Jurnal Ilmiah Mandala Education (JIME)
Vol 12 No.3 Agustus 2026
p-ISSN : 2442-9511, e-2656-5862
DOI: *10.58258/jime.v12i3.11154/http://ejournal.mandalanursa.org/index.php/JIME*

Engklek Traditional Game As An Unplugged Coding Media To Improve Computational Thinking In 5-6 Year Old Children

Nida Diana Hanifa[1], Dadan Nugraha[2], Budi Iskandar[3]
[1,3]Universitas Pendidikan Indonesia, Indonesia
[3]Universitas Pendidikan Indonesia, Indonesia

Article Info

Article history:
Accepted: 21 Juli 2026
Publish: 01 Agustus 2026

Keywords:
Computational thingking;
Engklek traditional game;
Unplugged coding;

Abstract

Technological developments in the 21st century require students to have various competencies that support higher-order thinking skills, one of which is computational thinking. In early childhood education, the development of these skills still faces various obstacles, including the limited learning strategies that are appropriate to children's learning characteristics. This study aims to analyze the application of the traditional engklek game as a learning medium based on unplugged coding in improving computational thinking in children aged 5–6 years. The study used the Classroom Action Research method of the Kemmis and McTaggart model which was carried out in two cycles with 15 children of Group B Hakim Sejahtera 4 Kindergarten, Tasikmalaya City as subjects. Data collection techniques were carried out through observation, interviews, and documentation, while data analysis used qualitative and quantitative approaches. The results of the study showed that the application of the traditional engklek game was able to improve the quality of teacher learning planning from 67.5% to 90%, while learning implementation increased from 68.3% to 90%. In addition, children's computational thinking skills also increased, as indicated by the percentage of developmental completion, from 6.7% in the pre-cycle to 46.7% in Cycle I, and then increasing to 80% in Cycle II. Improvements occurred in all elements of computational thinking, namely decomposition, patterns, abstraction, and algorithms. The results of the study indicate that the traditional game of engklek is effective as an unplugged coding learning medium to improve early childhood computational thinking.

Corresponding Author:
Nida Diana Hanifa
Universitas Pendidikan Indonesia, Indonesia
Email Coresspondent: nidadiana@upi.edu,

1. INTRODUCTION

Advances in science, technology, and digitalization have transformed the competencies students need to possess in the 21st century. In addition to communication, collaboration, creativity, and critical thinking skills, which are essential to master from elementary school (Mahrunnisya, 2023; Monika et al., 2022), computational thinking is now seen as a crucial competency that needs to be developed from an early age. According to Wing (2006), computational thinking is a thinking approach used to formulate problems and develop solutions logically and systematically, and can be applied in various areas of life. This ability is not only relevant in computer science but also serves as a foundation for developing problem-solving, logical reasoning, and decision-making skills in various

learning contexts. Computational thinking is increasingly viewed as a crucial competency that needs to be integrated into the education system because it contributes to the development of students' higher-order thinking, problem-solving, and reasoning skills (Lee et al., 2020).

The urgency of developing computational thinking is gaining increasing attention in early childhood education. Various countries have integrated coding and computational thinking concepts into their curriculums as an effort to prepare a generation that is adaptive to technological developments (Rahmawati & Agustin, 2024). In Indonesia, policies regarding coding and artificial intelligence learning have been introduced as part of strengthening student competencies. However, their implementation in early childhood education (PAUD) units still faces various challenges (Fitriyah et al., 2023). A study (Rahmawati & Agustin, 2024) showed that teachers' limited understanding of computational thinking, a lack of learning media, and a limited number of classroom implementation examples are the main obstacles to implementing unplugged coding in early childhood education. These conditions have resulted in learning that develops computational thinking skills not being optimally implemented. This situation indicates that the development of computational thinking in PAUD requires learning media that are appropriate to the characteristics of children. The use of media helps children understand concepts through more concrete experiences, thus making the learning process more effective (Baeti & Ramzi, 2025).

