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Impact of constructivist pedagogy on the cognitive development of children aged 4 to 5

Impacto de la pedagogía constructivista en el desarrollo cognitivo de niños de 4 a 5 años

ARTÍCULO DE INVESTIGACIÓN

ABSTRACT

Cognitive development in early childhood is crucial, and constructivist pedagogy stands out as an innovative approach to fostering it. This research aimed to analyze the influence of constructivist pedagogy on the cognitive development of 4- to 5-year-old children at José Mejía Lequerica Elementary School in Salinas, Ecuador. Using a qualitative-descriptive approach, a semi-structured interview was conducted with the teacher and observation sheets were compiled with 15 children. The results showed that the teacher applied constructivist strategies such as error management, a balance between exploration and curricular objectives, and the use of emerging technologies, which fostered cognitive skills such as reasoning, problem-solving, and memory. However, challenges such as lack of concentration and dependence on teacher guidance were identified in some children. It is concluded that constructivist pedagogy is effective in fostering cognitive development, but requires adaptations to address diversity and strengthen self-confidence.

Keywords: Active learning; Constructivism; Cognitive development; Early childhood education; Pedagogical strategies.

RESUMEN

El desarrollo cognitivo en la primera infancia es clave, y la pedagogía constructivista destaca como un enfoque innovador para impulsarlo. La presente investigación tuvo como objetivo analizar la influencia de la pedagogía constructivista en el desarrollo cognitivo de niños de 4 a 5 años de la Escuela de Educación Básica “José Mejía Lequerica”, en Salinas, Ecuador. Mediante un enfoque cualitativo-descriptivo, se realizó una entrevista semiestructurada a la docente y fichas de observación a 15 niños. Los resultados evidenciaron que la docente aplicó estrategias constructivistas como el manejo de errores, el equilibrio entre exploración y objetivos curriculares, y el uso de tecnologías emergentes, lo que fomentó habilidades cognitivas como el razonamiento, la resolución de problemas y la memoria. Sin embargo, se identificaron desafíos como la falta de concentración y la dependencia de la guía docente en algunos infantes. Se concluye que la pedagogía constructivista es efectiva para potenciar el desarrollo cognitivo, pero requiere adaptaciones para atender diversidades y fortalecer la autoconfianza.

Palabras clave: Aprendizaje activo; Constructivismo; Desarrollo cognitivo; Educación infantil; Estrategias pedagógicas.

INTRODUCTION

Cognitive development in early childhood is fundamental for the development of skills that allow children to understand and relate to the world around them. During the first years of life, infants experience rapid growth in areas such as reasoning, problem-solving, and memory. Consequently, timely intervention through early stimulation provides significant benefits for cognitive development in childhood (Caguas and Torres, 2023). In this sense, it is important that children fully explore and develop their abilities and skills, as these will play a fundamental role in their future. Therefore, innovative pedagogical approaches, such as constructivist pedagogy, have gained relevance thanks to their ability to foster active and meaningful learning, preparing children for school and life (Pincay et al., 2024).

In relation to the above-mentioned, constructivist pedagogy, based on the theories of Piaget and Vygotsky, focuses, according to Tamayo et al. (2021), on the idea that children construct their own knowledge through active exploration, social interaction, and problem-solving. This approach promotes a learning environment where children are the protagonists of their educational process, guided by teachers who act as facilitators. Furthermore, constructivism fosters classroom experiences connection with the real world, allowing children to develop cognitive skills in a comprehensive and meaningful way. By promoting autonomy and curiosity, this pedagogical perspective seeks to prepare children to face the challenges of learning and everyday life.

