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Original Article

Development learning model of unplugged coding-based basic movements for 4–6 year-old children

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Abstract:
This study aims to determine the learning model for the development of basic movement skills based on unplugged coding that allows children to grow knowledge of computation and correct basic movements. Materials and methods. This research was conducted at an Early Childhood Education school in Bandar Lampung involving 20 children aged 4-6 years. The research design used is development research (R n D). This study focused on three basic movement indicators (ie locomotor, non-locomotor and manipulative). The value used for processing is the highest score of three test repetitions. The statistical analysis applied in this study was carried out using SPSS version 20. P-value <0.05 indicates an increase in the three basic movement skills after implementing unplugged coding-based basic movement games. Many children try to win the game (hompimpa) to get the maximum score. Result (1) Manipulative Movement the Obtained P-value is 0.010 for boys and 0.026 for girls, which means that P-value < 0.05, (2) locomotor The independent sample t-test analysis shows the P-value of 0.025 for boys and 0.005 for girls, which means that P-value < 0.05. (3) Non Locmotor the Obtained P-value is 0.016 for boys and 0.012 for girls, which means that P-value < 0.05 The obtained results show that the pre-test and post-test scores are different. Thus, it is concluded that there is a significant difference between the mean score of manipulatives, Non-Locomotor and Locomotor basic movement skills. This game provides hands-on learning for children to cultivate critical thinking, identify and predict their next moves, and solve problems encountered during the game. The conclusion is that the learning model for developing unplugged coding basic movement skills is very effective and can be used in the learning process. This is reflected in children's basic motion exercises as learning media. In addition, the media and tools used for games are environmentally friendly and help the development of early childhood; thus, they are safe to use.
Key Words: **basic movement, unplugged coding, games.**.

Introduction

Children need movement activities. This is important to prevent problems in their adult life such as lack of motivation for learning physical education, performing physical activities and participating in sports (Chiorean et al., 2019; Mukherjee et al., 2017). Therefore, early development of competence is important to improve health from an early age and in the future so that children's movement skills are good (Fehmi et al., 2014). The basic movement skills cover three skill areas, i.e., 1) motor skill acquisition, 2) health and fitness, and 3) safety awareness (Hastie et al., 2018)However, it is important to evaluate children's delays or disturbances in motor skills. The delay is greatly influenced by the development of motor skills acquisition, which is divided into two parts, i.e., fine motor skills and gross motoric skills. This motoric development goes hand in hand with the child's physical maturity process and requires continuous practice until a permanent mastery of motion is achieved. However, this study focused on gross motor skills as learning activities.

The gross motor approach is selected and applied to early childhood because maturity in growth and development is the preparation towards the preschool level. The gross motor skills are divided into three basic movements, i.e., 1) locomotor, 2) non-locomotor, and 3) manipulative (Fereday, 2020)The three components of the basic movements must be integrated because during growth and development, children's movements cannot be limited by one basic movement component. It is an active start in the early childhood development phase (Dickinson, 2014)Thus, the learning of basic movements has a vital role. In this case, children learn computing and basic movements to provide support for growth and development.(Coskun & Sahin, 2014)

Currently, the application of the learning approach of technology is rapidly developing, including in early childhood learning. The role of technology has begun to be taught as a basic form of developing the abilities of

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computational thinking (CT) in early childhood education. (Poon, 2013)explained that the benefits of CT are crucial for children to learn computer science concepts and think critically to solve problems in their daily life. Learning CT can be conducted in various ways. One of them is learning by coding. Coding is the use of a coding language for developing instructions needed by computers for a program to work (Kelly, 2020)

(Samuel, 2020)explained that there are at least two types of code learning practices in early childhood education institutions, i.e., 1) plugged coding and 2) unplugged coding media. Plugged coding is the practice of learning to code using a computer as a medium. While unplugged coding is learning coding practice without using computer media. The novelty of this study is in learning basic movements using unplugged coding by 4–6-year-old children. The purpose is to improve basic movements and to attract students to perform basic movements. A previous study developed a physical education (PE) course to learn basic movements by focusing on skills and physical fitness training using modified approaches and various learning media (Luo et al., 2020). However, because computer facilities are not yet complete as a coding learning medium, this study examines the development of unplugged coding-based learning to develop children's coding skills.