Early childhood is characterized by learning through direct experience, concrete activities, and play. Therefore, computational thinking learning does not always require the use of digital devices, but can be done through learning experiences that actively involve children, indicating that the development of computational thinking does not have to use digital devices (Iskandar & Afifah, 2025). One suitable approach is unplugged coding, which is learning that introduces computational concepts through play activities without involving computers or electronic devices. The unplugged coding approach is considered suitable for early childhood because it provides an active, fun learning experience that is aligned with the child's developmental stage, thus providing optimal stimulation (Nugraha et al., 2017). Research (Su & Yang, 2023) explains that the integration of computational thinking in early childhood education will be more optimal if presented through play activities that are concrete, meaningful, and appropriate to the characteristics of child development. This opinion is supported by Brackmann in (Rosa et al., 2024) who stated that unplugged activities help children understand the concepts of decomposition, patterns, abstraction, and algorithms before being introduced to computer-based programming.

One learning medium that has the potential to support the implementation of unplugged coding in early childhood education (PAUD) is traditional games. In addition to functioning as a means of cultural preservation (Sava & Harianto, 2024), traditional games also provide learning experiences involving physical activity, social interaction, and problem-solving. The traditional game of engklek has characteristics that align with the elements of computational thinking because it requires children to recognize game parts, understand path patterns, follow rules, and carry out sequences of steps systematically. These activities enable children to improve their decomposition, pattern recognition, abstraction, and algorithmic skills through meaningful play experiences. Research results (Tung, 2025) show that traditional games integrated into unplugged coding activities can improve early childhood computational thinking skills in the aspects of decomposition, pattern recognition, abstraction, and algorithmic thinking. Furthermore, research (Sulistia et al., 2025) also

proves that the traditional game of engklek is effective as a learning medium to develop early childhood computational thinking skills.

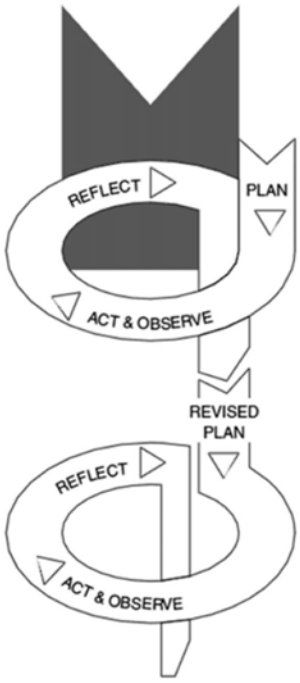
Initial observations in Group B of Hakim Kindergarten Sejahtera 4 indicate that children's computational thinking skills are still at a low level. Most children have difficulty recognizing the components of an activity, finding patterns, understanding rules, and systematically following a sequence of steps. Furthermore, the learning process is still dominated by the use of worksheets and routine classroom activities, limiting children's opportunities for game-based learning experiences. This situation highlights the need for learning innovations that integrate play activities with the development of computational thinking.

A gap in this research is that most studies still utilize digital games, robots, educational games, or instructional card-based activities. Research integrating the traditional game of engklek as a medium for unplugged coding, particularly using engklek for children aged 5-6 years through Classroom Action Research (CAR), is still very limited. Therefore, this study seeks to fill this gap by implementing computational thinking learning through the traditional game of engklek, which is close to children's lives and contributes to the preservation of local culture.

Based on the description, this study aims to analyze the application of the traditional game of engklek as a learning medium for unplugged coding in improving the computational thinking of children aged 5-6 years at Sejahtera 4 Kindergarten.

