



The Effect of Caterpillar Game on Higher Order Thinking Skills (HOTS) in Early Childhood Education

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Abstract

Purpose – This study aimed to determine the effect of the caterpillar game on Higher Order Thinking Skills (HOTS) in children aged 5-6 years at TK Negeri Pembina Ki Hajar Dewantoro, Duingingi District, Gorontalo City.

Design/methods/approach – The research uses experimental quantitative with pre-experimental type one grub pre-test and post-test. Data analysis used the Shapiro-Wilk normality test, followed by a t-test using SPSS software. Research respondents consisted of 30 children.

Findings – The findings of this study resulted in an analysis of the value of the t_{count} amounted to 3,689. While the value of the $t_{table} (\alpha) = 0.05$, which equals 0.674. If $t_{count} > t_{table}$ 3.689 > 0.674, in other words, $t_{count} > t_{table}$, then H_0 rejected and H_1 received. So that there is an influence between the caterpillar game on the ability of Higher Order Thinking Skills (HOTS) in children aged 5-6 years at the State Kindergarten of Pembina Ki Hajar Dewantoro, Duingingi District, Gorontalo City.

Research implications/limitations – This study focuses on children aged 5-6, the activity, and how the child completes the task correctly. In the learning process, some children are still challenged in their level of understanding, so there is a need for proper implementation of learning.

Practical implications – This research contributes in the form of innovations to teachers in providing fun learning and references for the teaching team in developing learning media for children.

Originality/value – This research provides an in-depth understanding of learning media innovation and developing Higher Order Thinking Skills (HOTS) on early childhood education.

Keywords: The caterpillar game; Higher Order Thinking Skills; Early childhood education

Paper type: Research paper

Introduction

Restrictions relating to children according to NAEYC (National Association For The Education of Young Children), explains that children are in the 0-8 year age stage for child care programs, family kid care home, pre-school preparation, both private and public, Kindergarten and Elementary School (Andrejko et al., 2022; I Putu, 2021). However, it is possible to see that early childhood is at the stage of a sensitive period in terms of feeling, hearing, and sight (Xiao et al., 2022). It is also very effective or perfect to teach good things to children because their brain development is multiplying (Duncan et al., 1996; Tomiyasu et al., 2017). Teaching for early childhood, namely: the development and improvement of children from birth to six years as a whole, includes several points of view, including physical and non-actual perspectives, by providing joy that is appropriate to the child's world, children's physical, scientific, changing events so that children grow and develop well (Kaimara et al., 2022; Mursid, 2015).

In the current century, the era of globalization has been running very fast (Yang et al., 2022), which demands change, and competition is no exception to developments in the field of education. The main area of mental turnover events is the direction of development and human reasoning skills starting from interest, arguing that interest will encourage people to think "outcomes" curiously and try various exercises that arise from plans to answer their need to know (Wolk et al., 2019). Kostelnik et al. said students are very focused on getting knowledge or information at this age. They are remembered for elementary age, being creative and acknowledging everything children hear, see, feel, and become what they are (Glennon et al., 2022; Khaironi, 2018).

The focus on improving children is also fundamental. Educators can develop all materials that help to develop children's potential both as far as children's reasoning and the way children learn. As Seifer, S. Higher Order Thinking Skills (HOTS) presentations are still not good in kindergarten for several reasons, for example, (1) the educator does not understand the child. Has HOTS capacity; (2) educators never show how to show HOTS to children, (3) instead of preparing children to predict abilities naturally, educators focus more on providing information to children, ensuring children have school status and preparing children for educational programs at a higher level of training; (4) most of the instructors of educational programs are offered the opportunity to use them, and the related tests are not necessary or try and lend themselves to utilizing higher order thinking skills; (5) supervisor's assumptions about the way instructors should introduce the rules used to assess them do not include advancing HOTS in youth (Salmiati, 2020).

The pattern of students' thinking development can be developed through games. As Stephanie et al. explain, game-based learning, which can make students active, can provide an interventional approach that results in active and innovative learning activities (Anzman-Frasca et al., 2020). Referring to the notion of educational games, Khobir explains that educational games are fun activities and educational tools that are educational (Veronica, 2018). However, in every move made in the school, one must look at the media, the point of fairness and the actual difficulty level of the game. Caterpillar activity is a simple game played in groups or teams where each team can fight for scores to determine who will be the winner. The caterpillar game is an educational game that can reduce the boredom of children in class, the use of the lecture method that teachers often use makes the class not conducive and even very dull for some children. In addition to providing entertainment and increasing student cooperation, the game is said to help introduce a positive attitude towards language mastery (Lee, 2012). With games like numbers caterpillar, students can be encouraged to participate in increasing self-confidence actively. The use of caterpillars is also taken with several references, namely, the word caterpillar numbers are used to be able to develop children's skills in terms of remembering, understanding, applying, analyzing, evaluating / judging, creating which in this case can develop higher order thinking skills against children.

