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ENHANCING CRITICAL THINKING SKILLS OF CHILDREN AGED 5–6 YEARS THROUGH SOLITE KIDS APPLICATION-BASED EDUCATIONAL MEDIA: A CLASSROOM ACTION RESEARCH

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Abstract

Critical thinking is a fundamental skill that should be developed in early childhood to support problem-solving and independent learning. Preliminary observations at TK Muslimat NU 64 showed that the critical thinking skills of children aged 5–6 years were still low. This study aimed to improve these skills through educational media based on the Solite Kids application. Using Classroom Action Research with the Kemmis and McTaggart model, the study was conducted in two cycles consisting of planning, action, observation, and reflection. The participants were 15 children in Group B1. Data were collected through observation and documentation and analyzed using descriptive quantitative and qualitative methods. The results showed a substantial improvement after the Solite Kids application was implemented. Learning achievement increased from 26.7% in Cycle I to 98.8% in Cycle II, exceeding the predetermined success criterion. Improvements were observed in children's ability to answer questions, ask questions, express opinions, and provide simple explanations. Thus, Solite Kids application-based educational media effectively enhanced the critical thinking skills of children aged 5–6 years by creating a more interactive and engaging learning environment.

Keywords: critical thinking skills; early childhood; educational media; classroom action research; Solite Kids application

Abstrak. Kemampuan berpikir kritis merupakan kompetensi dasar yang perlu dikembangkan sejak usia dini untuk mendukung kemampuan pemecahan masalah dan kemandirian belajar anak. Namun, hasil observasi awal di TK Muslimat NU 64 menunjukkan bahwa kemampuan berpikir kritis anak usia 5–6 tahun masih tergolong rendah. Penelitian ini bertujuan untuk meningkatkan kemampuan berpikir kritis anak melalui penggunaan media edukasi berbasis aplikasi Solite Kids. Penelitian ini menggunakan metode Penelitian Tindakan Kelas (PTK) dengan model Kemmis dan McTaggart yang dilaksanakan dalam dua siklus, meliputi tahap perencanaan, pelaksanaan tindakan, observasi, dan refleksi. Subjek penelitian terdiri atas 15 anak Kelompok B1. Data dikumpulkan melalui observasi dan dokumentasi, kemudian dianalisis menggunakan teknik deskriptif kuantitatif dan kualitatif. Hasil penelitian menunjukkan bahwa penggunaan media edukasi berbasis aplikasi Solite Kids mampu meningkatkan kemampuan berpikir kritis anak secara signifikan. Persentase ketercapaian kemampuan berpikir kritis meningkat dari 26,7% pada Siklus I menjadi 98,8% pada Siklus II, melampaui kriteria keberhasilan yang telah ditetapkan. Peningkatan terlihat pada kemampuan anak dalam menjawab pertanyaan, mengajukan pertanyaan, mengemukakan pendapat, dan memberikan penjelasan sederhana. Dengan demikian, media edukasi berbasis aplikasi Solite Kids efektif digunakan untuk meningkatkan kemampuan berpikir kritis anak usia 5–6 tahun melalui pembelajaran yang lebih interaktif dan menarik.

Kata kunci: kemampuan berpikir kritis; anak usia dini; media edukasi; Penelitian Tindakan Kelas; aplikasi Solite Kids

Background

Critical thinking is recognized as one of the essential competencies that should be developed from early childhood because it enables children to observe, analyze information, solve simple problems, make decisions, and express logical reasons for their ideas. Early childhood represents a critical period for cognitive development, during which appropriate educational stimulation can establish the foundation for higher-order thinking skills that support children's future learning. Therefore, early childhood education should provide meaningful learning experiences that encourage children to actively explore, ask questions, communicate ideas, and construct understanding through direct interaction with their environment (Khadijah, 2021; Pangestu, 2024; Yulia et al., 2025).

Despite the importance of critical thinking, its development among young children remains challenging. Learning activities in many early childhood classrooms continue to emphasize teacher-centered instruction, worksheets, and repetitive tasks that provide limited opportunities for children to investigate problems, express opinions, or explain their reasoning. Consequently, children's participation during learning is often passive, resulting in suboptimal development of critical thinking skills. Recent studies have shown that instructional approaches encouraging exploration, discussion, collaboration, and problem-solving significantly improve children's critical thinking abilities compared with conventional learning methods (Cahyaningsih & Harun, 2023; Rohita et al., 2023; Syafruddin et al., 2024; Yuliantina & Puspitasari, 2025).