2. METHOD

This study used Classroom Action Research (CAR) with the Kemmiis and McTaggart model, which consists of four stages: planning, action implementation, observation, and reflection. Reflection on actions in the previous cycle forms the basis for planning actions in the next cycle. This gradual improvement process is expected to produce an increasingly effective learning model (Asrori & Rusman, 2020). With adjustments made as necessary to address issues in each cycle, activities in the next cycle follow the same stages as the previous cycle, which include planning, action implementation, observation, and reflection (Yuzianah et al., 2025). This classroom action research aims to improve the quality of learning practices through concrete actions carried out systematically and reflectively. These stages are described as follows:



Picture 1: Research Stages

This research was conducted in the even semester of the 2025/2026 academic year at Sejahtera 4 Kindergarten in Tasikmalaya City, from late April 2026 to early June 2026. The research subjects consisted of 15 children from Group B Hakim, aged 5-6 years old, consisting of eight boys and seven girls. In addition to the students, the class teacher acted as a research partner in designing, implementing, observing, and reflecting on each action.

The research was conducted in two cycles and one pre-cycle, with each cycle consisting of three meetings. The action included the implementation of the traditional game of engklek as a learning medium based on unplugged coding. Research data were collected through observation, interviews, and documentation. The combination of these three techniques enabled more comprehensive data collection through triangulation. Data validity was achieved through technical triangulation by comparing the results of observations, interviews, and documentation to increase the credibility of the data obtained.

The research instruments included lesson planning observation sheets, lesson implementation observation sheets, children's computational thinking observation sheets, and semi-structured teacher interview guidelines. The computational thinking assessment covered four elements: decomposition, pattern recognition, abstraction, and algorithms using BB, MB, BSH, and BSB categories.

Qualitative data were analyzed through data reduction, data display, and conclusion drawing, while quantitative data were analyzed using descriptive percentages to determine the achievement of each indicator. The study was considered successful when at least 75% of children reached the BSH or BSB category.

The research instruments included lesson planning observation sheets, lesson implementation observation sheets, children's computational thinking skills observation sheets, and teacher interview guidelines. The assessment of computational thinking skills focused on four main elements: decomposition, patterns, abstraction, and algorithms. Each indicator was assessed using the

categories "Not Yet Developed (BB), Beginning to Develop (MB), Developing as Expected (BSH), and Developing Very Well (BSB) according to the early childhood development assessment criteria.

Data analysis was conducted qualitatively and quantitatively. The qualitative analysis was used to describe the learning process, teacher activities, children's responses, and reflection results in each cycle. Meanwhile, quantitative analysis was conducted to calculate the percentage achievement of each indicator using a percentage formula, then group the results into child development categories.

The success of the intervention was determined based on two indicators: improved quality of lesson planning and implementation, and achievement of children's computational thinking development indicators. The study was deemed successful if at least 75% of children achieved the "Developing as Expected (BSH) or "Developing Very Well (BSB)" categories after the intervention was administered.

3. RESULTS AND DISCUSSION

Improving the Quality of Learning Planning

The implementation of the traditional game of engklek as a learning medium based on unplugged coding has had a positive impact on teachers' ability to develop In-Depth Learning Plans . Improvements were made gradually through a reflection process at each cycle, ensuring the quality of the planning became more systematic and aligned with the goals of developing children's computational thinking.

In Cycle I, several learning components, such as identifying learning needs, learning partnerships, and digital utilization, were not optimally designed. The results of the reflection were then used as a basis for improvements in Cycle II by clarifying the initial assessment. Improvements were also made by strengthening collaboration between teachers, students, parents, and the community. This collaboration is a crucial factor in supporting the early childhood education process (Gandana et al., 2025). Furthermore, teachers optimized the use of learning support media. These improvements resulted in an improved quality of learning planning.

Table 1. Comparison of Techers'Abilities in Planning Learning

Siklus	Persentase	Kategori
Siklus I	67,5%	Baik
Siklus II	90%	Sangat Baik

Based on Table 1, a 22.5% increase in learning outcomes was observed from Cycle I to Cycle II. This increase indicates that the reflection process in classroom action research plays a crucial role in improving the quality of learning planning, making learning activities more focused and child-centered. This finding aligns with Kemiis and McTaggart's opinion that reflection is a key component in improving the quality of learning practices through classroom action research. Furthermore, the results of this study support research by Tung (2025), which explains that unplugged coding-based learning requires systematic planning so that each play activity can optimally enhance computational thinking skills.