Based on observations obtained at the Ki Hajar Dewantoro State Kindergarten, Duingingi District, Gorontalo City, in particular children, there is an underdeveloped HOTS increase, especially group B aged 5-6 years, there are some children who experience problems in

completing a task. Learning actions, the level of children's understanding in class cannot be increased as expected, considering that children experience boredom in class. For example, if the teacher gives learning and several children pass by in the classroom, the focus is less on learning in class, so if asked again, the child feels confused. In this case, the child is still tricky in logical ability or thinking logically. Lack of teacher information and even lack of understanding of learning that improves Higher order thinking skills For children, HOTS basic abilities for early childhood can be applied since kindergarten so that they can prepare children in terms of thinking and mentally the children at the next level will be ready. Some of the things that become obstacles are the learning equipment used in the classroom is less varied. the lecture method is very dominated, so the children's inactivity in the learning process. Besides, the media used is also limited. The teacher's ignorance of higher-order thinking skills. There is a lack of teacher references in engaging learning media and a lack of evaluation. It causes children's ability to think to be less developed through activities at school.

The reasoning or thinking power is a reasoning system that focuses on capturing human insight, thoughts, and memory to capture and handle dynamic information on the information students bring to learn. Memory capacity, according to Santrock (Ningtyas, 2018), includes three types of memory with: different periods: tactile memory, short memory (temporary memory or working memory), and long-term memory. Feldman (Ningtyas, 2018) states that the information handling model describes the mind as having three "storage facilities": sensory memory, working memory, and long-term memory. In the cycle of human reasoning, there are several levels, including HOTS, an instructive change idea given the scientific classification of learning (such as Bloom's scientific classification). The thinking is that some types of learning are more mindful or mental than others, but that does not deny them other general benefits. In the affirmation of Bloom's scientific categorization, for example, the ability to determine reasoning which includes analysis, evaluation, creation is considered to be of a higher level and requires different learning and educating techniques.

Methods

Pre-experimental research with a single contextual inquiry. This research uses quantitative research methods with quasi-experimental research. The design used in this study is pre-experimental. The pre-experimental used in this review is the pre-experimental type pretest-posttest, which is a research design that has a process to provide a pre-test before being given treatment and a post-test after treatment. The selected sample was given a pre-test (initial test) (X_1), followed by treatment (T) to determine the development of children's higher-order thinking skills. After that, a post-test (X_2) was given to measure the success of the treatment that had been given. This study has an independent variable, namely the caterpillar game, namely influence; the dependent variable is a Higher Order Thinking Skills (HOTS) of children aged 5-6 years which is the result of the influence given by the independent variable.

The population and sample in this study were students of the State Kindergarten of Pembina Ki Hajar Dewantoro, Duingi District, Gorontalo City group B, for the 2021/2022 academic year. With a sample of 30 students. The research was conducted during the learning process by involving teachers as research partners and direct researchers, and class B students as research subjects. The research was conducted at the State Kindergarten of Pembina Ki Hajar Dewantoro.

The data collection technique is observation and using a questionnaire, an instrument lattice model. A performance test is a form of activity in which the child's answers are in the form of behaviour, actions/deeds, or skills to perform specific tasks. Data analysis was carried out after data collection was completed and data had been collected. The part of the data that was analyzed statistically was the result of pre-test and post-test observations with the help of SPSS. The normality test was conducted to determine whether the data held were normally distributed or not by using the normality test Shapiro wilk.

Furthermore, the t-test was used to determine the difference before and after treatment. Besides, it also determines the effect of the caterpillar game on higher-order thinking skills in

children aged 5-6 years. This data analysis was carried out through SPSS. This study hypothesizes that using the caterpillar game significantly affects higher-order thinking skills in children aged 5-6 years at TK Negeri Pembina Ki Hajar Dewantoro, Duingi District, Gorontalo City.