The rapid development of digital technology has created new opportunities to design learning experiences that are more interactive and engaging for young children. Digital learning media integrate visual, audio, animation, and game-based activities that stimulate children's

curiosity while maintaining their attention throughout learning. Previous studies have reported that digital educational media improve children's motivation, participation, and cognitive development because learning activities become more enjoyable and meaningful (Pradana & Hasanah, 2023; Nurhayati & Rahmawati, 2023; Putri & Wibowo, 2024). Likewise, interactive game-based learning media have been found to enhance cognitive development, problem-solving abilities, and learning engagement among children aged 5–6 years (Wulandari & Kurniawati, 2022; Sari & Hidayat, 2021; Agustin et al., 2024).

Along with the increasing use of educational technology, several digital learning applications have been introduced to stimulate higher-order thinking skills in early childhood. Recent evidence indicates that digital media can effectively foster children's critical thinking by encouraging active exploration, observation, comparison, classification, and simple decision-making (Aini et al., 2026). Similar findings were reported by Fitriani and Marlina (2025), who found that educational games significantly improved the critical thinking skills of children aged 5–6 years. Furthermore, Bahti et al. (2025) demonstrated that innovative learning media designed according to children's developmental characteristics successfully stimulated critical thinking through meaningful learning experiences. Fatimah and Widyasari (2025) also concluded that educational play media provide children with greater opportunities to analyze situations, make choices, and justify their responses during classroom activities.

One educational application that has recently attracted attention is the Solite Kids application. This application provides various educational games introducing numbers, letters, colors, shapes, animals, transportation, puzzles, and other cognitive activities. Through these interactive games, children are encouraged to observe objects, compare alternatives, classify information, identify appropriate answers, and solve simple problems. These learning experiences are consistent with Ennis's concept of critical thinking, which emphasizes reflective and reasonable thinking in deciding what to believe or what action to take. In early childhood education, these competencies can be observed through children's ability to answer questions, ask questions, express opinions, and provide simple explanations during learning activities.

Previous research by Faikoturrohma et al. (2025) demonstrated that the implementation of the Solite Kids application improved children's critical thinking through educational games that promoted exploration and simple problem-solving. Although these findings indicate the potential of Solite Kids as an educational medium, previous studies have primarily focused on evaluating learning outcomes after the implementation of digital media. Studies describing how teachers systematically improve children's critical thinking through continuous classroom-based interventions remain limited.

This condition indicates several important research gaps. First, empirical studies investigating the implementation of the Solite Kids application specifically for improving the critical thinking skills of children aged 5–6 years are still limited. Second, previous studies have predominantly employed experimental or developmental research designs, whereas the implementation of Classroom Action Research (CAR) to continuously improve instructional practice has received relatively little attention. Third, limited evidence is available regarding the progressive improvement of children's critical thinking across successive learning cycles using observable indicators, including answering questions, asking questions, expressing opinions, and providing simple explanations. Addressing these gaps is important because Classroom Action Research allows teachers to continuously evaluate and refine instructional practices based on children's learning needs, thereby generating practical evidence that can be directly applied in early childhood classrooms.

Preliminary observations conducted in Group B1 of TK Muslimat NU 64 Lojejer, Jember Regency, further emphasized the urgency of this study. Most children tended to remain passive during classroom learning, were reluctant to ask questions, lacked confidence in expressing opinions, and experienced difficulty providing simple explanations for their answers. The pre-cycle observation showed that the average achievement of children's critical thinking skills was only 17.5%, categorized as *Belum Berkembang* (Not Yet Developed), indicating that existing learning practices had not yet optimally stimulated children's higher-order thinking skills. These findings demonstrate the need for innovative learning media capable of actively engaging children in meaningful learning experiences.