While constructivist pedagogy offers a promising framework for transforming education, it is important to recognize that its effective implementation faces significant challenges in the Ecuadorian context. Despite the inherent advantages of this approach in the teaching-learning process, Amores and Ramos (2020) determined that, although teachers in Ecuador are familiar with the theoretical concepts of constructivist pedagogy, its practical application in the classroom is limited, which restricts students' cognitive development and the institutions educational quality. This reality is reaffirmed by Herrera et al. (2022), who identified that many teachers still adhere to a traditional and transmissive pedagogy, a situation associated with a lack of professional experience. These authors report that this resistance to pedagogical innovation hinders the effective constructivist model implementation, which requires intervention by the Ministry of Education through the design of specific policies.

Considering these opportunities and challenges, the application of innovative pedagogical approaches in rural contexts such as José Mejía Lequerica Elementary School in Salinas, Santa Elena, Ecuador presents particular challenges. The lack of technological resources, limited infrastructure and the need to adapt educational strategies to the environment characteristics are some of the obstacles that teachers must overcome. Despite these limitations, this geographical environment offers unique opportunities, such as connection with nature and the community, which can enrich constructivist learning and promote children's holistic development.

This raises the following question: How does constructivist pedagogy influence the cognitive development of 4- to 5-year-old children at José Mejía Lequerica Elementary

School? To address this question, it is necessary to understand how this approach is applied in rural contexts and at early ages, which would provide empirical evidence of its impact on cognitive development. This understanding would provide teachers with concrete, context-adapted strategies for implementing constructivism in the classroom, thereby improving early childhood education quality. Furthermore, focusing on a rural area would contribute to reducing educational gaps and promote equitable cognitive development in children who, due to their geographic location, have less access to advanced educational resources. Consequently, this research aimed to analyze the influence of constructivist pedagogy on the cognitive development of 4- to 5-year-old children at José Mejía Lequerica Elementary School in Salinas, Ecuador.

METHOD

The study followed a qualitative approach with a descriptive scope and a phenomenological design. This allowed understanding the application of constructivist pedagogy on children's cognitive development, based on participants lived experience and subjective perception. Phenomenology focused on exploring how constructivist activities are experienced and interpreted by the actors involved, which provided a detailed and contextualized view of the phenomenon studied.

The study population consisted of 18 children and one teacher from the Initial Sublevel 2 at "José Mejía Lequerica" Basic Education School, located in a rural area of Salinas, Canton, Santa Elena province, Ecuador. The sample was selected using convenience sampling, which took into account participants accessibility and availability. It consisted of 15 children (9 boys and 6 girls), as well as one teacher. The children were selected based on their active participation in constructivist activities and their parents or guardians consent for their inclusion in the study.

Data collection was conducted during the 2024 academic year using two techniques: a semi-structured interview for the early childhood education teacher and observation sheets for children. The interview consisted of nine open-ended questions that allowed for detailed expression of opinions and experiences regarding the presence or absence of constructivist pedagogy as a means of cognitive development in children. The observation sheets consisted of 10 items and were administered during constructivist pedagogical activities in the classroom, allowing for the collection of direct data on children's behavior and responses. Table 1 presents the variables operationalization, detailing the indicators and questions posed in both instruments.

Table 1

Variables operationalization.

Variable	Indicators	Interview questions
Knowledge and application of constructivist pedagogy	Level of knowledge about cognitive development	What is your level of knowledge about cognitive development?
	Definition of constructivist pedagogy	How do you define constructivist pedagogy?