Result and Analysis

This research was conducted to see the effect of caterpillar games on the ability of Higher Order Thinking Skills (HOTS) children before and after treatment. In this study, the researcher used the caterpillar game model as an independent or independent variable. While ability HOTS child as the dependent or dependent variable. It is known that the statistical calculation on the score pre-test HOTS ability of children before being given treatment (pre-test) has an average value (mean) of 13.97, a lower limit value) of 13.05. The median is 14.00, the maximum is 21, the minimum is 8, the range value is 13, the interquartile range value is 2, the skewness is 117, and the kurtosis value is 2,069.

While the data for the value *post-test* the children's HOTS ability was obtained an average value (mean) of 23.10, then for the 95% confidence interval for the lower bound (confidence interval for the lower limit value) of 21.72. The median (middle value) is 24.00, the maximum (highest value) is 28, the minimum (low value) is 13. and the value range (range of values) is 15, and the value of the interquartile range (range of quartile) is 4, and the value of skewness (skew) -1.555, and the value of kurtosis is 2346.

Table 1. Pre-test & post-test data

Data	Variable	
	Pre-test	Post-test
Max score	21	28
Min score	8	13
mean	13.97	23.10
Standard deviation	2,442	3.689
median	14.00	24.00

Normality test

Data normality test means deciding whether the information is usually appropriate or not. A data normality test is planned to determine the delivery or circulation of information value. The structure of the data normality test is if the number of respondents < 50, using the Shapiro Wilk formula and if the number of respondents > 50, using the Kolmogorov Smirnov formula. Because the number of respondents is 30 children, the formula used to see the significant level is the table Shapiro wilk. Testing the normality of the data in this review uses the Liliefors test statistical test with the help of the Windows SPSS 16.0 program with a significance of 0.05.

Table 2. Normality test

	Statistics	Shapiro-wilk	
		df	Sig.
Posttest	.831	30	.000

Decision:

If the value of sig > 0.05, then the data is normally distributed

If the value of sig < 0.05, then the data is not normally distributed

Table 3 shows that the significant value in the Shapiro wilk table indicates that the significant value < 0.05, then the data is not normally distributed.

Hypothesis testing

Testing the hypothesis with a t-test aims to determine the effect of the caterpillar game on children's HOTS. Thus, the next step is to test the hypothesis with a t-test for further hypothesis

testing using the help of SPSS 16.0 software for windows. The hypothesis as a decision making as follows:

H_0 : there is no effect of the caterpillar game on the ability of Higher Order Thinking Skills (HOTS) in children aged 5-6 years

H_1 : there is the effect of the caterpillar game on the ability Higher Order Thinking Skills (HOTS) in children aged 5-6 years

Thus, the next step is to test the hypothesis with a t-test for further hypothesis testing using the help of SPSS 16.0 software for windows. The results of the t-test hypothesis testing can be presented in the following table 3. Based on table 3, the analysis results explain that the value of t_{count} is 3.689 while the value of $t_{table} (\alpha) = 0.05$, which equals 0.674. If $t_{count} > t_{table}$ $3.689 > 0.674$, in other words, $t_{count} > t_{table}$, then H_0 rejected and H_1 accepted means that there is an influence between the caterpillar game on HOTS for children aged 5-6 years at the Ki Hajar Dewantoro State Kindergarten, Duingingi District, Gorontalo City.

Table 3. Independent Samples Test

	Group	Group Statistics			
		N	mean	Std. Deviation	Std. Error Mean
Results	Pre-test	30	13.97	2,442	.446
	Posttest	30	23.10	3.689	.674

Discussion

Based on the results of the analysis explained that the value of t_{count} of 3.689 while the value of $t_{table} (\alpha) = 0.05$, the results obtained are 0.674. If $t_{count} > t_{table}$ $3.689 > 0.674$, in other words, $t_{count} > t_{table}$ means H_0 rejected and H_1 accepted, then there is an influence between the caterpillar game on Higher Order Thinking Skills (HOTS) in children aged 5-6 years at the Ki Hajar Dewantoro State Kindergarten, Duingingi District, Gorontalo City.

The review results significantly influence the number worm game and children's higher-order thinking skills at TK Negeri Pembina Ki Hajar Dewantoro, Duingingi District, Gorontalo City. A pre-test is a variety of information before being given treatment or educational experience that occurs, not surprisingly. At the same time, the post-test collects information after being given treatment or treatment. Before collecting data, the researchers first prepared an instrument that would be used as a data collection tool in the form of an observation sheet to see the ability of HOTS in children. The research results or the pre-test before being given treatment have an average value of 13.97. While in the post-test, after being given treatment, the average value is 23.10.