Improved Learning Implementation

Improvements made during the planning stage significantly impacted the quality of learning implementation. Teachers were increasingly able to manage play activities, provide clear instructions, guide children during play, and facilitate post-play reflection activities.

Several obstacles were still encountered in Cycle I, such as the suboptimal use of digital media, some children still requiring repetition of instructions, and teachers not fully integrating the graduate profile dimensions into the learning. After reflection, the results encouraged teachers to refine their learning strategies by providing clearer demonstrations so that children gained a comprehensive understanding of the game's stages (Supriatin et al., 2023). Teachers also increased the intensity of mentoring and utilized supporting media more effectively and in accordance with children's developmental characteristics (Nugraha et al., 2023).

Table 2. Comparison of Learning Implementation

Siklus	Persentase	Kategori
Siklus I	68,3%	Baik
Siklus II	90%	Sangat Baik

Based on Table 2, there was a 21.7% increase in learning implementation. These results indicate that the traditional game of engklek can create more effective, enjoyable, and child-centered learning. The teacher no longer acts as a transmitter of information, but as a facilitator, providing learning experiences through play activities. During the activity, the teacher guides children to remain focused on the planned play activities so that learning objectives can be optimally achieved (Iskandar, 2021).

This finding aligns with research (Bers, 2018), which states that unplugged coding activities provide opportunities for children to learn through concrete experiences, thereby increasing their engagement in learning. Research (Su & Yang, 2023) also shows that game-based learning can increase children's participation during the learning process.

Improvement in Children's Computational Thinking

The results show that the implementation of the traditional game of engklek has a positive impact on the development of children's computational thinking. Improvements occurred in all observed elements, namely decomposition, patterns, abstraction, and algorithms.

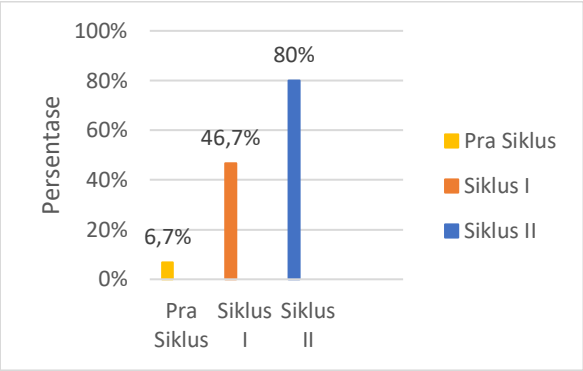
In the Pre-Cycle stage, most children were still in the Not Yet Developing (BM) and Beginning to Develop (MB) categories. After implementing the traditional engklek game in Cycle I, there was an improvement in all indicators. Improved actions in Cycle II further enhanced children's computational thinking, resulting in the majority achieving the Developing as Expected (BSH) and Developing Very Well (BSB) categories.

Table 3. Improvement in Children’s Computational Thinking

Elemen	Pra Siklus	Siklus I	Siklus II
Dekomposisi	20%	53,4%	86,7%
Pola	6,7%	60%	86,7%

Abstraksi	0%	40%	80%
Algoritma	6,7%	46,7%	80%

To clarify the increase in the completeness of children's development, the data is presented in the following diagram.



Picture 2. Comparison Diagram of Percentage of Child Development Completion

Based on Figure 2, the improvement in computational thinking skills indicates that traditional engklek games facilitate children's recognition of the game's components (decomposition), understanding path patterns (patterns), understanding the rules (abstractions), and systematically following the sequence of steps (algorithms). These activities provide concrete learning experiences, making computational thinking concepts easier for young children to grasp. These findings align with those of Iskandar & Afifah (2025), who explain that young children need opportunities to learn through concrete and manipulative activities appropriate to their developmental stage.

These research findings support Wing's (2006) theory, which states that computational thinking is a problem-solving process through decomposition, patterns, abstraction, and algorithms. These findings also align with the research of Brackmann et al. (2017) in Rosa et al. (2024), who stated that computational thinking skills can be developed through unplugged activities that do not always involve computers. Furthermore, research (Tung, 2025) shows that unplugged coding-based play activities effectively enhance computational thinking because they provide learning experiences tailored to the characteristics of early childhood. These learning experiences are expected to contribute to optimizing children's growth and development in subsequent stages (Hanifa et al., 2025).