	Activities used from constructivist pedagogy to develop cognitive skills	What activities have you used from a constructivist pedagogy perspective to develop cognitive skills?
	Specific activities implemented in the classroom to promote cognitive development	What are some specific activities you have implemented in the classroom to promote students' cognitive development?
Constructivist pedagogical strategies	Approaching errors as learning opportunities	In a constructivist classroom, mistakes are recognized as learning opportunities. How do you address children's mistakes during learning activities and use them to promote their cognitive growth?
	Balancing exploration and curricular objectives	The constructivist approach promotes exploration and discovery. How do you balance this freedom of exploration with the need to achieve specific learning objectives in the curriculum?
	Incorporation of emerging technologies and digital tools	How do you effectively incorporate emerging technologies and digital tools into the learning of 4- and 5-year-olds, while maintaining a focus on active knowledge construction?
	Strategies to motivate children in knowledge active construction	What is your strategy for motivating children to be active in building their own knowledge and understanding of the world around them?
	Promoting confidence and self-esteem in the learning process	How do you foster children's confidence and self-esteem in the learning process within the constructivist approach?
Children´s cognitive development	Materials handling by children	How does the child manipulate the materials?
	Incorporating environmental materials and real-world experiences	Do you incorporate environmental materials and real-world experiences into learning activities?
	Curiosity and active exploration of the environment	Do children show curiosity and actively explore the environment or materials provided?
	Reflection on strategies used during tasks	Does the teacher encourage them to reflect on how they are approaching the task and what strategies they are using?
	Testing different strategies to achieve goals	Does the child try different strategies to achieve a goal?
	Identifying problems and solutions during activities	Do you identify problems and possible solutions regarding the activity you are doing?
	Awareness of one's own thinking and learning processes	Are children aware of their own thinking and learning processes during the activity?
	Formulating reflective questions or expressing opinions	Do children ask thoughtful questions or express opinions during the activity?
	Classroom organization to encourage autonomy, curiosity, and exploration	Are the classroom and learning environment organized in a way that encourages autonomy, curiosity, and exploration?

	Demonstration of initiative and self-confidence in learning activities	Does the child demonstrate initiative and self-confidence on his/her learning activities?

Throughout the study, the data confidentiality and anonymity of all participants were guaranteed. The study was conducted with due respect and care to avoid any interference with children's emotional or physical well-being. The interview was conducted in person, using audio recordings with teacher's permission, and notes were taken during the conversations. Throughout the study, teacher's confidentiality and anonymity were maintained. The data collected were used exclusively for academic purposes, with participants' rights respected at all times.

Once the interview was completed, an interpretive content analysis of the collected data was conducted. This process allowed for conclusions to be drawn about teacher's experiences and perceptions. To optimize the qualitative analysis, the ATLAS.ti software was used, which enabled efficient and systematic management of textual data. The data were coded in the software to generate semantic networks and word clouds, which were then analyzed. In addition, categorization and information triangulation were implemented to ensure the results validity and reliability. In the context of research on constructivist pedagogy, categorization organized the classroom observations and the interview around key themes related to children's cognitive development.

RESULTS

The analysis of the data collected through the semi-structured interview with the teacher and the observation sheets administered to the children allowed to identify significant results organized around the three study variables: knowledge and application of constructivist pedagogy, constructivist pedagogical strategies, and children's cognitive development. The findings are presented below, structured according to these dimensions.

Regarding pedagogy knowledge and application of constructivist, the teacher demonstrated cognitive development knowledge in early childhood by integrating Piaget´s and Vygotsky´s theories into teaching practice. She described constructivist pedagogy as an approach that focuses on the active construction of knowledge through exploration, experimentation, and interaction with the environment. She further noted that this process allows humans to acquire knowledge through learning and experience, which in turn strengthens children's confidence and self-esteem. In this way, growth occurs as mental abilities and thought processes mature.

In line with the above, the teacher presented key concepts that, in her opinion, stand out in constructivist pedagogy. These concepts have been represented by the word cloud shown in Figure 1. As it can be seen, "active learning" and "meaningful learning" stand out. Words like "interactive," "dialogue," and "communication" indicate the role of social interaction in the construction of knowledge, aligned with Vygotsky's theories. Furthermore, terms like "strategy," "curriculum," and "teachers" denote the intentional planning of

activities that promote autonomy and reflection, while "play," "growth," and "learning" allude to the playful and dynamic environment that characterizes a constructivist classroom. In this way, a holistic view of constructivist pedagogy is illustrated, where the child is the protagonist of learning, guided by a teacher who facilitates enriching and meaningful experiences.

Figure 1.