The research above aligns with the theory of HOTS by Benjamin S. Bloom. In line with the premise of early childhood HOTS, Lewis stated as follows: "higher order thinking occurs when a person searches for new information by digging information through his experiences stored in his memory so that he can rearrange and expand new information to achieve goals or find possible answers to confusing situations" (Sutama et al., 2021). Applying HOTS at an early age can also prepare children for the changing times that focus children on being more advanced and critical.

In this caterpillar game, several treatments are given according to the existing instrument grid. Each meeting is arranged with activities that increase HOTS and additional activities to give children maximum achievement. Children must be able to do well and follow the rules and procedures. Among some playing activities, direct learning is also given, such as distinguishing large and small shapes, separating objects based on numbers, comparing many a little, clarifying lines in caterpillar images, and others. The design of caterpillars as a game tool for children is carried out for two months, starting from the preparation of making game patterns that will be given even though the context of the child is playing the game but also adding the realm of

learning so that children's HOTS can be seen, as well as making instruments used so that it can cause fun for children in learning activities.

Before the treatment or treatment is carried out, there are several existing problems, including the level of understanding of children in a learning process is still lacking, this is marked by the way the child completes his work not well, the teacher lacks knowledge and understanding of early childhood HOTS learning, and others. According to Lewis, higher-demand thinking occurs when an individual seeks new information by exploring knowledge through his encounters stored in his memory so that he can revise and grow new knowledge to achieve goals or find potential responses to confusing circumstances (Sutama et al., 2021). This reasoning area consists of six levels: remembering, understanding, applying, analyzing, evaluating/judging, and creating. In children's learning plans, the improvements that must be moved higher than before focus on HOTS, including analyzing, evaluating, and creating (Wiresti & Nugraheni, 2021).

Before the treatment, it was seen that children often experienced boredom because the world of children learning while playing had not been implemented even though the progress of educational games at the school level to develop reasoning abilities or coexist with their current state. The help of educational games displays materials that foster the turn of events and children's development with an educational value component (Hasanah, 2019). Thus, the instructive game is a type of movement that gives a feeling of pleasure and can teach. Meanwhile, the type, according to Piaget in Santrock (Utoyo 1 -Irvin & Arifin, 2017), describes exercises that can prepare children mentally in the face of an event, one of which is a game that depends on the media. Active activity is an action that can give pleasure and satisfaction to children through actions that involve bodily activities including (a) free and spontaneous, (b) constructive, (c) imaginary/role, (d) collecting, (e) exploration, (f) games and sports, (g) music. Hurlock in Tedjasaputra, the caterpillar game is more focused on the type of exploration and games/sports where children find out new things and try them as well as game activities that have special rules that must be obeyed (Andini & Lestarinigrum, 2018). Based on the content, the games include social affective play, sense of pleasure play, skill play, dramatic role play, games, and unoccupied behavior (I Putu, 2021).

With the existing problems, innovations create a sense of fun learning through games using "Caterpillars". Caterpillar is a game shaped like a caterpillar whose body is round and given a head and exciting variations of determination so that children can be interested to see it. Caterpillars are one of the educational learning tools that can be made and use simple tools and materials. Learning mathematics for children will be lighter and more accessible by using a basic methodology close to the daily life setting of the children's current condition (Amalina, 2020). However, most guardians did not notice that mathematics learning can be tracked in daily practice (Amalina, 2020). Family caregivers in this situation can help by presenting new numerical ideas both now and later.

The caterpillar game is delightful and prominent for children because the use of the caterpillar game is believed to increase HOTS progress explicitly for group B kindergarten as an underlying starting point for additional levels of instruction. Thus, the caterpillar game can build children's enthusiasm for learning and increase children's interest in learning because it uses the principle of learning by playing. Rahmawati (Ningtyas, 2018) states that: At an early age, children can be shown basic mathematical ideas, such as counting and observing pictures of numbers, arguing that children cannot be expected to think coherently, so the educational experience ends with playing using visual aids or objects around them. Hamruni closes the importance of edutainment itself, more precisely, a developing experience that makes use of a severe framework of games, where learning is spread out in the most common way of games so that learning completed gives joy to children and does not bring much fear and frustration (Etivali, 2019). Caterpillar activity is a simple game played in groups or teams where each team can fight for scores to determine who will be the winner. The caterpillar game is also an educational game that can reduce children's boredom in class, the use of the lecture method that teachers often use makes the class not conducive and even very boring for some children. The use of caterpillars is also taken with several references, namely the word caterpillar numbers are used to be able to develop

children's skills in terms of analyzing, evaluating/ assessing, creating which in this case can develop higher order thinking skills against children.

