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THINKING SKILLS AND LEARNING STRATEGIES: USING THE MYSTERY APPROACH WITHIN PRIMARY EDUCATION

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Abstract

Early critical thinking and sustainability awareness development is crucial for equipping future generations to handle global issues in an increasingly complicated and interconnected society. This study examined how 9-year-old primary school students applied their knowledge through a collaborative Mystery assignment, demonstrating a Thinking Skill Learning Strategy within education for sustainable development. The Mystery Learning Strategy supported holistic and pluralistic educational approaches, fostering critical thinking, social interaction, and individual development within a socio-cultural framework. Inspired by lesson study principles and based on participatory observations, the findings revealed that while the Mystery approach is dynamic and engaging, it requires careful facilitation to be effective. The study demonstrated that collaboration and critical reasoning were fostered among students. By working in groups, sharing ideas, and building on one another's suggestions, students engaged in communication, active listening, and the integration of diverse perspectives. Future research could investigate the long-term effects of the mystery approach on developing critical thinking skills and enhancing sustainability awareness in younger students.

Keywords: Critical thinking, envisionment, learning strategies, play-based learning, primary education.

INTRODUCTION

Critical thinking transcends mere memorization, urging students to draw connections between concepts, solve problems, think creatively, and apply knowledge in innovative ways (Facione, 2009). These skills are essential not only for success in various academic disciplines but also for valuable functioning in everyday life (Simonovic et al., 2023). This study explores how young primary school students can actively apply their knowledge through an assignment that requires them to engage socially and practically with one another to solve a so-called Mystery. This assignment exemplifies a Thinking Skill Learning Strategy within the context of Education for Sustainable Development (ESD). The ability of critical thinking is most evident in situations where students are encouraged to make decisions based on the circumstances, content, or dilemmas they face (O'Reilly, 2022). Critical thinking is defined here as the capacity to identify the issue at hand, evaluate significant suggestions, and reason critically before arriving at a decision. One objective of education that fosters critical thinking is to enhance students' ability to analyze situations, make interdisciplinary connections, and understand how these abilities can be applied in real-life contexts (Simonovic et al, 2023). Vincent-Lancrin et al. (2019) describe critical thinking as a detective-like approach to thinking, emphasizing imaginative and creative aspects. Ennis (2018, p.166) defines it as "reflective thinking focused on deciding what to believe or do". The process of critical thinking involves several key skills, including being analytical, that is scrutinizing something methodically, predicting outcomes, recognizing patterns, questioning presented evidence, incorporating diverse perspectives, connecting disparate ideas, and envisioning various explanations (Facione, 2009; Simonovic et al., 2023; Ennis, 2018).

By engaging students in activities that require these skills, educators can help students develop a more profound and flexible approach to learning and problem-solving, including issues of sustainability, preparing them for the complexities of today's world.

In this study, I integrate Vygotsky's theoretical insights with Biesta's educational functions of qualification, socialization, and subjectification, and Judith Langer's theories of Envisionment to create a comprehensive framework. Vygotsky posits that individuals learn to navigate the future world through their ability to imagine. Practicing imagination is crucial for envisioning alternative futures. Imagination broadens an individual's experiences by enabling them to conceive of what is not present and to conceptualize others' narratives and experiences (Vygotsky, 1995). Imagination and fantasy build on elements of reality derived from previous experiences, making the richness of an individual's experiences essential for creative activities. Through envisioning, a person can picture various scenarios by combining prior experiences with enhanced knowledge and transformed elements of reality, such as when reading or hearing about events and places they have not personally witnessed. Emotions play a crucial role in these processes. Building on Vygotsky's theoretical insights, Biesta's (2020) framework of the three educational functions serves as a valuable tool for planning, conducting, and analyzing this study's specific activity. Qualification concerns the acquisition of knowledge, skills, and understanding that enable students to perform tasks and act. This function encompasses education's role in fostering development, growth, and cultural literacy. Socialization implies integrating individuals into established ways of thinking and behaving. It ensures the survival of culture and tradition by working to transmit particular norms and values.

Subjectification highlights the individuality and agency of humans. It represents the expression of personal independence from societal norms. Although subjectification can be seen as a counterbalance to socialization, emphasizing the individual's uniqueness rather than the group's collective identity, it remains a relational concept. Langer's theories of Envisionment further enhance this study by providing a specific approach to how students engage with content. Langer describes envisionments as "the worlds of knowledge in our minds that are made up of what we understand and don't about a particular topic or experience at any point in time" (Langer, 2011, p.17). Langer's five stances of Envisionment are used in the study's analysis.