The novelty of this research is that these games provide hands-on learning for children to cultivate critical thinking, identify and predict their next steps, and solve problems encountered during games. as well as showing that the learning model for developing unplugged coding basic movement skills can be used in the learning process. This can be seen in children's basic motion exercises as learning media. In addition, the media and tools used for games are environmentally friendly and help early childhood development; thus, they are safe to use. The benefits of learning unplugged coding are that children can develop their problem-solving skills, improve spatial reasoning abilities, create active learning with effective, inexpensive, simple and interesting tools through targeted activities. Owing to the abovementioned benefits, the application of learning needs to be properly designed to attain learning objectives (i.e., knowledge of CT) and the effect on children's growth and development. Thus, this study investigated computing learning conducted by developing aspects and variations of learning through basic movements using mainly unplugged coding-based learning. Thus, in this study, the development of an unplugged coding-based basic movement (Pate et al., 2019; Pem, 2015; Sánchez-Miguel, 2020) model was performed. The objective is to help children to comprehend and implement CT using basic movement skills. It is expected that children will increase their knowledge of computing and develop correct basic movement skills.

Methods

(1) Unplugged Coding-based Basic Movement Learning in Early Childhood

The concept of learning to code is the learning of coding language by developing instructions either using a computer (plugged coding) or without a computer (unplugged coding). Learning to code requires a structured and logical way of thinking in identifying and solving problems. (Lee, 2020) assumes that in early childhood education, learning to code is conducted by equipping children with concrete experiences related to coding in a way that children like and understand. According to the Directorate of Early Childhood Education), (Pate et al., 2019) learning to code is implemented through children's daily routines or life experiences. It is an efficient way to help them to get used to coding and do it themselves.

1. Research Design

Learning to code develops several competencies, i.e., a) decomposition, b) pattern recognition, c) abstraction, and d) algorithms (sequences, loops, conditionals, and debugging). Decomposition implies breaking the problems into smaller parts so that the big problem is easier to solve. Pattern recognition implies looking for similarities and differences in the encountered issues to recognize patterns. Abstraction implies focusing only on the main problem and ignoring less important or unrelated information. The purpose of abstraction is to find solutions to the issues and apply them in solving new problems (generalizing). Algorithms (i.e., sequences, loops, conditionals, and debugging) are simple detailed steps or rules that are used to solve problems that are designed in flowcharts or computer programs. Furthermore, the purpose of learning to code is to educate children to be more confident and able to develop their curiosity, have good attitude in obeying the rules, have flexible personality, increase their creativity, and develop high collaborative awareness.

The research design used is research and development (R n D). Learning to code can be conducted by integrating methods, activities, media and learning resources. Thus, learning to code is developed through learning by playing, by involving media or tools for support. In this study, learning to code was performed by performing movement tasks based on the instructions for attaining targets. Referring to the research purposes, the implementation of the learning to code is manifested through three basic movement tasks, i.e., 1) locomotor with jumping motion tasks, 2) non-locomotor tasks with body twisting, and 3) manipulative tasks with throwing motions. Each movement task is explained below.

(2) Participants

This study was conducted at an Early Childhood Education school in Bandar Lampung, Western Indonesia. The school has adequate facilities to develop children's basic movement skills. Moreover, it has many students (children) studying in each class. Twenty children studying at the school (ten males and ten females) participated in the study as research participants. They were randomly selected from several different classes.

Then, they participated in a basic movement test based on the instrument. Next, they were grouped based on the obtained total score. The subjects were chosen based on the children's average scores. This first data collection was performed to obtain data on the pre-test. Next, the treatment was performed for four weeks in July 2022 and involved six games with basic movements. After the treatment, a post-test was performed. Regarding the ethical considerations of researchers towards the school as the research site, the information and explanations of this research are presented correctly and do not harm anyone. The results of this research are related to the variations in teaching basic movements conducted through unplugged coding-based media.

