observations.	CPSAA4, CPSAA5
Develop critical thinking skills by learning to pause, analyze an image and think step by step to organize the thought process.	7, 8	CE 3, CE4	2. Analyzes the image carefully and methodically, applying the steps of the thinking routine and recording observations in the journal.	CPSAA4, CPSAA5, CCEC2
Strengthen creativity skills through group discussion and dialogue to invent a creative solution to a problem.	5, 6	CE 9	3. Participates actively and respectfully in the group discussion, offering original ideas and valuing others' ideas.	CCL1, CPSAA3, CE1
Improve reading comprehension skills through the use of short texts read in class.	12, 13, 15	CE 4, CE 8	4. Follows the rhythm of the class while reading, showing active listening skills.	CCL1, CCL2, CCL3, CCL4
Improve writing skills through the use of journals and creative writing activities.	14, 16	CE 5	5. Actively and creatively takes part in the creation of the ending of the story and makes correct	CCL1, CCL3, CCL4

			use of the journal during the sessions.	
Enhance digital skills through the production of a small group presentation using ICT programs.	**4**	**CE 1**	6. Contributes to the team effort of making the digital presentation and makes correct use of ICT devices.	**CD2, CD3**
Design and carry out basic scientific tests on different materials and come to reasoned conclusions by analyzing the results.	**1, 2, 3**	**CE 2**	7. Demonstrates a methodical and appropriate use of the materials available, recording the steps taken and basing logical conclusions off of the evidence gathered.	**STEM2, STEM4, CE1, CE3**
Effectively use body language and movement to convey ideas and emotions through original group choreography.	**9, 10, 11**	**CE 3, CE 4**	8. Shows an open and positive attitude toward working as a team and takes an active role in suggesting movements for the choreography.	**CEC2, CEC3, CEC4**

Source: own elaboration based on Royal Decree 157/2022 and Organic Law 3/2020

(LOMLOE). Structure based on Ribera (2024).

5.13.2. Evaluation tools

As stated above, the tools used in the evaluation of the didactic proposal will be direct observation and formative evaluation through the use of rubrics. All rubrics are included in the annexes.

Table 13: Indicative table of evaluation tools and evidence of learning

Evaluation tools	Type of evidence
Observation scale	Oral answers
Rubric	Written answers Products Performances

Source: own elaboration

6. Conclusions

The general objective of the present Final Degree Essay was to design an educational proposal that integrates the use of visible thinking routines into daily classroom activities in order to improve students' metacognitive competency. After the careful revision and selection of existing literature on the subject as well as the design of the didactic proposal, we can say that this objective has been achieved satisfactorily.

With regards to specific objective 1 (to identify and adapt specific visible thinking routines to fit the needs of 6th grade students and to implement them in general classroom activities), while the thinking routines employed in the didactic proposal were not actually adapted or modified in and of themselves, there was a significant selection process undertaken to carefully choose which of the Project Zero thinking routines would be most useful to students in the general sense. Within the 10 different categories of thinking routines proposed in the Project Zero toolkit (including over 165 distinct, step-by-step thinking patterns), the decision was made to center the proposal on a selection of the 10 core thinking routines. This pedagogic design decision proved fundamental in allowing the didactic proposal to be applied in various different academic subjects and in permitting students to familiarize themselves with thinking routines as vehicles to achieve metacognitive development without getting overly focused on the specifics of the routines themselves.

The second and third specific objectives (to evaluate the use of visible thinking routines in fostering autonomous learners who are metacognitively aware of their strengths and weaknesses and to evaluate the usefulness of the educational proposal based on student assessment as well as the teacher's self-assessment) were achieved through the development of the evaluation section of the proposal and were considered through several different angles: that of heteroevaluation, of co-evaluation and of self-evaluation. Additionally, an important window into the students' thinking processes was provided through the use of the thinking routine journal, a tool designed to help students externalize their thoughts and which also provided the teacher with invaluable information regarding their metacognitive development.

7. Final considerations

The limitations encountered while developing this Final Degree Essay were mainly associated with the creation of the theoretical framework due to the fact that, while there is a robust body of literature concerning the broader topic of metacognition, in regard to thinking routines, substantially less research has been carried out.

Another minor limitation of the didactic proposal that was discovered during its development was that certain thinking routines, despite being designed to be applicable in any context, seemed to only really fit in one or two specific subjects (for example, Circle of Viewpoints) and that, on the other hand, certain subjects seemed susceptible to the use of only one thinking routine (for example, mathematics).

Despite the few limitations encountered, the application of thinking routines presents several future lines of investigation for Primary Education, including designing longer didactic proposals to be followed throughout the school year and more focused proposals that include the application of a specific thinking routine systematically in one subject area over time. Another highly interesting and relevant line of research could be to expand the introduction of metacognition and thinking routines to the lower grades, thus benefiting even younger learners.

The development of this Final Degree Essay and the hours of bibliographic research and didactic design that it represents has been a challenging but highly rewarding academic experience for me. I had always been interested in the area of metacognition since I learned about it in my first year of the degree in the subject Personalized Education but I had never had the opportunity to really dive deeply into thinking routines or the didactic application of metacognition, so this was a very exciting and enriching project.

As we continue to evolve and progress as a society, continually adjusting and improving our educational systems, I'm convinced that helping our students to become independent and critical thinkers will become more and more of a priority and I'm positive that metacognition will take on an ever-increasing importance in reaching this goal.

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9. Annexes

9.1 Annex 1: Evaluation rubrics

Table 14: Teacher's rubric to evaluate students based on observations during activities

Evaluation Criteria	Excellent (4)	Good (3)	In progress (2)	Needs improvement (1)
Understanding	Student shows full understanding of the concepts	Student shows good understanding of the concepts	Student shows partial/incomplete understanding of the concepts	Student struggles to understand the concepts
Use of thinking routine steps	Student correctly and thoughtfully uses all steps of the thinking routine	Student uses all steps of the thinking routine with some depth	Student rushes through the steps and/or misses a step	Student fails to put into practice the steps of the thinking routine
Creativity	Student volunteers creative and original proposals	Student occasionally volunteers an original idea	Student limits themself to go along with the ideas of others	Student does not provide any ideas or engage with others' ideas
Communication	Student communicates their ideas in a clear and organized way	Student communicates their ideas with minimal difficulty	Student communicates their ideas with disorganization	Student struggles to communicate their ideas with classmates
Teamwork/Group discussion	Student works very well in a team and always participates in group conversation in a respectful way	Student works well in a team and sometimes participates in the conversation	Student shows minimal participation in the conversation	Student barely participates and/or causes problems or distractions for the team

Table 15: Student's rubric for co-evaluation of teammates

Evaluation Criteria	Excellent	Good	Needs work
They communicated their ideas clearly	🥳	🙂	🤔
The used the steps of the thinking routine correctly	🥳	🙂	🤔

They listened, shared ideas and were a good teammate	🥳	🙂	🤔
They participated actively and gave their best effort	🥳	🙂	🤔
The thing I liked best about their work is…			
One thing I think they could improve on next time is…			

Table 16: Teacher's rubric for self-evaluation/evaluation of the didactic proposal

Evaluation Criteria	Yes	No
Were the activity instructions clear and easy for students to follow?		
Were the students engaged/motivated by the activities proposed?		
Were the students able to put the thinking routines into practice?		
Did the thinking routines help students to better conceptualize and manage their thinking processes?		
Was the activity organized and carried out properly?		
Was the activity completed within the time limit established?		
Were the didactic objectives reached?		