This study aims to investigate the ways in which the Mystery Learning Strategy affects the critical thinking, interpersonal relationships, and personal growth of nine-year-old primary school pupils. Specifically, the study aims to examine how students engage in problem-solving activities, collaborate with peers, and develop a sense of agency through participation in simulated mystery scenario, including issues of sustainability. The study is guided by three questions: How does the Mystery Learning Strategy impact the development of students' critical thinking skills and problem-solving abilities (Qualification)? In what ways does participation in the Mystery learning activity influence students' social interactions and collaborative behaviors (Socialization)? How does engaging with the Mystery Learning Strategy contribute to students' sense of agency, identity, and personal growth (Subjectification)?

Mystery as a Method to Enhance Students' Critical Thinking Skills

The Mystery Learning Strategy enhances logical thinking and encourages students to take initiative. The intention is to enable students to apply their knowledge and abilities to various situations, identify potential solutions, and solve problems. Finding suitable answers is the goal of problem-solving, whereas selecting from a variety of options is the goal of decision-making.

Working with mysteries involves group work and cooperative learning, which helps broaden students' worldviews and exposes them to different methods of approaching and resolving issues (Ehlers et al., 2008). The aims of the Mystery Learning Strategy align well with a holistic/pluralistic approach to ESD (Jickling et al., 2018; UNESCO, 2020; Häggström & Schmidt, 2020; Tryggvason, 2023). The Mystery approach enhances students' creative abilities and imagination by engaging them in activities where they must observe clues, listen actively, and practice reflecting and reacting to what is said and visualized (Leat & Nichols, 1999). During a mystery session, students develop their communicative skills by reasoning, arguing, persuading, responding to, and sometimes agreeing with others' suggestions. Creativity—here defined as thinking in novel and creative ways—is a key component of critical thinking that is highlighted in a mystery exercise. This method promotes flexibility and

open-mindedness in thought, as well as curiosity, the investigation of novel behaviors, awareness of one's environment, and meticulous attention to detail.

The strategy promotes several important skills that are often highlighted in ESD. These include collaborative skills and learning to value and integrate diverse perspectives. The iterative process of hypothesizing, testing, and revising theories within a mystery scenario mirrors scientific inquiry, thereby strengthening students' ability to engage in scientific reasoning. In the present study, the mystery was employed as part of a Storyline approach, where students have created characters. The mystery they need to solve was a specific incident, which required students to consider different perspectives and reason through various options, and collaborate to agree upon a solution to the problem.

Pedagogical Departure

The teaching and learning methodology of Ehlers et al. (2008), which is founded on the Thinking Skill Learning Strategies created by David Leat and Peter Fisher in the 1990s, served as the model for this study. These tactics' main goal is to change teachers' attention from giving "the right" response to helping pupils become more capable of learning on their own.. These skills include the ability to reflect on their own thinking and learning. By applying these strategies, it is anticipated that students will develop the competence needed to understand various subjects and societal changes related to ESD. Following Ehlers et al. (2008), thinking skills strategies have a five-step structure. The first is the planning phase, in which the specific thinking skill strategies are identified and defined. Then, the teacher presents the strategy for the students, revealing necessary information, putting emphasis on the procedures. Thirdly, the teacher leads the activities, monitoring the students while they work. If required, the teacher can guide the students by asking open and reflective questions. Here, the teacher takes notes from the evolving conversations, to be used in the debriefing. Fourthly, the debriefing starts, and the students talk about how they solved the tasks they have worked with, and specifically how they solved challenges that arose. The last step highlights how the students solve the whole task, contextualizing their findings, and connecting the knowledge to other fields and topics. The work is organized into small group activities, where dialogue is essential for student learning, and is concluded with a whole class debriefing session to consolidate understanding. In this study the first four steps in managing the TS learning strategies with the students were applied, in accordance with the specific assignment called the mystery with the missing plants.