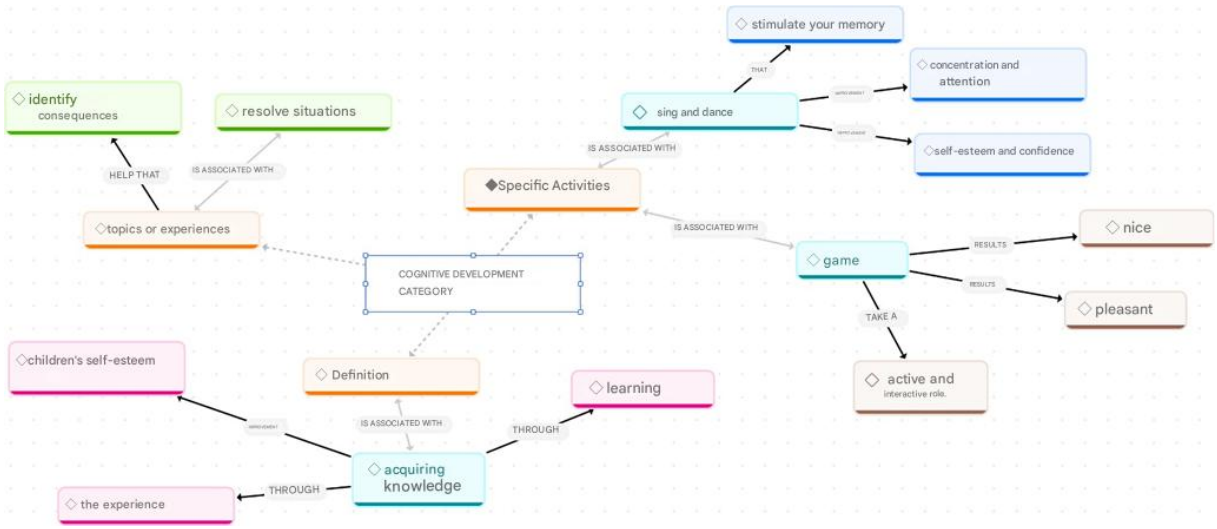
Regarding the activities implemented using constructivist pedagogy to develop cognitive skills, the teacher noted that the main objective is to promote children's active participation in constructing their own knowledge and understanding of the world. To achieve this, she indicated that it is essential to address topics or experiences that allow children to identify the consequences of their actions and resolve classroom situations during the activities. In this way, the use of memory and problem-solving contribute to critical thinking and decision-making.

When analyzing this interview it is important to highlight that an observation was madeboth verbal and non-verbal content, identifying themes and patterns recurring, and draw meaningful conclusions that help to better understand the interview and perspective. In such a way that the words that determine are reflected to constructivist pedagogy and cognitive development in children aged 4 to 5 years sublevel 2.

The interview was analyzed by half of ATLAS.ti24, showing the followingcriteria:

Figure 2.

Semantics network of interview: cognitive development category



Note: Extracted of ATLAS.ti24

In line with the teacher´s theoretical knowledge, she reported that she implements various constructivist activities aimed at developing cognitive skills, such as role-playing, exploratory projects, and problem-solving activities. In addition, singing and dancing activities are conducted to stimulate memory and improve children's concentration and attention span. This makes the process enjoyable and pleasant, allowing children to take an active and interactive role, thus distancing the teaching-learning process from a behaviorist approach. Observations confirmed that these activities align with constructivist principles, demonstrating coherence between theoretical discourse and classroom practice.

Delving deeper into practical applications and strategies for fostering a constructivist environment, the teacher emphasized in the interview that she promotes group reflection when faced with mistakes, approaching them as learning opportunities. To this end, she encourages children to reflect on their mistakes and seek alternative solutions. For example, if a tower of blocks falls, she guides the children to analyze the causes and adjust their strategy. She also mentions that she combines free activities (e.g., sensory exploration with natural materials) with structured tasks (e.g., logical sequences), adapting to curriculum goals without limiting autonomy. In addition, she uses digital tools such as interactive stories and educational games on tablets, always under supervision and with a focus on physical and social interaction. She also motivates and fosters self-confidence by implementing positive reinforcement (e.g., verbal recognition) and assigns leadership roles during group activities to strengthen self-esteem. With these strategies, she believes the classroom is dynamic and that children show greater participation and willingness to take on challenges.