Learning while playing is highly recommended at the stage of child development so that children feel better, think more broadly, and see and try new things through playing. The learning to improve children's hot or high thinking skills must also consider several components. From various opinions of experts regarding the components of the learning model provided, among others: (1) learning procedures or steps, (2) identification of social rules, (3) reaction principles, (4) supportive systems, (5) learning effects (Setiawan et al., 2019). Meanwhile, referring to the notion of educational games Khobir, explaining that educational games are fun activities and educational tools that are educational (Veronica, 2018). Instructive play is a game intended to provide instructive encounters or development opportunities to its players, including all games with informational content (Afrianti, 2014). At the same time, Piaget explained that children are not passive creatures but dynamic initiators and constantly looking for new things (Ginting, 2018).

Everyone generally thinks that games must exist and be nurtured at a young age as well as at an old age (Hasanah, 2019). In line with that, Ismail provides an overview of some of the qualities of game devices that are good for children, including (1) Simple and basic plans; This means that the determination of the device for the exercise of children's imagination should choose a simple one. Because a large number of subtleties (chaotic) hardware will hinder children's opportunities to be inventive. (2) Multifunction: The equipment provided to children must be adapted and suitable for the young man or woman. (3) Alluring; This means that you should choose equipment that allows and wakes the children to complete various exercises and does not require ongoing management or lengthy explanations about their use. (4) Large and easy to use; the enormous innovation device will make it easier for children to hold. (5) Tough; implies flexible, challenging, and sturdy materials, not tools prone to damage and stains. (6) As needed; This means that how much equipment a child uses depends mainly on how much the child needs hardware. (7) No mischief for children; the safety level of children's imagination devices is beneficial for guardians/teachers in supervising children's practice. (8) Encourage children to play together; the goal is to invite children to play together, so we need a device that can refresh the practice that impacts others. (9) Can cultivate children's dream power; This implies that a playing instrument that is not difficult to shape and change makes sense to create the power of dreams. (10) Not because of good looks or excellence; That is, the instrument chosen as a tool to foster children's imagination is a wrong or entertaining tool, but rather an instrument that can foster an educated personality, full of feelings, and the ability to coordinate. (11) Using simple and readily available equipment, use devices made of simple and accessible materials effectively (Fadlillah, 2019).

So, from the importance of the game given, we will have the option to refresh and have the option to improve early childhood skills to get information. As for several categories regarding games, (a) Practical games: muscle development, the primary motivation behind item development. (b) Productive games: making or assembling things from objects, (c) Drama performances: making and participating in imaginary pretend games, (d) Games with rules: admitting, accepting, and according to the rules described earlier (Herman et al., 2017). So that the results of the pre-test and post-test show a significant difference between the application of the caterpillar game before and after the game treatment caterpillar numbers in learning, especially in the aspect of early childhood HOTS abilities.

Conclusion

The study concludes that the caterpillar game affects the ability of Higher Order Thinking Skills (HOTS) in children aged 5-6 years at the Ki Hajar Dewantoro State Kindergarten, Duingi District, Gorontalo City. The analysis shows that the value of t_{count} is 3.689 while the value of $t_{\text{table}} (\alpha) = 0.05$, which equals 0.674. If $t_{\text{count}} > t_{\text{table}}$ $3.689 > 0.674$, in other words, $t_{\text{count}} > t_{\text{table}}$, then H_0 rejected, and H_1 accepted means that there is an influence between the caterpillar game on the ability of higher order thinking skills (HOTS) for children aged 5-6 years at the Ki Hajar Dewantoro State Kindergarten, Duingi District, Gorontalo City.

Declarations

Author contribution statement

Muzdalifa Mamonto conceived the presented idea. Setiyo Utoyo developed the theory of early childhood education and Higher Order Thinking Skills (HOTS) in early childhood education. Icam Sutisna verified the analytical methods. All authors discussed the result and contributed to the final manuscript.

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Data availability statement

The datasets generated during and/or analysed during the current study are available from the corresponding author on reasonable request.


Declaration of interests statement


The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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