Based on these considerations, this study implemented educational media based on the Solite Kids application through a Classroom Action Research approach to improve the critical thinking skills of children aged 5–6 years. Unlike previous studies, this research not only examined the effectiveness of digital educational media but also documented the continuous improvement of children's critical thinking across two action cycles. Therefore, this study contributes theoretically by enriching the literature on digital learning media and critical thinking development in early childhood education, and practically by providing an evidence-based instructional strategy that can assist teachers in creating more interactive, engaging, and child-centered learning environments. Accordingly, the objective of this study was to examine the effectiveness of Solite Kids application-based educational media in improving the critical thinking skills of children aged 5–6 years.

Method

This study employed Classroom Action Research (CAR) using the Kemmis and McTaggart model, which consists of four cyclical stages: planning, action, observation, and

reflection. Classroom Action Research was selected because it enables teachers to identify classroom problems, implement instructional improvements, evaluate learning outcomes, and continuously refine teaching practices based on reflection. This design is appropriate for improving children's critical thinking skills because it emphasizes an iterative process that allows learning strategies to be modified according to children's responses and learning progress throughout the intervention.

The research was conducted at TK Muslimat NU 64 Lojejer, Wuluhan District, Jember Regency, Indonesia, during the second semester of the 2025/2026 academic year. The participants were all 15 children in Group B1, consisting of eight boys and seven girls aged 5–6 years. A total sampling technique was employed because the number of children in the class was relatively small, and the study aimed to improve the learning outcomes of the entire classroom rather than compare different groups.

The intervention consisted of implementing educational media based on the Solite Kids application over two research cycles. Each cycle included two learning sessions, with every cycle following four stages.

- 1) Planning stage. The researchers prepared lesson plans, learning scenarios integrating the Solite Kids application, observation instruments, learning materials, classroom equipment, and documentation sheets. Learning activities were designed to provide opportunities for children to observe, explore, answer questions, ask questions, express opinions, and explain their reasoning through interactive educational games.
- 2) Action stage. The teacher implemented learning activities according to the prepared lesson plans using the Solite Kids application as the primary instructional medium. During the learning process, children participated individually and in groups in completing educational games, solving simple problems, discussing answers, and communicating their ideas under teacher guidance.
- 3) Observation stage. During each learning session, the researcher and collaborating teacher observed children's critical thinking skills using a structured observation checklist. Children's participation, responses, interactions, and behavioral changes throughout the learning activities were systematically recorded.
- 4) Reflection stage. At the end of each cycle, observation results were analyzed to identify strengths, weaknesses, and obstacles encountered during implementation. The reflection findings were subsequently used to revise learning strategies and instructional activities before conducting the following cycle to achieve more effective learning outcomes.

Data were collected through observation and documentation. Observation served as the primary data collection technique because the indicators of critical thinking were expressed

through children's observable behaviors during classroom activities. The observation instrument was developed based on Robert H. Ennis's critical thinking framework and adapted to the developmental characteristics of children aged 5–6 years. Four observable indicators were assessed: (1) answering questions, (2) asking questions, (3) expressing opinions, and (4) providing simple explanations. Each indicator was assessed using the early childhood developmental assessment categories, namely Not Yet Developed (NYD), Emerging Development (ED), Developing as Expected (DAE), and Advanced Development (AD). Documentation in the form of photographs, lesson plans, children's learning activities, and observation records was collected to strengthen and verify the observational findings.

Data analysis employed descriptive quantitative and descriptive qualitative techniques. Quantitative data were analyzed by calculating the percentage of children's achievement on each critical thinking indicator.

The percentage results were then interpreted according to the predetermined developmental achievement categories to evaluate children's progress in each cycle. Qualitative data were analyzed through data reduction, data presentation, and conclusion drawing by describing changes in children's learning participation, interaction, confidence, and critical thinking behaviors observed throughout the intervention. The integration of quantitative and qualitative findings enabled a comprehensive evaluation of both learning outcomes and the instructional improvement process.

The success criterion of the study was established before the implementation of the intervention. The action was considered successful when at least 80% of the children achieved the categories of Developing as Expected (BSH) or Advanced Development (BSB) on the four critical thinking indicators. This criterion was adopted because these categories indicate that children have reached the expected level of developmental achievement according to early childhood education assessment standards and demonstrate that the implemented instructional strategy effectively improved children's critical thinking skills.