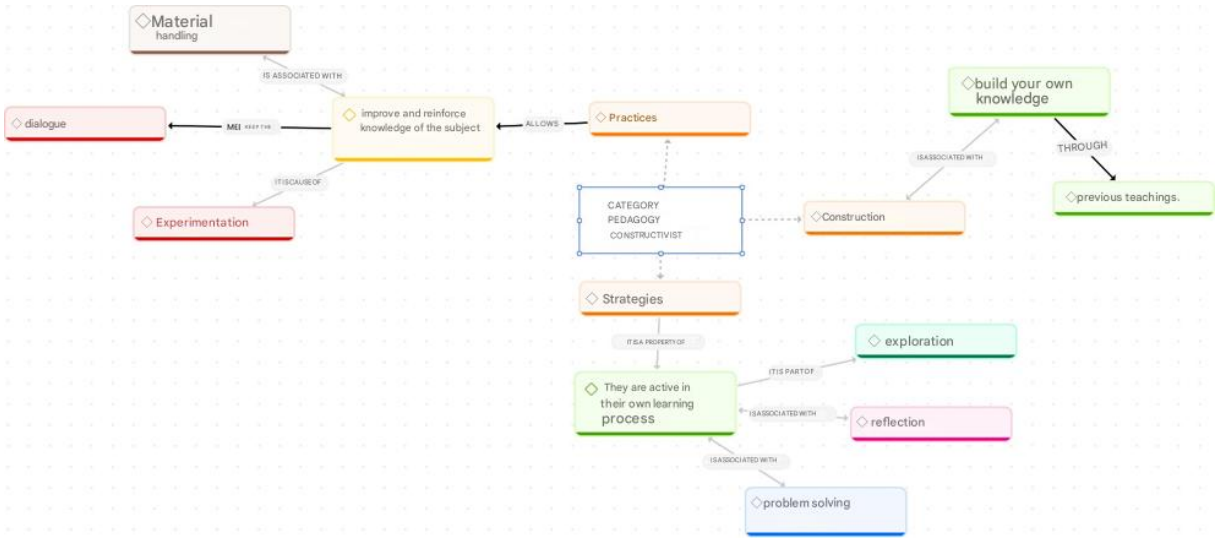
The results on children's cognitive development showed that, although most interacted with the materials provided, some displayed distraction and lack of interest, which limited their ability to create shapes or complete tasks. However, it was observed that children incorporated materials from their surroundings and related the activities to real-world experiences, which facilitated meaningful learning. Furthermore, although most actively explored, two of them displayed disinterest and difficulty achieving the planned objectives. The teacher played a decisive role by encouraging them to reflect on their strategies, using techniques such as material manipulation and fine motor skills to guide them. In the

meantime, while some children tried different problem-solving strategies, others showed distraction and did not complete the activities, reflecting a lack of concentration at certain times.

Furthermore, it was observed that children did not always identify problems or seek solutions autonomously in the classroom, relying heavily on teacher's support and guidance to overcome obstacles. Despite this, many showed awareness of their thought processes by reflecting on how they approach tasks, although the aforementioned lack of attention influenced their overall performance. Only a few children were seen expressing doubts or reflective opinions, reflecting variability on their level of participation and cognitive engagement during activities. It is significant to note that the classroom was organized in a way that fostered autonomy and curiosity, allowing children to explore and work with initiative. However, it was observed that some waited to see their classmates the progress before advancing in their own activities, which could indicate a lack of confidence on their abilities or a tendency to seek external validation. Regarding the Constructivist Pedagogy category, Figure 3 shows its analysis:

Figure 3

Semantics network



The results of the interviews and observations indicated that constructivist pedagogy strengthens cognitive development through practical and socially interactive activities. A notable coherence between theory and practice was evident, with the teacher implementing constructivist pedagogical strategies that fostered children's cognitive development. The children, in turn, responded positively, demonstrating curiosity, initiative, and self-confidence in their learning activities. The qualitative analysis identified three central themes: meaningful learning (understood as linking activities to real-life experiences), teacher scaffolding (conceived as the gradual support provided for problem-solving), and autonomy as a cognitive driver (related to exploratory freedom and skill development).

DISCUSSION

The results of this study align with the findings of various authors who have investigated the application of constructivist pedagogy in the cognitive development of preschool children. The research highlights teacher's theoretical and practical mastery of the constructivist approach, which coincides with Piaget´s (1977) and Vygotsky´s (1978) proposals, who emphasize the importance of active exploration and social interaction on knowledge construction. However, while Piaget focuses on individual development through experimentation, Vygotsky highlights the role of the teacher as a facilitator of learning through scaffolding. In this study, the teacher combined both approaches, promoting autonomy and structured guidance, which denotes an effective integration of both theories in educational practice.

These findings highlight the importance of continuing teacher training in active pedagogies. To maximize the constructivist approach potential, educators should be trained in its application, with special emphasis on technology management and methodologies that balance exploratory freedom with curricular objectives. This recommendation aligns with González (2024), who argues that the application of strategies that promote active learning is essential in educators training, as it fosters meaningful learning of current pedagogical trends in education. By training teachers in these areas, they are provided with the necessary tools to create effective constructivist learning environments where students can optimally develop cognitive skills.

The teacher implemented various constructivist pedagogical strategies, including misinterpreting errors as learning opportunities, which promotes a growth mindset and fosters resilience in children. Furthermore, a balance was fostered between free exploration and curricular objectives, fostering the development of creativity and the skills necessary to achieve learning objectives. In line with these results, Coba (2024) determined that promoting curiosity as a strategy fosters meaningful learning, while Guaman and Espinoza (2022) highlighted the importance of reflection and problem-solving in the learning process. This connection between teaching practice and theory is reinforced by the ideas of Pazos and Aguilar (2024), who believe that the use of teaching strategies such as problem-based learning promotes the development of mental operations, intellectual processes, and awareness of the learning process.

In addition, the teacher developed playful activities with structured tasks that allow children to develop specific skills. This use of games as a constructivist approach in early childhood education aligns with Velasco et al. (2024), who in the Ecuadorian context showed that it is an effective pedagogical tool for children´s comprehensive development. Similarly, it corresponds to Tuárez and Tarazona (2022), for whom the playful methodology nourishes the pedagogical process if applied correctly, because it fosters children´s identity and autonomy. In this way, the idea is denoted that games application is not a simple recreational activity, but a fundamental tool for constructivist teaching, allowing children to explore, experiment and construct their own knowledge in a meaningful and autonomous way. By strategically integrating games into the curriculum, teachers can enhance preschool-aged children´s cognitive, social and emotional development.

In the same way, another constructivist pedagogical strategy employed by the teacher was the use of emerging technologies, such as interactive stories and tablet games, always under supervision to ensure physical and social interaction. This practice corresponds to the proposals made by Estrada et al. (2024) and Agustin et al. (2022), who argue that digital tools can enhance constructivist learning and cognitive development if used intentionally and contextually. However, it is important to consider the warning by Oflu et al. (2021), who point out that excessive screen use is associated with emotional risk, reflecting the need for a more balanced and conscious adaptation to children's individual needs. In this sense, the teacher's approach, which prioritizes supervision and physical and social interaction, is essential to moderate technology potential negative effects and maximize its benefits.