(3) Instrument (Survey Content)

The instrument of this study contains demonstrations of basic movement skills consisting of three components, i.e., 1) locomotor movement with the hoop motion skills, 2) non-locomotor movement with right and left body turning skills while balancing, and 3) manipulative movement with throwing skills. Each of these movements is expounded to explore the details of performing the movements. The movements were analysed using the Guttman Scale; 1 point was given if the movement was correct, and 0 if the movement was wrong.

The hoop motions were assessed on a flat plane. Then, the children's movements were observed and assessed by referring to the achievement guidelines for each movement. There were at least 4 indicators of motion tasks for observing the hoop motions, i.e., 1) basic position consisting of 4 subindicators, 2) step position with 5 subindicators, 3) position of hovering in the air consisting of 5 subindicators, and 4) position of landing with 5 subindicators. Thus, all movements should be assessed using the hoop motion instruments consisting of 19 movements. Furthermore, to assess non-locomotor movement, the children rotated their bodies to the right and left sides in harmony and quietly. In this movement, there were three indicators consisting of 1) the beginning step with 4 subindicators, 2) the practice step with 5 subindicators, and 3) the final step with 5 subindicators. Therefore, there were 14 movements of non-locomotor instruments that had to be observed and assessed. The final assessment was the manipulative movement assessment conducted by observing the children throwing balls. In this component, 3 indicators of movement tasks had to be observed during the process. Each indicator was manifested through observations, i.e., 1) the beginning step with 4 subindicators, 2) the practice step with 5 subindicators, and 3) the final step with 5 subindicators. Thus, there were 14 movements that had to be assessed using this instrument.

(4) Research procedure

The development of locomotor basic movement skills was performed through games with jumping motion. Figure 1 shows that a child was asked to jump on one leg after a particular command. The choice of commands was decided by rock–paper–scissors (hompimpa). For each game, each child had five chances in rock–paper–scissors (hompimpa). Out of five chances, the players who got a turn to play the game counted the winners of hompimpa. For example, let's say that a child had five chances in the game (hompimpa), but the child was the winner of the game (hompimpa) only three times out of five. Referring to her/his achievement in hompimpa (being the winner of hompimpa three times), the child got to jump three times. Then, the child marked the last place of his/her jump. The game of hompimpa was payed until the child as a player manages to finish it within 5 min of each game or based on the number of players. Furthermore, the non-locomotor basic movement skills were developed through the game of body twisting. It is shown in Figure 2. The figure illustrates that a child was on a medium with an image. The image had various meanings that should be synchronized to the direction of motion. Some images represented barriers (it was not allowed to pass them). To reach the intended image, the child must move himself/herself and make the fastest movement forward to reach the requested image. Following the teacher's commands, who gives instructions on directions (such as right 2 steps, left 3 steps, etc.), the child (the player) rotates his/her body to perform the next movement.

In addition, the development of manipulative basic movement skills was conducted through the game of throwing motion (i.e., the game of throwing a ball), as illustrated in Figure 3. The figure indicates that a child was throwing a ball into a basket held by a teacher. In this game, the teacher instructed a child to find the colour of the ball, then throw it into the basket. Each ball that the child got into the basket had 1 point. This game should be played quickly, and as many balls as possible should be thrown before the time runs out (1 min), particularly before the referee gave instructions with a different colour ball. The player wins the game if the referee has given the signal to finish the game. Generally, the game is played for 30 min. The player is the winner of the game, if the player puts many balls into the basket.

(Figure 1)

(Figure 2)

(Figure 3)

(5) Data Analysis

The analysis was performed using the t-test of the child's movement records repeated 3 times in different situations. The value used for processing was the highest value of the three repetitions of the test. Statistical analysis in this study was performed with SPSS version 20 with a significance level of $P < 0.05$.