Critical Thinking in Education: A Multifaceted Approach

There is a substantial body of research on critical thinking, encompassing various definitions and perspectives (Yuan et al., 2022; Vincent-Lancrin et al., 2019; Willingham, 2020; Cáceres et al., 2020). Most national curricula within OECD countries emphasize critical thinking as a key competency that students should develop as part of their education, underscoring the importance of fostering creativity and independent thinking (Vincent-Lancrin, 2023). In the Swedish curriculum, as in many others, this ability is linked to the goal of cultivating democratic citizens through experiential learning, understanding democracy by practicing it (National Agency for Education, 2022). This educational objective entails imparting fundamental knowledge about democratic processes and principles, particularly those rooted in Western democratic traditions. It gives pupils the chance to understand the fundamental principles of democracy and cultivate their capacity for democratic cooperation and thinking.. Such an approach is intended to enhance students' sense of agency, encouraging them to participate actively in their communities, voice their opinions, and become proactive citizens. The Council of Europe similarly emphasizes the role of education in preparing young people to be active societal participants and responsible individuals, especially in multicultural and rapidly changing societies, and during times of economic and political crises (Vincent-Lancrin, 2023). ESD integrates these critical thinking and democratic principles, aiming to equip students with the skills and knowledge necessary to address complex global challenges, fostering a sustainable and equitable future. However, achieving this democratic ideal in schools poses significant challenges, particularly regarding student participation. There exists a power imbalance between adults and children, and teachers and students,

which affects students' independence and their reliance on teachers (Thornberg & Elvstrand, 2012). Thornberg and Elvstrand argue that the structural constraints of the school system limit students' autonomy, even as it expects them to act independently within these confines. Therefore, pedagogical practices are crucial in shaping students' opportunities for democratic experiences. The Thinking Skills Learning Strategy, the mystery approach, and ESD share similar aims, emphasizing the development of critical thinking, student agency, and the ability to engage meaningfully in democratic and sustainable practices.

Mystery approaches in education

The mystery was employed as a strategy for fostering and diagnosing relational thinking in Karkdijk's (2021) doctoral thesis, which investigated secondary students' geographical relational thinking. The results were intended to provide teachers with potential insights into strategies for enhancing this thinking skill among their students. Karkdijk highlights several advantages of using the mystery strategy. He claims that it can significantly positively affect students' relational thinking in geography by engaging them in active problem-solving and critical thinking. During the debriefing sessions, students provided more concrete explanations, indicating a deeper understanding of the relationships between geographical concepts. These explanations often involved linking specific geographical phenomena to broader patterns and processes, showing that relatively easy-to-establish relationships dominated their explanations.

In their descriptive article, Macchi and Ridle (2012) highlight the use of role-play and non-verbal communication in a mystery. This practice brings the concepts to life, as students observe and engage with the concepts being acted out by their classmates. Role-play and non-verbal communication offer several advantages over traditional teaching methods. By taking on different roles, students can explore multiple perspectives and develop empathy, which enhances their ability to grasp complex concepts and relationships (McNaughton, 2014). Through the engagement of several sensory modalities, nonverbal communication—such as body language and gestures—helps reinforce learning. It frequently takes direction from the instructor and more time to interact with the characters and the scenario when using characters to explore imaginary worlds.. These interactive strategies align closely with the principles of play-based learning, which emphasize the importance of exploration and creativity in the educational process.

Play-Based Learning

Play-based teaching and learning is a child-centered pedagogy that promotes children's development by harnessing their innate inquisitiveness and exploratory behavior (Hunter, 2019). Aiono (2015, p. 2) asserts, "In order for them to continue to grow this disposition, they must feel connected to their learning environment and confident in their abilities as a learner". However, play-based learning is often considered primarily a pre-school educational strategy, and its suitability for primary school settings has been questioned (Aiono, 2020; Briggs, 2012). In accordance with Aiono (2020, p. 8), play-based learning in this context is defined as "the adult facilitating and encouraging children's play while simultaneously aligning learning outcomes." This definition underscores the dual role of adults in guiding play activities and ensuring that these activities meet educational objectives. Aiono (2020) argues that the phrase "learning through play" recognizes play as a powerful medium for learning, where children can develop critical thinking, problem-solving skills, and social interactions within a structured yet flexible framework. Play-based learning is also recognized as a holistic pedagogical approach, addressing the comprehensive development of children by integrating cognitive, social, emotional, and physical growth. The integration of play-based learning in primary education can bridge the gap between the genuine learning tendencies of young children and the more structured learning environments of primary schools. Research indicates that play-based learning enhances academic outcomes by promoting active engagement, creativity, and motivation (Aiono, 2020; Bergen, 2009; Blucher, 2017). Similarly, Susanti (2024) demonstrates that incorporating stories and fairy tales with problem-based approaches and social interaction are effective strategies for enhancing critical thinking skills in primary school children. Susanti emphasizes that young students typically have limited

attention spans and require engaging and enjoyable learning experiences. Therefore, educational approaches should be tailored to suit these characteristics to ensure effective learning. The task included in the study presented in this article is a play-based, small-scale mystery.