In this same manner, the educator strengthened children's self-confidence through positive reinforcement and the assignment of leadership roles in group activities, which helped consolidate their self-esteem and foster their active participation and willingness to take on challenges. This approach aligns with Bandura's (1977) self-efficacy theory, which argues that confidence in one's own abilities is strengthened through positive experiences, reinforcement, and role models. According to this author, these practices improve self-esteem and motivate individuals to face new challenges, which explain children's greater participation and willingness to participate in the recommended activities.

Evidence obtained from observing children in the classroom indicates cognitive development in infants. It was observed that they related activities to real-world experiences and used materials from the environment, which indicates significant learning. In line with these findings, Lambraño et al. (2025) implemented the constructivist methodology with didactic strategies that enriched the teaching-learning processes in preschool at an educational institution in Cordoba, Colombia. The authors reported that, in this way, the traditional structure practiced in that classroom was overcome, which responded to students´ individual characteristics and promoted a significant increase in participation and attention. This coincidence between the results of both studies reinforces the idea that constructivist pedagogy, when implemented effectively, can transform learning environment and promote more significant cognitive development in children.

Although most children were active, significant challenges were also observed, such as disinterest, lack of concentration, dependence on the teacher in some cases, and the need for support to solve problems independently. These results indicate that, although constructivist pedagogy has a positive impact on children's cognitive development, individualized attention is required to address each child's specific needs and promote their autonomy and problem-solving skills. In contrast to these difficulties, Macias and Henriquez (2023) successfully fostered children's autonomy in a private educational institution in Ecuador, where each child demonstrated their ability to think, feel, act, and decide independently. This result highlights the importance of the teacher's role, as pointed out by Castillo et al. (2023), who emphasize that it should be characterized by a dynamic, proactive, and participatory praxis, where their role as guide and mediator of the teaching-learning process is evident.

The study confirmed that constructivist activities facilitate meaningful learning by

linking classroom experiences to the real world. This is in line with Roa (2021), who describes the relevance of this type of learning, proposed by David Ausubel, where he considers it a challenge and an opportunity for new knowledge construction. Furthermore, classroom organization to foster autonomy and curiosity coincides with what Loaiza and Salazar (2025) suggested, who emphasize the importance of an environment prepared for autonomous learning. However, it was observed that some children waited to see their classmates progress before moving forward, which highlights the need to strengthen self-confidence, an aspect that is not addressed in depth by these authors.

CONCLUSIONS

In this study, it was found that constructivist pedagogy influences 4- and 5-year-old children cognitive development at José Mejía Lequerica Elementary School in Salinas. It was shown to foster essential skills such as reasoning, problem-solving, and memory through practical and socially interactive activities. This was demonstrated by the teacher's theoretical and practical mastery of constructivism, with the integration of key strategies, including error management as learning opportunities, balancing exploration with curricular objectives, and the supervised use of emerging technologies. These practices support Piaget´s and Vygotsky´s theories and highlight the importance of teacher scaffolding and social interaction in knowledge construction.

Consistent with this, the results showed that the children developed meaningful learning by linking activities to real-world experiences. However, challenges such as lack of concentration and dependence on teacher guidance were identified in some cases, reflecting the need to adapt strategies to address diversity in the classroom and strengthen children's self-confidence. Furthermore, classroom organization that fosters autonomy and curiosity was key to promoting active exploration, although some children showed a tendency to seek external validation before moving forward with their activities.

Therefore, although constructivist pedagogy is noted to enhance cognitive development on early childhood, its success depends largely on ongoing teacher training, flexibility in the strategies implemented, and adaptation to children's individual needs. These results validate the inclusion of constructivist approaches in the official curriculum in rural contexts and highlight the importance of educational policies that promote pedagogical innovation and the balanced use of technologies in class.

In this regard, it is recommended to implement teacher training programs focused on constructivist pedagogies, develop educational resources adapted to rural contexts, and promote assessment strategies that value the learning process and student autonomy, rather than focusing only on final results. Furthermore, it is important to encourage parents´ and community active participation in the educational process to create a rich and meaningful learning environment for all children.

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