Results and Discussion

Result

This classroom action research investigated the effectiveness of Solite Kids application-based educational media in improving the critical thinking skills of children aged 5–6 years in Group B1 at TK Muslimat NU 64 Lojejer. Children's critical thinking skills were assessed using four observable indicators: (1) answering questions, (2) asking questions, (3) expressing opinions, and (4) providing simple explanations. The implementation of the intervention was conducted in two action cycles following the stages of planning, action, observation, and reflection.

The pre-cycle observation was conducted to identify children's initial critical thinking abilities before implementing the intervention. The results indicated that children's critical thinking skills were still relatively low, with an average achievement score of 17.5%, which was categorized as Not Yet Developed.

Table 1. Percentage of Children's Critical Thinking Skills Across the Research Cycles

Stage	Percentage (%)	Category
Pre-cycle	17.5	Not Yet Developed
Cycle I	26.7	Emerging Development
Cycle II	98.8	Advanced Development

The pre-cycle findings revealed that most children showed limited participation during classroom learning. Only a few children responded when the teacher asked questions, while the majority tended to remain passive and waited for direct instructions. Children also experienced difficulty expressing their own opinions and providing simple explanations for their answers. These findings indicated that the learning activities implemented before the intervention had not yet provided sufficient opportunities for children to actively construct ideas or demonstrate critical thinking behaviors.

The first cycle introduced educational activities using the Solite Kids application through interactive learning sessions designed to encourage children's participation. Educational games within the application provided opportunities for children to observe objects, recognize patterns, identify correct answers, and respond to teacher questions during play-based learning activities.

Following the implementation of Cycle I, the average achievement of children's critical thinking skills increased from 17.5% during the pre-cycle to 26.7%. Although this improvement did not yet reach the predetermined success criterion of 80%, observable changes in children's learning behaviors began to emerge.

During classroom observations, more children demonstrated willingness to participate in learning activities. Several children who had previously remained passive began answering teachers' questions and showed greater interest in interacting with the digital learning media. However, classroom observations also indicated that many children still hesitated to initiate questions independently, express opinions confidently, and explain the reasons for their responses. Most children continued to require teacher prompts and encouragement before participating actively.

Reflection conducted after Cycle I identified several aspects requiring improvement. The teacher increased the use of open-ended questions, provided additional opportunities for each child to communicate ideas, strengthened positive reinforcement, and ensured that all children actively engaged in classroom discussions during the subsequent cycle.

Based on the reflection results from Cycle I, several instructional improvements were implemented during Cycle II. Learning activities became more interactive by increasing children's opportunities to explore educational games independently, discuss answers with peers, explain their reasoning, and receive continuous scaffolding from the teacher throughout the learning process.

The implementation of these improvements resulted in a substantial increase in children's critical thinking skills. The average achievement reached 98.8%, exceeding the predetermined research success criterion that at least 80% of children should achieve the Developing as Expected (BSH) or Advanced Development (BSB) categories.

A detailed comparison of each critical thinking indicator across the two action cycles is presented in Table 2.

Table 2. Improvement in Critical Thinking Indicators

Indicator	Cycle I (%)	Cycle II (%)
Answering questions	38.3	95.0
Asking questions	23.3	100
Expressing opinions	25.0	100
Providing simple explanations	20.0	100

Table 2 demonstrates consistent improvement across all observed indicators. The ability to answer questions increased from 38.3% to 95.0%, indicating that children became more confident in responding to teacher questions during classroom learning. The ability to ask questions improved from 23.3% to 100%, suggesting that children became increasingly curious and actively initiated communication during learning activities.

Similarly, children's ability to express opinions increased from 25.0% to 100%, reflecting greater confidence in communicating personal ideas and participating in classroom discussions. The most substantial improvement occurred in the ability to provide simple explanations, which increased from 20.0% to 100%. This finding indicates that children became increasingly capable of explaining the reasons underlying their answers rather than merely selecting correct responses.

In addition to the quantitative improvement, classroom observations documented noticeable behavioral changes throughout the intervention. During the pre-cycle, children generally demonstrated passive learning behaviors and relied heavily on teacher direction. In Cycle I, children showed increased interest in digital learning activities and became more willing to participate, although active engagement remained inconsistent among individuals.