METHOD

The study was inspired by the principles of lesson study (Baumfield et al., 2022), which encompassed three distinct stages: 1) the preparation of a detailed lesson plan, 2) the observation of a live lesson, and 3) the subsequent analysis of the lesson. A comprehensive lesson plan was developed, incorporating specific learning objectives, instructional strategies, and anticipated student responses. The second stage involved the observation of the lesson as it was delivered in real-time, which facilitated the collection of empirical data on student interactions, engagement, and the effectiveness of the instructional strategies employed. The final stage consisted of a thorough analysis of the observed lesson. Participatory observations allowed for gaining a deep, nuanced understanding of the group by blending observation with active engagement (Pedersen Dalland et al., 2021). The empirical data comprises field notes, audio recordings, and photographs of the table setting, specifically excluding any images of students. Seven groups, each consisting of three to five students, participated in the study. Each event lasted between 20 and 40 minutes.

Reflexivity and Ethics

The study adheres to the core ethical principles outlined by Ethical Research Involving Children (ERIC, 2013) and complies with the requirements for research ethics in Sweden (Swedish Research Council, 2017) and the General Data Protection Regulation (GDPR), and the University of Gothenburg's recommendations. When conducting this kind of study, certain ethical aspects must be considered. Understanding the classroom culture and the specific dynamics of a group of 9-year-olds is essential. Ensuring a safe environment is paramount; the researcher must be vigilant about the physical and emotional safety of the children during participatory observations. Children might initially see the researcher as an authority figure. Engaging in activities at their level and showing genuine interest in their play helps build trust. With younger students, balancing participation and observation is critical. Too much involvement can influence their behavior, but too little can make it hard to gain meaningful insights. Extra considerations were taken according to the Mystery Method, role play, and play-based learning. Younger children often need more guidance and support during role play and play-based learning activities. As a researcher, I had to balance observation with providing appropriate scaffolding. The activities were designed to keep the children engaged and accounted for their shorter attention spans. Since children often communicate through non-verbal means such as gestures and facial expressions, carefully documenting these cues was crucial for a comprehensive understanding. Throughout the research process, the rights and interests of the students have been prioritized, ensuring their best interests and potential benefits are consistently considered. Data was anonymized to protect privacy.

Data Analysis

In this study, I employed a deductive qualitative method (Drisko & Maschi, 2015; Bingham, 2023) analyzing the empirical material through the theoretical lenses. This approach involved creating codes derived from the components of the theoretical framework. In addition to Biesta's three educational functions, Langer's five steps of envisionments served as an analytical framework:

1. **Being out and stepping into an envisionment:** Students relate new material to their prior experiences and knowledge, searching broadly without knowing exactly what they are looking for, thereby taking initial steps into envisionments.

2. **Being in and moving through envisionment:** Students become more immersed in the material, making connections and enriching their understanding through deeper engagement.

3. **Stepping out and rethinking what you know:** Students use emerging envisionments to enhance their understanding or rethink their prior knowledge, becoming aware of and questioning their own understandings.

4. **Stepping out and objectifying the experience:** Students distance themselves from their envisionments to analyze, evaluate, and synthesize their learning, reflecting on their process and comparing new knowledge to other contexts.

5. **Leaving an envisionment and going beyond:** Students apply their well-developed envisionments to new situations, moving from one learning experience to another and using their knowledge in new contexts.

The material was analyzed from a concrete level to a more theoretical one. The first phase consisted of a spontaneous analysis, sometimes including illustrative quotes from the data, to identify prominent themes and patterns emerging from the raw data. The final phase was the deductive analysis, where the data were examined through the pre-established theoretical framework. This allowed for a more structured and detailed interpretation, linking empirical findings to broader theoretical constructs. During the initial review of the data, broad topical categories of interest were established based on the research questions. Subsequently, the data were sorted into these predefined categories (see table 1.) allowing for a structured and systematic analysis directly related to the theoretical framework (see e.g., Bingham, 2023). By progressing from a spontaneous to a more structured deductive analysis, this approach ensured both the discovery of emergent themes and their alignment with existing theories, providing a robust and comprehensive understanding of the data.

Table 1. Examples of analysis of empirical material.