These research findings are also supported by Bers (2018), who stated that unplugged learning provides children with opportunities to build computational concepts through physical activity, exploration, and collaboration. This approach helps children gradually understand concepts according to their developmental characteristics. In this study, the traditional engklek game serves not only as a medium for play but also as a means to gradually develop logical thinking, problem-solving, and decision-making skills. Thus, the traditional engklek game can be viewed as an innovative learning medium capable of integrating local cultural values with the development of 21st-century skills.

4. CONCLUSION

1. The implementation of the traditional game of engklek as a learning medium based on unplugged coding successfully improved the quality of lesson planning. Improvements made through reflection in each cycle resulted in a more systematic In-Depth Learning Plan (IPL), oriented towards children's learning needs, and optimally integrating computational thinking elements. The percentage of teachers' ability to plan lessons increased from 67.5% in Cycle I to 90% in Cycle II, categorized as Very Good.
2. The implementation of the traditional game of engklek improved the quality of classroom learning. Teachers were able to manage learning more effectively through play activities that provided opportunities for children to explore, experiment, discuss, and reflect on their learning experiences. The percentage of teachers' ability to implement lessons increased from 68.3% in Cycle I to 90% in Cycle II, categorized as Very Good.
3. The traditional game of engklek was effective in improving the computational thinking of children aged 5-6 years. Improvements were seen across all elements of computational thinking, namely decomposition, patterns, abstraction, and algorithms. The percentage of children achieving developmental milestones increased from 6.7% in the pre-cycle to 46.7% in Cycle I and reached 80% in Cycle II, exceeding the established research success indicators.

   These findings demonstrate that the traditional game of engklek can be an alternative unplugged coding-based learning medium that is contextual, enjoyable, and appropriate for early childhood learning characteristics in developing 21st-century skills.

5. ACKNOWLEDGMENTS

We would like to thank Sejahtera 4 Kindergarten for providing space for this research activity.

6. BIBLIOGRAPHY

Asrori, & Rusman. (2020). *Classroom Action Research Pengembangan Kompetensi Guru*.

Baeti, H., & Ramzi, M. (2025). Analysis Of The Implementation Of Clay Media In Improving The Creativity Of 5 – 6-Year-Old Children At Bintang Nahdlatul Wathan Rempek Paud In The 2024 / 2025 Academic Year. *JUPE : Jurnal Pendidikan Mandala*, *10*(4), 1301–1310. https://ejournal.mandalanursa.org/index.php/JUPE/index

Bers, M. U. (2018). *Coding and Computational Thinking in Early Childhood : The Impact of ScratchJr in Europe*. *3*(3).

Fitriyah, Q. F., Saputri, L. R., & Aljawad, H. I. (2023). *Praktik unplugged coding berbasis daily lives dalam meningkatkan computational thinking pada anak usia dini*. *12*(2), 176–185.

Gandana, G., Elan, Nugraha, D., Rahmat, M. K., Sianturi, R., Huriyah, F. S., & Fauzi, R. A. (2025). *Ekopedagogik dalam pendidikan anak usia dini strategi untuk mengembangkan kesadaran peduli lingkungan*. *5*(1), 9–15.

Hanifa, N. D., Nur, L., & Purwati. (2025). Implementation Of Nutrition Week Program To Meet Children's Nutritation Needs In Pilot Laboratory Kindergarten UPI Tasikmalaya. *JP2KG AUD (Jurnal Pendidikan, Pengasuhan, Kesehatan Dan Gizi Anak Usia Dini)*, *06*(1), 28–41.