Results

(1) Locomotor Movement

Table 1. Comparison of Basic Locomotor Movements Before and After Treatment

Gender	Items	Pre-test		Post-test		T-value	P-value
		Mean	SD	Mean	SD		
Boys (n = 10)	Hoop Motion	8,40	2,366	16,70	1,829	15,513	0,025
Girls (n = 10)	Hoop Motion	10,00	3,091	16,40	1,647	10,064	0,005

Table 1 shows the analysis results. The independent sample t-test analysis shows the P-value of 0.025 for boys and 0.005 for girls, which means that P-value < 0.05. The obtained results indicate that there is a difference between pre-test and post-test scores. Thus, it is concluded that there is a significant difference between the mean score of locomotor basic movement skills before and after treatment, both for boys and girls. Moreover, the mean scores of boys and girls were not significantly different after the treatment.

(2) Non-locomotor Movement

Table 2. Comparison of Non-locomotor Basic Movements Before and After the Treatment

Gender	Items	Pre-test		Post-test		T-value	P-value
		Mean	SD	Mean	SD		
Boys (n = 10)	Turning the Body Right and Left	7,20	1,229	12,70	1,059	20,466	0,016
Girls (n = 10)	Turning the Body Right and Left	8,20	1,476	12,70	1,160	14,643	0,012

Table 2 shows the results of the independent sample t-test analysis. The obtained P-value is 0.016 for boys and 0.012 for girls, which means that P-value < 0.05. The obtained results show that the pre-test and post-test scores are different. Therefore, it is assumed that there is a significant difference between the average score of non-locomotor basic movement skills before and after the treatment, both for boys and girls. In addition, the mean scores of boys and girls were not significantly different after the treatment.

(3) Manipulative Movement

Table 3. Comparison of Manipulative Basic Movements Before and After the Treatment

Gender	Items	Pre-test		Post-test		T-value	P-value
		Mean	SD	Mean	SD		
Boys (n = 10)	Ball Throwing	7,00	1,491	12,40	1,174	17,676	0,010
Girls (n = 10)	Ball Throwing	7,00	1,247	12,90	1,287	18,762	0,026

Table 3 shows the results of the independent sample t-test analysis. The obtained P-value is 0.010 for boys and 0.026 for girls, which means that P-value < 0.05. The obtained results show that the pre-test and post-test scores are different. Thus, it is concluded that there is a significant difference between the mean score of manipulative basic movement skills before and after the treatment, both for boys and girls. In addition, the mean scores of boys and girls were not significantly different after the treatment.

Discussions

Hoop basic movement learning for early childhood manifested in unplugged coding-based games, which made children cheerful and happy. Many children tried to win the game (hompimpa) to get the maximum score. This game provides direct learning to children to foster critical thinking, identify and predict the next movement, and solve problems that are being encountered during the game. The results are in line with the statements of (Canadian Paediatric Society, 2008; Morales, 2020; Neville, 2021; Vanhelst, 2020)who proposed that the learning of unplugged coding allows children to develop problem-solving skills, extend spatial reasoning

abilities, create active learning, is cost-effective, and uses simple and interesting tools for realizing guided activities.

Moreover, implementing the game in a large space makes it more exciting. Children are more active in expressing themselves when they win against friends who are rivals in the game. The findings agree with those of (Neville, 2021)who recommended that the school's physical environment influences the locomotor skills of preschool children. Complete facilities and environment allows children to freely express themselves. Thus, children's development of basic locomotor movements is supported by the activities they experience. This argument is in line with the results of this research, which focused on developing the basic locomotor learning model. Referring to the statistical evidence, the research findings indicate that there is a significant impact on learning before and after the treatment. It is assumed that the development of the basic locomotor learning model plays a crucial role in contributing to children's development of movement until adulthood. (Galan et al., 2018)

In addition, learning basic movements, particularly turning the body left and right (reflected in the unplugged coding-based game) gave children joy and pleasure. (Greco & de RONZI, 2020)Many children cheered and gave commands to their friends to use a fast path to reach the intended image. At the end of the game, the children were confused about performing the next motion command. The children's confusion allowed them to successfully learn the objectives of non-locomotor basic movements through body twisting. The children subconsciously performed the task commanded by their friends.