Categories	Example of sayings and doings	Interpretation	Theoretical note
Engagement and motivation	"Look at that! What is that? Can you move it?"	Showing excitement, talk and laugh and play.	Socialization Stepping in to envisionment
Critical Thinking and Problem-Solving Skills	"It cannot be them because there is no soil around them".	Analyze the whole situation, asking questions.	Qualification Moving through envisionment
Systems thinking	"It can be this person. She does not have a home. She was perhaps hungry and took the fruit".	Making interconnections between social, economic and environmental systems.	Qualification Socialization Stepping out and rethinking
Links to sustainability issues	"He was hungry and has no family".	Link to hunger and social exclusion.	Qualification Stepping out
Collaboration and communication	They resonate and build on each other's ideas.	Talking and listening to each other, developing new ideas.	Qualification Socialization Subjectification Objectifying
Creativity and Imagination	They resonate and build on each other's ideas.	Developing the story through play and envisionment.	Socialization Moving through envisionment
Roleplaying and storytelling	They change their voices.	Talk and act as their character.	Socialization Moving through envisionment
Empowerment and agency	They argue for their suggestions.	Taking initiative and decisions.	Subjectification Objectifying

The study context

This study was conducted at a non-profit primary school that emphasizes democratic pedagogical methods, as highlighted on its website. As part of this approach, all classes and teachers implement a Storyline every year, allowing students to actively influence their education. The school has maintained

a strong environmental focus since 2014. The class involved in this study was a grade 3 class consisting of 27 students aged 9-10. The students represented a diverse mix of immigrant backgrounds from various parts of the world and came from different socio-economic, religious, and cultural backgrounds. There was an equal representation of girls and boys.

The mystery included in this study was part of a Storyline called The Park. All students created a character who would encounter various challenges as the story unfolded. During the mystery assignment, 8 groups of 3-5 students entered a room where a model of part of the park was set up on a table. On the table, a scene depicting a park with a small pond was arranged. On one side, there was a small forest area, and next to it lay a person covered with a plastic bag. On the opposite side, there was a park bench, next to which stood a bicycle with two shovels. A person sat on the bench, gazing out over the pond, where two birds were swimming. At one end of the park, two people were having a picnic, sitting on a blanket in the grass. To their left, there was a flower bed that appeared to have been vandalized, with all the bushes uprooted and soil scattered far beyond the bed. In the flower bed lay a ball and nearby was a football jersey. The event began with a brief introductory story about a peaceful morning in the park. However, something was amiss: someone had visited the park and uprooted the valuable fruit plants that the students' characters had planted the previous week. Who could it be, and why? What did they intend to do with the fruit? This mystery is what you are now tasked with solving. The students were then provided with several clues to investigate; traces of animals, a forgotten team jersey, an elderly man sitting on a bench who mentioned seeing a small work vehicle with two men carrying shovels, and a homeless person sleeping at the edge of the forest. After some time, the students' attention is directed to three buildings nearby to the park: a preschool, a youth center, and a store. They are asked to consider whether anyone from these buildings might have been involved in the incident.

RESULTS

This section presents the study's results in relation to the research questions, Biesta's three educational functions and to envisionment.

Development of students' critical thinking skills and problem-solving abilities (Qualification)

During the activity, students first surveyed the terrain, examining the park area, noting what was present, who was there, and speculating about the actions of these individuals. Their aim was to describe the scene and identify what might have caused the disturbance in the flowerbed. One student explained, "Look here, this guy brought a football, kicked it, and then ran off, just like, oh, oh dear. So, the ball ended up in the flowerbed. Then he hid here and threw it to someone else." Another student supported this explanation, seemingly eager for a quick resolution to the problem: "The homeless man was wearing a shirt, playing football, accidentally kicked the ball into the plant, got stressed, threw off his shirt, ate all the fruits, and then hid there! So, no one would see him."

After that, they looked for traces and other indicators that would point to a possible plant crime offender.. Many students considered soil outside the flowerbed a potential clue; where there was soil, the offenders might have moved. One student said, "It can't have been the pigs, because there's no soil around them." They also looked for other clues, like hair from the individuals or stains from the fruits.

In a deeper analysis, the students began discussing motives behind the act. Why would someone steal the valuable fruit plants? The students primarily identified two underlying reasons: to satisfy hunger or for economic gain, such as selling the plants for money. In their reasoning, the students tried to understand who reasons might have to commit these acts. Several students in different groups pointed to the homeless man as a potential candidate for the theft. "It's him, the homeless man!" said one student. "Yes, because he is lying so close to the flowerbed!" confirmed another student. "I think he was hungry," the first student replied.

Although there were no indications of the usual picnic supplies, such as cups, a picnic basket, or traces of bread or other food, the duo on the blanket was suspected in a few groups because they were enjoying a picnic.. One student explained, "They don't have a picnic basket, so they took the berries instead. There's a bit of soil on the blanket." Several students also pointed to the two pigs, since pigs are

expected to root and dig in the soil and seem capable of eating almost anything. Some also believed that the duck or seagull might have eaten the berries, but they struggled to explain where the bushes had gone. Regarding the second motive, that someone stole the plants to sell them, the analysis did not progress to discussing the underlying reasons behind this motive. It seemed sufficient to assume that wanting money was a strong enough motive. The possible uses of the money, such as poverty driving the actions, were never discussed.

