

Unplugged Activity-Based Computational Thinking Using Algorithm Tasks for Early Childhood

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Abstract

Computational thinking (CT) skills based on unplugged activities using algorithmic tasks have recently gained attention in early childhood education. Various creative activities can stimulate these skills, and fun cooking is one effective alternative for preschool children. This study aims to describe how fun cooking activities can foster computational thinking, which has been widely implemented by early childhood education institutions. The research involved 18 children from Angkasa Lanud Adisucipto Kindergarten, Yogyakarta. Data were collected through interviews, documentation, and direct observation. The findings revealed several algorithmic tasks understood by the children during fun cooking activities: (1) students listened carefully to the teacher's instructions about the cooking process, (2) they recognized the correct sequence of steps to follow, and (3) some cooking tasks involved repeated processes. These results indicate that fun cooking activities can indirectly develop computational thinking by engaging children in problem-solving through step-by-step activity processes.

Keywords : *computational thinking; algorithm task;*

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INTRODUCTION

Computational thinking is often interpreted as the process of thinking and solving problems based on computer thoughts or ideas (Masarwa et al., 2024; Celik, 2023). Learning about computational thinking stimulation units have integrated computational thinking skills into the learning curriculum. However, in early childhood education units, research on computational thinking skills is still minimal to find. In fact, this ability is one of the important parts that must be developed in students in order to prepare more mature individuals to enter the 5.0 era. In addition, having computational thinking skills makes students have the ability to solve problems (Celik, 2023). Currently developing computational thinking skills is often understood as activities related to how computers think. This is what causes the application of computational thinking skills at the early childhood education level to still have an ambiguous understanding. While activities related to computational thinking can be simplified according to the level of education and the abilities of students.

Introducing computational thinking skills to early childhood can be done by involving every activity in learning. One of them is in the application of fun cooking. Learning with the application of fun cooking has been widely and often used. Indirectly, this activity is included in the process of stimulating computational thinking skills in children aged 5-6 years. However, there are still many teachers who have minimal understanding of this. During the process of fun cooking activities carried out by children, they actually learn about the procedures for implementation from start to finish. If associated with the computational thinking process with the way computers think, this is included in the algorithm task. The computer system that we know so far has commands after commands in carrying out each instruction that will be used. Likewise with the fun cooking activities carried out in every early childhood education institution. The activities carried out by children in fun cooking activities by following the steps instructed by the teacher are called unplugged activities.

This means that every activity carried out by children in participating in fun cooking activities follows every command and step that has been explained by the teacher before the activity is carried out. So there are similarities between the development of computational thinking skills by utilizing sophisticated technology such as computers with manual activities carried out in fun cooking activities, namely each activity integrates algorithm tasks in completing activities (problem solving). Computational thinking has four divisions of skills; 1) algorithmic thinking, which is the ability to solve problems using logical steps, 2) decomposition, which is the ability to break down large problems into smaller or more detailed ones, 3) pattern recognition, which is the process of connecting existing problems with the solutions to be used, 4) pattern generalization and abstraction, which is the process of solving problems by combining the same and repeated patterns (T. Y. Lee et al., 2014). These four classifications have a role in both the problem-solving process using computers and manual (unplugged activity).

Based on the explanation above, this study aims to stimulate the computational thinking ability of early childhood through fun cooking activities by following algorithm tasks in each activity carried out. In addition, this activity is able to improve children's understanding in solving the problems faced.

METHODS

This research is qualitative descriptive with a case study approach. The research location was at Angkasa Lanud Adisucipto Kindergarten, Yogyakarta. The research sample consisted of 18 people with an age range of 5-6 years in group B. The sample selection used purposive sampling by considering several criteria (Lenaini, 2021), namely: 1) equality of the number of boys and girls in one class, 2) the ability of children who still need help in solving problems, 3) the ability of children to listen to instructions for activities that need stimulation. This activity is carried out in groups outside the classroom. Facilitates research, data collection techniques using observation, interviews and documentation. The data analysis technique is by triangulating data through three stages, namely data reduction, data presentation, drawing conclusions (Abdussamad, 2021).

FINDING AND DISCUSSIONS

The research was conducted at Angkasa Lanud Adisucipto Kindergarten, Yogyakarta in an effort to develop computational thinking skills through unplugged activities in early childhood by utilizing fun cooking activities. Fun cooking activities are carried out by introducing traditional sawut dishes. Based on an interview with one of the class teachers, the introduction of sawut food is one of the real actions of the school program as a form of implementing the independent curriculum in the early childhood education environment. When associated with the learning module, traditional food is included in the "my food, my culture" project. In addition, according to the class teacher of TK Angkasa Lanud Adisucipto Yogyakarta, traditional sawut food has begun to be rarely known by the current generation, so the implementation of learning using the independent curriculum through the introduction of fun cooking activities is considered the right thing that is mutually continuous with each other.