This activity has a good impact on their vestibular system. The findings are relevant to the argument of Khan and Chang (2013) who explained that the vestibular system is a system that maintain body balance. Children with a good vestibular system will have good movement awareness. On the other hand, children with a disturbed vestibular system will have difficulty maintaining their body balance. Therefore, basic non-locomotor movements must be developed to optimally train the children's body balance. It is manifested in the non-locomotor motion game that trains children's body balance. The obtained results reveal that children' body improves after taking part in the game of non-locomotor motion.(Coskun & Sahin, 2014)

Moreover, manipulative movement learning (particularly the motion of throwing) in early childhood manifested through unplugged coding-based games provides new meaning to children's learning activities. This is reflected during the treatment session because the children were happy performing their activities. They were excited and enthusiastic about performing the activities because of the targets that needed to be achieved in a limited time. This has a positive influence on the development of basic manipulative movements. When children perform throwing movements, they subconsciously strengthen their muscles and joints. The results are relevant to the argument of (Wood, 2020)who stated that upper body segments provide a good muscle stimulus in a coordinating throw. The findings of this research support the concept. The children's throwing movement capability increases through the game of manipulative movements. Thus, it is assumed that the children's development of basic movements is vital for learning and development. The right stimulation will maximize the children's skills and body functions.

Study limitations

This study is limited to a minimal scope of gross motor skills, particularly basic movements. It requires further development to complement the movement needs of children through the same learning. In addition, the need for supporting infrastructure is the main point in playing the game. A small space makes children unable to move and express themselves freely. Moreover, this game cannot be played simultaneously by many children; thus, they have to take turns playing it. Therefore, the teaching media require additional development to engage children and foster children's basic movement skills. Thus, it is expected that implementing proper teaching media will produce permanent correct basic movements in children.

Conclusions

The conclusion is that the learning model for developing unplugged coding basic movement skills is very effective and can be used in the learning process. This study developed basic movement skills through unplugged coding-based games, i.e., six games for early childhood. Referring to the evidence of three instruments, the results obtained indicate an increase in children's basic movement skills before and after the game, which is used as the treatment.

This means that the learning model of unplugged coding-based basic movement for early childhood is crucial to develop. This is reflected through children's basic movement practice as the teaching media. In addition, the media and tools used for the game are environmentally friendly and help the growth and development in early childhood; thus, they are safe to use. Future research can be used with a larger number of samples, different age groups and with models that can be used later

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References:

Canadian Paediatric Society. (2008). *A physical literacy resource for Early Childhood Educators in Windsor-Essex County*. *3*, 4–34.

Chiorean, A., Savoy, C., Schmidt, L. A., Morrison, K., Saigal, S., & Van Lieshout, R. J. (2019). Childhood Motor Coordination and Adult Affective Experience Among Extremely Low Birth Weight Survivors. *Perceptual and Motor Skills*, *126*(4), 656–674. https://doi.org/10.1177/0031512519846769

Coskun, A., & Sahin, G. (2014). Two different strength training and untrained period effects in children. *Journal of Physical Education and Sport*, *14*(1), 42–46. https://doi.org/10.7752/jpes.2014.01007

Dickinson, R. K. (2014). A Review of "Conditions of Children's Talent Development in Sport." *Journal of Sport Psychology in Action*, *5*(2), 132–134. https://doi.org/10.1080/21520704.2014.927043

Fehmi, Ç., Mahmut, G., Kürşad, S., Ihsan, S., & Erdi, K. (2014). Analysis and examination of the relationship between leisure motivation and academic motivation of students of schools of physical education and sports. *Journal of Physical Education and Sport*, *14*(1), 127–133. https://doi.org/10.7752/jpes.2014.01020

Fereday, K. (2020). A comparison of rolling averages versus discrete time epochs for assessing the worst-case scenario locomotor demands of professional soccer match-play. *Journal of Science and Medicine in Sport*, *23*(8), 764–769. https://doi.org/10.1016/j.jsams.2020.01.002