Students' social interactions and collaborative behaviors (Socialization)

The various groups exhibit different approaches after listening to the introductory story. Some groups quickly become excited and start searching for clues and traces around the park while conversing and sharing their ideas with each other. They engage in associative thinking and validate each other's thoughts and ideas, making most suggestions seem possible. This can be likened to a verbal mind map where all ideas are considered. Subsequently, they begin to argue for their own ideas. Occasionally, peers agree with the arguments presented. However, quite often, they counter with their own arguments without, it seems, fully listening to and considering each other's ideas. When the group was asked to agree on a suggestion about who they think is the most likely suspect, most groups once again offer different suggestions. They did not reach a consensus on rejecting some proposals or ranking them. The suggestions remained equally possible for the students.

There are also examples where students tried to reason why someone is a suspect. The following exchange exemplifies such a passage:

"Seagulls are always around when you have a picnic! So it could be them."

"But then it would be dirty!"

"The seagull might have bathed here afterwards (pointing to the pond)."

Seagulls don't usually go into the water. Do they?"

"Yes, they do!"

Some collaborative conversations focused on systematically solving the problem:

"We need to check, where is that thing you found earlier?"

"The hair?"

"Yes. We can take all the people and compare to see whose hair is most similar."

"This one isn't similar!"

"But it could actually come from the clothes. That guy over there has brown shoes."

"No, this is light brown."

"It's probably from another character."

Students' sense of agency, identity, and personal growth (Subjectification)

During the activity, students energetically engaged by searching for clues and sharing their ideas, demonstrating a sense of agency. Their excitement and positive behavior in investigating the mystery showed that they felt empowered to contribute to solving the problem. The process of proposing hypotheses and debating their validity indicates that students were exercising their decision-making abilities. As students took on different roles within the group (such as leaders, supporters, or skeptics), they were exploring and expressing aspects of their identities. The way they interacted and asserted their ideas reflects their individual personalities and how they see themselves in a group setting. Students' willingness to argue for their own ideas and hypotheses shows a sense of ownership and personal investment in the activity. The need to discuss, argue, and sometimes reach a consensus helped students improve their collaborative skills. Even though collaborative discussions were not always successful, the effort to work together shows growth in their collaborative skills.

Being out, stepping in, moving through an envisionment

The scenery and the introductory story facilitated the students' immersion into the activity. Some students were hesitant at first, needing time to understand the purpose of the activity and the type of rules that might apply in such an educational situation, as opposed to more traditional instruction. However, since all the students in the class had participated in two previous storyline projects and were now engaged in a third, I knew they were familiar with role-playing and play-based learning. In many groups, students fully embraced their roles as their created characters, which supported their immersion into the imaginative world. In some groups, play came naturally, allowing students to remain in the imaginative scenario for extended periods. They turned to me, indicating that I should assume the roles of some of the people present in the park. In one group, the students' characters became police officers on a surveillance mission to observe if anyone entered the park at night. Even though the students knew it was all pretend and that no outsiders would come, it became very exciting for them. They hushed each other and giggled, as if the surveillance was real. They altered their voices when interrogating those they deemed particularly suspicious. However, it seemed more challenging for them to step out of the imaginative world, take a step back, and discuss their proposals more objectively. Being in the fictional world appeared enjoyable, while distancing themselves and engaging in reasoning seemed more demanding.

DISCUSSION, CONCLUSION, and SUGGESTIONS

In summary, this activity, which was a minor part of a larger storyline project, aimed at enhancing students' awareness and knowledge about sustainability, was designed to develop students' thinking skill strategies. Consequently, the activity was considered one of the Storyline's key incidents and a method to address the aspects of thinking skill learning strategies outlined in this article. As such approach is viewed as a crucial component of ESD, the activity aimed at enhancing important abilities and competencies. The following section discusses key points of the results and concludes with final observations.

Critical Thinking Skills During the Activity

Implementing a mystery with 9-10-year-old students has its benefits and obstacles. Firstly, the emotional and affective aspects of working with a mystery at this age are crucial for students' motivation and engagement, which are essential for the learning process. When students find the teaching and learning activity enjoyable, fun, and appropriately challenging, they are likely to remain engaged (Aiono, 2015). The combination of cognitive and emotional aspects of the activity was prominent. Balancing is a keyword, particularly regarding play and reality, fiction and fact, being immersed in an envisionment, and stepping out again to reflect (Langer, 2011).