By Cycle II, most children actively interacted with the Solite Kids application and participated enthusiastically in classroom discussions. Children voluntarily answered questions, initiated conversations, expressed opinions without hesitation, and explained their reasoning using simple language. Classroom interactions also became more dynamic, with

children demonstrating greater confidence, curiosity, and collaboration during learning activities.

Overall, the findings demonstrate a progressive improvement in children's critical thinking skills throughout the two action cycles. The combination of quantitative achievement data and classroom observations indicates that the implementation of Solite Kids application-based educational media successfully enhanced both children's critical thinking performance and their active participation in learning activities.



Figure 1. Main Menu of the Solite Kids Application

Discussion

The findings of this study demonstrate that the implementation of Solite Kids application-based educational media effectively improved the critical thinking skills of children aged 5–6 years. The improvement was evident from the gradual increase in children's achievement, from 17.5% in the pre-cycle to 26.7% in Cycle I and 98.8% in Cycle II. The progressive improvement across the research cycles indicates that the intervention was not only effective in enhancing learning outcomes but also successful in creating a learning environment that actively stimulated children's higher-order thinking skills. The substantial increase achieved in Cycle II further suggests that continuous instructional refinement through the Classroom Action Research process played an important role in optimizing children's learning experiences.

The improvement in children's critical thinking skills can be explained by the characteristics of the Solite Kids application, which combines digital technology with play-based learning activities. Unlike conventional teacher-centered instruction, the application encourages children to interact directly with learning materials through educational games that require observing, identifying patterns, comparing alternatives, selecting appropriate answers, and solving simple problems. These activities engage children in active cognitive processes

rather than passive information reception. Consequently, children are provided with repeated opportunities to analyze information, make decisions, and communicate their reasoning during classroom learning.

The present findings support the critical thinking theory proposed by Robert H. Ennis, who describes critical thinking as reasonable and reflective thinking focused on deciding what to believe or what action to take. In early childhood education, this ability is reflected through children's capacity to answer questions, ask questions, express opinions, and provide simple explanations. These four indicators showed substantial improvement throughout the intervention, indicating that children increasingly developed the ability to think reflectively before responding to learning tasks. Rather than simply identifying correct answers, children gradually became able to explain the reasons underlying their responses, demonstrating the emergence of higher-order thinking appropriate to their developmental stage.

The findings are also consistent with constructivist learning theory, which emphasizes that children actively construct knowledge through direct interaction with their environment. The Solite Kids application provided opportunities for children to explore learning materials independently while receiving guidance from the teacher when necessary. Through repeated exploration, children were encouraged to connect new information with their prior experiences, resulting in deeper conceptual understanding and improved reasoning. This learning process is particularly important during early childhood because cognitive development is strengthened when children actively participate in meaningful learning experiences rather than merely receiving information from teachers.

Another important factor contributing to the success of the intervention was the implementation of scaffolding throughout the learning process. During Cycle I, observations showed that many children were still hesitant to ask questions, express opinions, and explain their reasoning. Reflection after Cycle I prompted several instructional improvements, including increasing the use of open-ended questions, providing more opportunities for discussion, encouraging every child to participate, and delivering immediate positive feedback. These improvements enabled children to gradually perform learning tasks with greater independence during Cycle II. This finding is consistent with Vygotsky's theory of scaffolding, which explains that appropriate adult support enables children to perform cognitive tasks beyond their initial level of competence until they become capable of completing them independently.

The significant improvement observed in Cycle II also demonstrates the value of the Classroom Action Research approach. The cyclical process of planning, implementing actions, observing children's responses, and reflecting on instructional practices allowed continuous refinement of teaching strategies based on classroom evidence. Rather than assuming that a single instructional intervention would immediately produce optimal outcomes, the CAR

process enabled teachers to identify learning obstacles, adjust instructional methods, and provide more effective learning support. This iterative improvement process contributed substantially to the remarkable increase in children's critical thinking achievement.

The findings of this study are consistent with previous research highlighting the effectiveness of digital learning media in early childhood education. Aini et al. (2026) reported that digital educational media effectively stimulate children's critical thinking by creating interactive learning experiences that encourage exploration and active participation. Similarly, Fitriani and Marlina (2025) found that educational games significantly improved the critical thinking skills of children aged 5–6 years because game-based activities motivated children to analyze situations and make decisions independently. Comparable findings were also reported by Fatimah and Widyasari (2025), who concluded that educational play media create learning situations that encourage children to express ideas, justify answers, and solve simple problems through active participation.