Fun cooking activities basically have several steps that children must follow so that the activity can run well. This activity is called unplugged activity. Unplugged activity shows how students are able to think like computers but without involving technological devices (Tonbuloğlu & Tonbuloğlu, 2019). In other words, every type of activity without using technology, is done offline using real objects around the child, one of which is by utilizing activities like this. Fun cooking is an activity that involves the child's five senses directly. In addition, through fun cooking, children are also trained to work together with peers, interact directly with the tools and ingredients used, build new knowledge and experiences through real activities and hone children to be confident in their own cooking results (Diana & Zulminiati, 2022).



Figure 1. Circle time activity when the teacher explains the tools and materials that will be used

Based on the picture above, it can be seen that the teacher and children are in a circle time activity to find out the ingredients that will be used in the activity of cooking traditional sawut dishes. In addition, the teacher also divides the children into several small groups. In the picture, it can be seen that the main ingredient used in the fun cooking activity to make traditional sawut food is cassava. Likewise with the cooking utensils that will be used such as frying pans, stoves, knives, and graters. Before the cassava grating activity is carried out, the children are asked one by one to wash their hands and open the cassava skin. After the cassava is peeled, it is then washed clean with running water and then continued with grating the cassava.



Figure 2. The teacher cuts the cassava into small pieces, while the children peel the cassava and wash it until clean

Picture two shows the teacher cutting and dividing the cassava into several parts. This is intended so that each child gets an equal share. After the child has finished peeling the cassava skin and washing it until clean. Next, the cassava is grated until smooth. Each child in each small group gets one grater to do it. Boys and girls also get the same opportunity. This means that the grating activity does not discriminate against gender. So it can be concluded that every child involved in the activity of cooking this traditional sawut food has the same status. During the grating process, the teacher continues to supervise the children for safety during the activity. For children who do not know how to use a grater, the teacher provides assistance by demonstrating directly.



Figure 3. Each child grates cassava

Cassava grating activities are carried out by children in small groups. There are two people, three to six people in one group. However, for the grater used, each child gets one tool per person. So that the work of grating cassava becomes faster and each child also gets new experiences related to the tools used. So that the child's previous knowledge with the new experience gained is a form of stimulation in developing cognitive abilities. Where this is known as the term assimilation (Nuryati & Darsinah, 2021). Before the activity was carried out, the teacher and children discussed whether the children had ever seen and used a grater. Some of them only knew its shape but had never used it. While some others had just seen the shape of a grater for the first time. And some had used the tool when cooking with their parents at home.

The next stage in the fun cooking activity of cooking traditional sawut dishes is to grate palm sugar into smaller pieces. Palm sugar is used to give a sweet taste to the cassava that has been grated previously. In addition to using palm sugar, sweeteners are also given through granulated sugar. So that the final result of traditional sawut food produces sawut with a sweet taste from palm sugar and granulated sugar. After the grating process is complete, palm sugar is then mixed with grated cassava. In addition, grated cassava is also given food coloring to stimulate the appetite and make it more attractive.



Figure 4. The process of cutting palm sugar and mixing food coloring with grated cassava

The children's enthusiasm was clearly visible when they were cooking sawut from cassava. Each stage of the work was carried out under the supervision of the teacher. especially when the children used a knife in the process of cutting palm sugar or grating when smoothing the cassava. In addition, green coloring was added to the smooth cassava to beautify the color of the cassava. While the light brown color is also used in making this sawut which is obtained from the color of the palm sugar that the children had previously cut. Mixing palm sugar, granulated sugar or adding coloring to the cassava is done by continuously stirring it evenly on a tray. Each child gets the opportunity to do this which is done alternately.



Figure 5. The steaming process is carried out independently by the child

The last stage in the activity of cooking traditional sawut food is steaming cassava that has been given coloring over medium heat. Although this activity is entirely done by the children, the teacher still monitors the progress of the activity. In addition, the teacher also helps the children in things that they cannot do themselves, such as cutting cassava into small pieces so that it is easy for the children to peel, turning on the stove and putting the pan on the stove are also done by the teacher in this activity. After all the series of activities are carried out, the teacher then holds a discussion again with the children in small groups related to the activities that have been carried out. The discussion process is carried out to see whether the children still remember the stages of the activities that have just been carried out. During the discussion process, there are several trigger questions asked by the teacher to see to what extent the children's computational thinking abilities are stimulated through this sawut cooking activity as outlined in the table below:

No.	Research Questions Using Algorithm Design
1.	Who still remembers how to make the traditional sawut dish that we did?
2.	If we make traditional sawut food, what should we prepare first?
3.	What are the first steps we should take in making this traditional?
4.	Try to mention the sequence of steps in making this traditional dish in sequence!