Iskandar, B. (2021). Bermain Sambil Belajar: Konsepsi Guru Dalam Mengelola Permainan Anak Usia Dini Di PAUD. *Jurnal Ilmiah Profesi Pendidikan*, *6*(3), 461–466. https://doi.org/10.29303/jipp.v6i3.242

Iskandar, B., & Afifah, S. N. (2025). Stimulasi Pemahaman Konsep Matematika Anak Usia Dini

Melalui Aktivitas Montessori. *Jurnal Paud Agapedia*, *9*(1), 85–90.

Lee, I., Grover, S., Martin, F., Pillai, S., & Malyn-Smith, J. (2020). Computational Thinking from a Disciplinary Perspective: Integrating Computational Thinking in K-12 Science, Technology, Engineering, and Mathematics Education. *Journal of Science Education and Technology*, *29*(1), 1â€“8. https://doi.org/10.1007/s10956-019-09803-w

Mahrunnisya, D. (2023). Keterampilan Pembelajar Di Abad Ke-21. *JUPENJI: Jurnal Pendidikan Jompa Indonesia*, *2*(1), 101–109.

Monika, T. S., Julia, J., & Nugraha, D. (2022). Peran Dan Problematika Guru Mengembangkan Keterampilan 4C Abad 21 Masa Pandemi Di Sekolah Dasar. *Jurnal Cakrawala Pendas*, *8*(3), 884–897. http://dx.doi.org/10.31949/jcp.v8i2.2672

Nugraha, D., Apriliya, S., & Veronicha, R. K. (2017). Kemampuan empati anak usia dini. *Jurnal PAUD Agapedia*, *1*(1), 30–39.

Nugraha, D., Jalal, F., & Hartati, S. (2023). Peningkatan Perilaku Prososial Melalui Pengembangan Media Digital. *DWIJA CENDEKIA: Jurnal Riset Pedagogik*, *7*(1).

Rahmawati, I., & Agustin, M. (2024). Kegiatan Bermain Menggunakan Pendekatan Unplugged Coding dalam Pendidikan Anak Usia Dini : Sebuah Tinjauan Sistematis Journal of Islamic Early Chilhood Education. *Abna Journal of Islamic Early Childhood Education*, *5*(2), 130–145.

Rosa, E., Nuraulia, A., Destian, R., & Riza, L. S. (2024). *Penerapan Computational Thinking melalui Aktifitas Unplugged dalam Materi Pengelolaan Sampah pada Pendidikan Anak Usia Dini*. *8*, 14940–14952.

Sava, I. B., & Harianto, S. (2024). Esensi Budaya Permainan Tradisional pada Anak- Anak di Era Globalisasi. *Jurnal Obsesi : Jurnal Pendidikan Anak Usia Dini*, *8*(4), 765–772. https://doi.org/10.31004/obsesi.v8i4.6030

Su, J., & Yang, W. (2023). A systematic review of integrating computational thinking in early childhood education. *Computers and Education Open*, *4*(August 2022), 100122. https://doi.org/10.1016/j.caeo.2023.100122

Sulistia, E. P., Diana, R. R., & Rezeki, A. S. (2025). Implementasi Unplugged Coding Games Dalam Meningkatkan Kemampuan Berpikir Anak Usia Dini. *Muara Pendidikan*, *10*(1), 138–146.

Supriatin, Galis, R., & Y.M.Sani, Y. S. (2023). Pengaruh penggunaan Metode Demonstrasi untuk meningkatkan hasil belajar peserta didik materi IPA di MTs Muhammadiyah Wuring Kecamatan Alok Barat Kabupaten Sikka. *Jurnal Pendidikan Surya Edukasi (JPSE)*, *9*(2), 101–111. https://doi.org/10.37729/jpse.v9i2.3422

Tung, K. Y. (2025). *Implementation of Traditional Games as Unplugged Activities to Foster Computational Thinking in Early Childhood Education*. *6*(2), 84–93.

Wing, J. M. (2006). Computational Thinking. Communications Of The ACM, 49(3), 33-35.

Yuzianah, D., Maryam, I., & Kurniasih, N. (2025). *Kuis lisan sebagai argumentatif strategi peningkatan ketrampilan*. 156–168.