The present findings also support those of Bahti et al. (2025), who demonstrated that innovative learning media designed according to children's developmental characteristics effectively stimulate critical thinking. Likewise, Syafruddin et al. (2024) emphasized that learning models promoting collaboration, discussion, and problem-solving significantly improve young children's higher-order thinking skills. Furthermore, Rohita et al. (2023) argued that critical thinking develops more effectively when children are provided with opportunities to investigate authentic learning situations, communicate ideas, and reflect on their own understanding. Collectively, these studies reinforce the present finding that meaningful, child-centered learning environments are essential for fostering critical thinking during early childhood.

More specifically, the results corroborate the findings of Faikoturrohma et al. (2025), who reported that the Solite Kids application effectively enhanced children's critical thinking through educational games emphasizing exploration and simple problem-solving. However, the present study extends previous research in several important ways. First, it demonstrates the implementation of the Solite Kids application through a Classroom Action Research approach, allowing continuous refinement of instructional practices across two action cycles. Second, this study provides detailed evidence of children's progressive improvement on four observable indicators of critical thinking rather than reporting only final learning outcomes. Third, the integration of interactive digital media with teacher scaffolding and reflective instructional improvement provides a more comprehensive explanation of how digital educational media contribute to children's cognitive development.

From a scientific perspective, the effectiveness of the Solite Kids application can be explained by the interaction of several complementary learning mechanisms. The attractive

visual displays, interactive audio, and game-based activities increased children's attention and intrinsic motivation to participate in learning. Sustained attention enabled children to process information more effectively, while repeated opportunities to solve problems strengthened reasoning and decision-making skills. Simultaneously, teacher guidance through questioning, discussion, and positive reinforcement encouraged children to verbalize their thinking processes, thereby strengthening metacognitive awareness and conceptual understanding. These mutually reinforcing cognitive and social processes explain why children's critical thinking skills improved substantially during the intervention.

Despite the positive findings, several limitations should be acknowledged. This study involved only one classroom with a relatively small number of participants and did not include a comparison group. Furthermore, the intervention was implemented over two action cycles within a limited period, making it difficult to evaluate the long-term retention of children's critical thinking skills. Future studies are therefore encouraged to involve larger samples, apply quasi-experimental or mixed-methods designs, compare different types of digital learning media, and investigate the sustainability of children's critical thinking development over longer periods.

Overall, the findings indicate that integrating Solite Kids application-based educational media with reflective classroom instruction provides an effective strategy for improving critical thinking skills among children aged 5–6 years. Beyond improving learning outcomes, the intervention fostered greater curiosity, confidence, communication, and active participation throughout the learning process. These findings contribute to the growing body of evidence supporting the integration of interactive digital learning media into early childhood education and offer practical guidance for teachers seeking to create engaging, child-centered learning environments that promote higher-order thinking skills.

Conclusion

This study demonstrates that the implementation of Solite Kids application-based educational media effectively enhances the critical thinking skills of children aged 5–6 years by creating interactive, engaging, and child-centered learning experiences. The learning activities encouraged children to actively observe, ask questions, express opinions, provide simple explanations, and participate more confidently in classroom discussions, indicating meaningful development of critical thinking behaviors appropriate to early childhood. The study contributes to the growing body of knowledge on digital learning in early childhood education by providing empirical evidence that the integration of educational applications with a Classroom Action Research approach can systematically improve children's critical thinking through continuous instructional reflection and refinement. Unlike previous studies that primarily examined the effectiveness of digital media, this research demonstrates how iterative

classroom interventions supported by teacher scaffolding can optimize the development of higher-order thinking skills in young children.

From a practical perspective, the findings suggest that digital educational media such as the Solite Kids application can be effectively integrated into early childhood classrooms when accompanied by developmentally appropriate instructional strategies, including play-based learning, open-ended questioning, active discussion, and continuous teacher guidance. These findings provide practical guidance for early childhood educators seeking to create learning environments that promote children's active participation and critical thinking. Future studies are recommended to involve larger and more diverse samples, employ comparative or mixed-methods research designs and examine the long-term effects of digital learning media on various aspects of early childhood development.

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