Galan, Y., Andrii, K., Yuriy, M., Paliichuk, Y., Moroz, O., Tsybanyuk, O., & Yarmak, O. (2018). Characteristics of physical conditions of 7-9-year-old schoolchildren within the process of physical education. *Journal of Physical Education and Sport*, *18*(5), 1999–2007. https://doi.org/10.7752/jpes.2018.s5297

Greco, G., & de RONZI, R. (2020). Effect of karate training on social, emotional, and executive functioning in children with autism spectrum disorder. *Journal of Physical Education and Sport*, *20*(4), 1637–1645. https://doi.org/10.7752/jpes.2020.04223

Hastie, P. A., Valentini, N. C., Rudisill, M. E., & Chiviacowsky, S. (2018). Children's knowledge of skill cues and the enhancements of motor skill performance. *Journal of Physical Education and Sport*, *18*(3), 1654–1660. https://doi.org/10.7752/jpes.2018.03242

Kelly, R. K. (2020). Factors Affecting Tracking of Blood Pressure from Childhood to Adulthood: The Childhood Determinants of Adult Health Study. *Journal of Pediatrics*, 1422–1428. https://doi.org/10.1016/j.jpeds.2015.07.055

Lee, J. (2020). Coding in early childhood. *Contemporary Issues in Early Childhood*, *21*(3), 266–269. https://doi.org/10.1177/1463949119846541

Luo, Y. J., Lin, M. L., Hsu, C. H., Liao, C. C., & Kao, C. C. (2020). The effects of team-game-tournaments application towards learning motivation and motor skills in college physical education. *Sustainability (Switzerland)*, *12*(15), 1–12. https://doi.org/10.3390/su12156147

Morales, J. S. (2020). Exercise Interventions and Cardiovascular Health in Childhood Cancer: A Meta-analysis. In *International Journal of Sports Medicine* (Vol. 41, Issue 3, pp. 141–153). https://doi.org/10.1055/a-1073-8104

Mukherjee, S., Ting Jamie, L. C., & Fong, L. H. (2017). Fundamental Motor Skill Proficiency of 6- to 9-Year-Old Singaporean Children. *Perceptual and Motor Skills*, *124*(3), 584–600. https://doi.org/10.1177/0031512517703005

Neville, R. D. (2021). Longitudinal Association Between Participation in Organized Sport and Psychosocial Development in Early Childhood. *Journal of Pediatrics*, *230*, 152–160. https://doi.org/10.1016/j.jpeds.2020.10.077

Pate, R. R., Dowda, M., Dishman, R. K., Colabianchi, N., Saunders, R. P., & McIver, K. L. (2019). Change in Children's Physical Activity: Predictors in the Transition From Elementary to Middle School. *American Journal of Preventive Medicine*, *56*(3), e65–e73. https://doi.org/10.1016/j.amepre.2018.10.012

Pem, D. (2015). Factors affecting early childhood growth and development: golden 1000 days. *Adv Practice Nurs*, *1*(101), 347–2573.

Poon, J. (2013). Blended learning: An institutional approach for enhancing students' learning experiences. *Journal of Online Learning and Teaching*, *9*(2), 271.

Samuel, S. R. (2020). School Interventions–based Prevention of Early-Childhood Caries among 3–5-year-old children from very low socioeconomic status: Two-year randomized trial. *Journal of Public Health Dentistry*, *80*(1), 51–60. https://doi.org/10.1111/jphd.12348

Sánchez-Miguel, P. A. (2020). Children's physical self-concept and body image according to weight status and physical fitness. *Sustainability (Switzerland)*, *12*(3). https://doi.org/10.3390/su12030782

Vanhelst, J. (2020). Normative health-related fitness values for French children: The Diagnoform Programme. *Scandinavian Journal of Medicine and Science in Sports*, *30*(4), 690–699. https://doi.org/10.1111/sms.13607

Wood, A. P. (2020). Physical activity types and motor skills in 3-5-year old children: National Youth Fitness Survey. *Journal of Science and Medicine in Sport*, *23*(4), 390–395. https://doi.org/10.1016/j.jsams.2019.11.005