From the discussion results, information was obtained that children were able to explain and retell activities, tools and materials and how to carry out the sequence in carrying out fun cooking activities to make traditional sawut dishes from start to finish without teacher assistance. So that this is able to hone children's computational thinking skills through unplugged activities by collecting algorithm tasks (introduction to the stages of cooking activities in sequence). Computational thinking helps a person's cognitive practice in designing computing systems so that they can interpret everything through complex information processes (Silander et al., 2022). Computational thinking helps a person's cognitive practice in designing computing systems so that they can interpret everything through complex information processes (Silander et al., 2022).

Computational thinking is also described as the practical and thinking skills used to solve problems in everyday life (Masarwa et al., 2024b). A child can use the concept of computational thinking in planning a series of actions in the form of simple steps that must be completed sequentially. The child will represent the activities carried out to find an efficient way so that they can describe it in a simple form. Therefore, it is important to involve computational thinking in children's learning activities because there is a problem-solving process that must be completed effectively and obtain the right solution in solving it (J. Lee & Junoh, 2019). In addition, it is emphasized that by involving computational thinking in learning, children will utilize and increase their creativity in various fields of science (Costa Junior et al., 2024). Like the fun cooking project because the teacher uses various methods to instill computational thinking with the aim of getting children to solve problems creatively and build confidence in their own abilities (Otterborn et al., 2020).

Integrating computational thinking into children's learning is also a teacher's readiness in education 21 which focuses on literacy teaching. There are several studies that show that when computational thinking is integrated into literacy teaching, children will achieve higher achievement in both literacy skills and programming practices (Ottenbreit-Leftwich et al., 2022). Therefore, it is important to remember that in the education of 21-year-old children, they must be equipped with digital literacy so that they can fully participate in society, both as users and creators of technology. Seeing this situation, with the existence of digital literacy learning, children's learning is required to be interactive, collaborative, creative, and innovative (Lodi & Martini, 2021). Because the benefits of computational thinking also target collaborative environments through learning strategies and learning media (Tikva & Tambouris, 2022).

A collaborative environment can help children design and create communication and collaboration with other friends so that they are able to be persistent in facing complex problems. This means that children have the tenacity and resilience to not give up when facing complex problems. Computational thinking skills are a way to find or build solutions in everyday life. If children are accustomed to improving these skills, then children will find it easy to solve authentic problems in the real world. Children will handle parts of the whole problem through the processes contained in computational thinking, namely decomposition, abstraction, pattern recognition, and algorithms (Reffay & Viroonluecha, 2019). The previous explanation shows that computational thinking is important to learn early and is used to develop many aspects of skills. Then the most important thing is that learning with the first level of computational thinking must begin with students learning to think about how to make something gradually, the second level is solving complex problems, and the last level is setting tasks correctly (MacGregor, 1990). Because this learning can be called project-based or problem-based learning which has been widely used in education 21.

One form of activity that can develop computational thinking skills in early childhood is by involving unplugged activity. Unplugged activity is a learning activity that is carried out without using digital devices. So children are taught basic concepts of computer science and programming through practical, interactive, and physical-based methods. Unplugged activity in early childhood can be in the form of lego patterns and chain stories. Through lego patterns, children will build patterns that are carried out directly and learn to recognize the pattern. While through chain stories, children are asked to arrange several pictures of story scenes in the correct order such as how to brush their teeth, how to make breakfast, cook food (fun cooking) and other activities.

Pattern recognition and sequencing capabilities make it easy for children to design paths with the right sequence of commands. In fact, when children learn basic concepts through physical and hands-on activities (unplugged), they can easily improve their skills when moving on to more complex programming applications (plugged). This also supports a learning approach that combines traditional methods and technologies in computational thinking education for children (J. Lee & Junoh, 2019). Unplugged activity basically has several types of activities, one of which is an algorithm. An algorithm is defined as a series of instructional steps arranged sequentially to solve a problem in order to achieve the final goal. According to Greyling (2022) algorithm is a series of steps to achieve a goal. If these steps are done randomly or some are skipped, then the goal will not be achieved optimally.

CONCLUSION

Basically, early childhood computational thinking skills can be stimulated using activities integrated with an independent curriculum. One activity that can be done is using fun cooking activities. Fun cooking activities are able to collect algorithm tasks by running each step of the activity from start to finish. So that children are accustomed to following each flow explained previously to complete learning activities according to what has been explained. This fun cooking activity contains algorithm tasks that are seen step by step. This can be seen from the enthusiasm of the children when following each rule in the activity. So that the learning that takes place can provide an opportunity for children to develop their computational thinking skills.