Play-based learning seems to work well with these students, but it is necessary to balance play with reflective work, or rather, learning through play and learning through discussion and reflection (Aiono (2020). It was important for students to recognize the learning aspects of both activities, which required scaffolding to help them identify these aspects. For instance, teachers can scaffold students by guiding them through questioning techniques and provide prompts that encourage deeper thinking (Ehlers et al., 2008). Thus, the question arises: What does it mean to learn something, and consequently, what is knowledge? This epistemological question is crucial for teachers to reflect upon before conducting a mystery, as it frames the educational objectives and outcomes of such activities.

So, what specific critical thinking skills are developed through this mystery? The results align with previous research on mystery-based learning as an effective tool for fostering critical thinking and problem-solving skills. Ehlers et al. (2008), Leat & Nichols (1999), and Karkdijk (2021) emphasize that mystery-based learning encourages students to engage in inquiry-driven exploration, guiding them to analyze evidence, formulate hypotheses, and refine their reasoning. The students' ability to observe details, generate multiple explanations, and apply logical reasoning reflects the iterative process of hypothesizing, testing, and revising theories, as noted by Karkdijk (2021). The integration of role-play, where students took on investigative roles, aligns with Macchi & Ridle (2012), who highlight how

embodying different perspectives enhances reasoning and engagement. The play-based aspects of the activity, where students actively explored clues and debated their ideas, are supported by Hunter (2019), Aiono (2020), Briggs (2012), Bergen (2009), Blücher (2017), and Susanti (2024). These studies collectively underscore that structured play fosters deeper learning, cognitive flexibility, and motivation, all of which were evident in the students' ability to analyze clues, eliminate unlikely scenarios, and develop plausible explanations. The findings reinforce that mystery learning, role-play, and play-based approaches work synergistically to promote higher-order thinking and problem-solving in sustainability education. Even though several students brought up hunger and financial gain, it was more difficult to analyze the reasons behind the theft. By posing open-ended questions and bringing up points the students might otherwise overlook, the instructor can assist the students in this situation.

The development of these critical thinking skills through the mystery activity not only aligns with the objectives of the Thinking Skill Learning Strategy but also supports the goals of ESD (Jickling et al., 2018; UNESCO, 2020; Häggström & Schmidt, 2020; Tryggvason, 2023). ESD aims to equip learners with the knowledge and skills needed to promote sustainable practices and make informed decisions that benefit society, the economy, and the environment. By fostering critical thinking, problem-solving, and the ability to analyze complex situations, the mystery approach contributes to a holistic understanding of sustainability issues and prepares students to address real-world challenges. Having explored the development of critical thinking skills through mystery activity, it is essential to consider the didactic implications of this approach for broader educational practice.

Didactic Implications

The results indicate several aspects that are important to consider before conducting a mystery activity. It is likely that students need practice in engaging with a mystery to understand its purpose and what is expected of them. One such aspect is the ability to balance the enjoyable elements of play with the need for critical reflection and learning (Hunter, 2019; Susanti, 2024). According to Aiono (2020), play-based learning involves adults facilitating and encouraging children's play while aligning activities with educational outcomes. The results showed that students found it challenging to transition from being immersed in a fictional world to engaging in reflective and objective discussion, highlighting the importance of planning how to achieve this balance. Teachers need to ask themselves: What specific strategies can be used to facilitate play-based learning effectively, and how can they guide students without dominating the activity?

Another key point to discuss with students, as mentioned previously, is that learning and learning outcomes encompass more than just factual knowledge. Learning also involves enhancing skills, abilities, and competencies. This study evidenced that collaboration and reasoning were promoted. Students had to work in groups, share ideas, and build on each other's suggestions, which involved communication, listening, and integrating different perspectives. The process of students reflecting individually and collectively mirrors Vygotsky's notion of the Zone of Proximal Development (1978), where learners achieve higher levels of understanding through social interaction and scaffolding provided by peers and teachers.

Creativity and imagination are core aspects of the mystery approach (Ehlers et al., 2008; Leat & Nichols, 1999; Karkdijk, 2021), which teachers should highlight as important abilities for envisioning alternative futures. Some explanations, such as the homeless man getting stressed and eating all the fruits, demonstrate imaginative thinking. Creativity is a component of critical thinking that involves looking at problems in new ways and thinking outside the box. Vygotsky (1995) emphasizes the importance of social interactions and cultural tools in cognitive development, highlighting how imagination and creativity are cultivated through collaborative and socially situated activities. The results also indicate that these young students needed guidance and a highly present teacher. For example, pausing to reflect on the group's suggestions, sorting, and ranking them according to perceived credibility. Some students had difficulties listening to their classmates. All groups showed challenges in finding a common solution based on a critical discussion where they could present arguments and counterarguments to support their hypotheses. Such a critical discussion could help refine students' collective understanding

of the situation, although reaching a consensus is challenging. The teacher could facilitate students in revisiting and reevaluating ideas based on new evidence or persuasive arguments. The difficulty in reaching consensus indicates the complexity of the problem and the students' varied perspectives. Being able to provide integrated, holistic explanations is mentioned as a way of thinking that makes thinking skill learning strategies powerful for young people.

Conclusions

In summary, the mystery approach, based on play-based learning, offers a dynamic and engaging educational method that can significantly benefit primary school students, by fostering intrinsic motivation for learning and supporting holistic development. This method is particularly suitable for ESD as it encourages active, engaged learning, and prepares students for future academic and personal success. However, this approach requires careful facilitation. In some groups, external guidance from the teacher was necessary to help students focus, reflect, and discuss effectively. The teacher's role in asking open-ended questions and pointing out clues is crucial for facilitating collective decision-making. Additionally, some students need scaffolding to fully embrace the play, adopt a character, and move seamlessly between engaging in the mystery and reflecting on its learning potential. This scaffolding might also include support for the teacher in managing these transitions.

Suggestions for researchers

Future research on the Mystery Learning Strategy could explore its long-term impact on critical thinking development and sustainability awareness in younger students, as well as its adaptability across different age groups, cultural contexts, and subject areas to promote interdisciplinary learning. Investigating teacher implementation challenges, such as the high level of guidance required for effective facilitation, would be valuable, particularly in larger or under-resourced classrooms where such support may be limited. Further studies could also assess student engagement, emotional involvement, and the role of playfulness, as well as explore technology-enhanced approaches to determine how digital tools might support or hinder the mystery approach in diverse educational settings.

Suggestions for practitioners

Teachers should facilitate students' transition between play and reflection by using open-ended questions to stimulate critical thinking. A balance of immersive play and structured discussions, reinforced by debriefing sessions, enhances learning. Group problem-solving fosters collaboration, while mystery scenarios addressing real-world sustainability challenges add relevance. Activities should offer diverse learning styles for accessibility. Encouraging student initiative fosters ownership, while varied assessment methods, such as self-reflection and peer evaluations, offer valuable insights. Professional development opportunities can support educators in effectively implementing the mystery approach.

Limitation of the study

This study is a pilot study, meaning that its findings are preliminary and should be interpreted with caution. One key limitation is the small sample size, as only a limited number of students (aged 9-10) participated. This restricts the generalizability of the results to broader educational settings and different age groups. The study was conducted in a specific school environment that emphasizes democratic pedagogical methods, which may not reflect the conditions of other educational contexts. Another limitation is the high level of teacher involvement required to facilitate the mystery-based learning activities effectively. Such targeted instruction might not be possible in classrooms that are larger or have fewer resources.. Furthermore, the study primarily relies on qualitative observations and participatory methods, which, while offering in-depth insights, lack the standardized measurements needed for broader comparative studies. Future research should include a larger and more diverse sample, incorporate longitudinal data to assess long-term effects, and explore alternative implementations of the mystery learning strategy in different educational contexts.

Ethics and Conflict of Interest

Certain ethical considerations were addressed to ensure a safe environment, both physically and emotionally, and to acknowledge the power imbalance between students and researchers. Demonstrating genuine interest in the students' play helped build trust. Balancing participation and observation were critical; excessive involvement could influence their behaviour, while insufficient involvement could hinder the collection of meaningful insights. Additional considerations were taken in accordance with the Mystery Method, role play, and play-based learning as younger children often require more guidance and support during these activities. As a researcher, I had to balance observation with providing appropriate scaffolding. The study adheres to the core ethical principles outlined by Ethical Research Involving Children (ERIC, 2013): respect, benefit, and justice. ERIC emphasizes the need for critical reflection, context-specific problem-solving, and transparency. The study also complies with the ethical requirements for research in Sweden (Swedish Research Council, 2017) and the General Data Protection Regulation (GDPR). Throughout the research process, the rights and interests of the students were prioritized, ensuring their best interests and potential benefits were consistently considered. Data was anonymized to protect privacy. No conflicts of interest are related to this work.

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