REFERENCES

- Abdussamad, Z. (2021). *Metode Penelitian Kualitatif* (P. Rapanna (ed.); 1 ed.). CV Syakir Media Press.
- Celik, I. (2023). Exploring the Determinants of Artificial Intelligence (AI) Literacy: Digital Divide, Computational Thinking, Cognitive Absorption. *Telematics and Informatics*, 83(October 2022), 102026. <https://doi.org/10.1016/j.tele.2023.102026>
- Costa Junior, A. de O., Guedes, E. B., Lima e Silva, J. P. F., & Rivera, J. A. (2024). Developing Computational Thinking in Middle School with an Educational Robotics Resource. *Journal of Intelligent & Robotic Systems*, 110(2), 49. <https://doi.org/10.1007/s10846-024-02082-7>
- Diana, S. P., & Zulminiati. (2022). Pengaruh Kegiatan Fun Cooking dalam Meningkatkan Kemampuan Sains Anak Kelompok B di Taman Kanak-kanak Telkom Schools Padang. *Jurnal Pendidikan AURA (Anak Usia Raudhatul Athfal)*, 3(1), 54–66.
- Greyling, J. (2022). *Coding Unplugged. A Guide to Introducing Coding and Robotics to South African Schools*.
- Lee, J., & Junoh, J. (2019). Implementing Unplugged Coding Activities in Early Childhood Classrooms. *Early Childhood Education Journal*, 47(6), 709–716. <https://doi.org/10.1007/s10643-019-00967-z>
- Lee, T. Y., Mauriello, M. L., Ahn, J., & Bederson, B. B. (2014). CTArcade: Computational Thinking with Games in School Age Children. *International Journal of Child-Computer Interaction*, 2(1), 26–33. <https://doi.org/10.1016/j.ijcci.2014.06.003>
- Lodi, M., & Martini, S. (2021). *Computational Thinking , Between Papert and Wing*. 883–908.

- MacGregor, J. (1990). Collaborative Learning: Shared Inquiry as a Process of Reform. *New Directions for Teaching and Learning*.
- Masarwa, B., Hel-Or, H., & Levy, S. T. (2024a). Kindergarten Children's Learning of Computational Thinking with the "Sorting Like a Computer" Learning Unit. *Journal of Research in Childhood Education*, 38(2), 165–188. <https://doi.org/10.1080/02568543.2023.2221319>
- Masarwa, B., Hel-Or, H., & Levy, S. T. (2024b). Kindergarten Children's Learning of Computational Thinking With the "Sorting Like a Computer" Learning Unit. *Journal of Research in Childhood Education*, 38(2), 165–188. <https://doi.org/10.1080/02568543.2023.2221319>
- Ottenbreit-Leftwich, A., Moore, T. J., Tank, K. M., Kim, J., Fagundes, B., Chu, L., & Wafula, Z. (2022). Rethinking Circle Time. *Proceedings of the 54th ACM Technical Symposium on Computer Science Education V. 2*, 2, 1394–1394. <https://doi.org/10.1145/3545947.3576338>
- Otterborn, A., Schönborn, K. J., & Hultén, M. (2020). Investigating Preschool Educators' Implementation of Computer Programming in Their Teaching Practice. *Early Childhood Education Journal*, 48(3), 253–262. <https://doi.org/10.1007/S10643-019-00976-Y/TABLES/2>
- Reffay, C., & Viroonluecha, P. (2019). *Computational Thinking Nurturing Skills and Inspiring Pedagogy for Sustainable Education in the 21st Century*. 66–77. <https://doi.org/10.1007/978-3-030>
- Silander, P., Riikonen, S., Seitamaa-Hakkarainen, P., & Hakkarainen, K. (2022). Learning Computational Thinking in Phenomena-Based Co-creation Projects: Perspectives from Finland. *Computational Thinking Education in K–12, May*, 103–120. <https://doi.org/10.7551/mitpress/13375.003.0008>
- Tikva, C., & Tambouris, E. (2022). The effect of scaffolding programming games and attitudes towards programming on the development of Computational Thinking. *Education and Information Technologies*, 28(6), 6845–6867. <https://doi.org/10.1007/s10639-022-11465-y>
- Tonbuluğlu, B., & Tonbuluğlu, İ. (2019). The Effect of Unplugged Coding Activities on Computational Thinking Skills of Middle School Students. *Informatics in Education*, 18(2), 403–426. <https://doi.org/10.15388/infedu.2019.19>