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Learning Cycle Model and Improvement of Cognitive Ability of Elementary School Students

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Abstract

This study aims to analyze the cognitive abilities that can be developed by grade 1 elementary school students in learning using the learning cycle model based on Bloom's taxonomy. The Learning Cycle model is a learning model that has learning stages that contain high-level thinking activities. The stages in the Learning Cycle model are engagement, exploration, explanation, elaboration, and evaluation. This type of research is qualitative. This research was conducted at SDN 175 Bonto Masunggu, Bone Regency, South Sulawesi. The subjects of the study were 26 grade 1 students. The determination of subjects was carried out using the Purposive Sampling technique. The data collection technique uses tests to measure learning outcomes, observation to observe student activities in thinking activities, and documentation. Then the data was analyzed using the qualitative method of the Miles and Huberman Interactive Model. The results show that the Learning Cycle model can support the development of cognitive abilities by providing better efforts in packaging activities and guiding student learning activities. This is shown in the cognitive activity of students at a low level (C1-C3) which increases significantly. In the first cycle, 77% of students appeared, while in the last cycle, 97% of students showed C1-C3 cognitive activity. Meanwhile, the analysis activity (C4) is packed with cognitive games. One of them is to find 5 differences in 2 similar images. Games like this arouse interest to be active and focused on learning activities.

Keywords

Learning cycle, cognitive ability, elementary school students

INTRODUCTION

Grade 1 elementary school students generally turn 6-7 years old. Based on Piaget's theory of cognitive development, at this age students' cognitive thinking ability is in a transition period from the pre-operational stage to concrete operational (Amanaturrakhmah & Fauzan, 2018). This condition requires significant action to help students adapt in all aspects. In this case, teachers can help students adjust by understanding the thinking skills that current students have and facilitating learning activities that can support the cognitive development of future students.

A student's cognitive ability can be implied by the learning outcomes obtained. From the perspective of students and guardians, the expected learning outcomes are in the form of numbers with high scores. However, for a teacher, grades can be analyzed in terms of cognitive ability, affective development, psychomotor ability, and other skills. From a constructivist point of view, the result of learning is not a gift from the teacher. Learning outcomes are the result of the construction process carried out by each individual (Suani, 2013).

In the pre-operational and concrete operational stages, students still need objects in real form to understand a concept. When connected with Bloom's taxonomy, the cognitive

ability of students as a whole is still at a low level of cognitive ability. However, in a study, it was stated that critical thinking skills can be built by the habituation process through learning activities in the classroom (Haryanti, 2017). In the journal, it was explained that the researcher explored critical thinking skills in students at the elementary school level. The researcher habituates students to improve their critical thinking skills by repeating the stages of the problem-based learning model in classroom learning activities. Similar research states that certain learning approaches and models can encourage students to have higher-order thinking skills (Hidayati, 2017). In this study, the researcher uses open-ended questions and questions to provide stimulation to students to be able to practice high-level thinking skills.

The Learning Cycle model was originally developed by Robert Karplus around the 1970s. Karplus introduced this model with the stages of Preliminary exploration, Invention, and Discovery. In addition, Charles Barman and Marvin Tolman developed the stages into exploration, concept introduction, and concept application. Next, the Learning Cycle model continues to be developed into five phases consisting of engagement, exploration, explanation, elaboration, and evaluation (Ahmadurifai, 2020). The Learning Cycle model has similar characteristics to Bloom's taxonomy. Both are based on the constructivist paradigm. From a constructivist point of view, the results of learning obtained are not a gift from teachers, but a process built by each individual who learns (Suani, 2013).

The learning cycle model consists of a series of several stages of activities that are organized in such a way as to help students master the achievement of learning competencies by playing an active role in the learning process. The first stage of activity in the Learning Cycle model is Engagement, which is accessing student knowledge. Second, Exploration, in the form of student activities to explore the knowledge conveyed in learning activities. Third, Explanation is the teacher's activity to explain the concepts or learning materials that have been explored by students. Fourth, Elaboration or development stage. At this stage, the teacher guides students to develop new understandings in different contexts. The last is the Evaluation stage. At this stage, an evaluation of the achievement of learning objectives by students is carried out (Rini & Amaliyah, 2021).

This learning model is supported by the theory of constructivism. This understanding supports the development of knowledge that can be achieved by individuals with the process of assimilation and accommodation. Assimilation is the phenomenon of a person inserting new information or experience into old experiences so that they can form a new view (Sugrah, 2019). Meanwhile, accommodation is the process of forming a new scheme or modifying the scheme to new information or experiences that come in if it cannot be assimilated with existing information or experiences.

The steps in the Learning Cycle model can be classified into both low-level and high-level cognitive thinking domains in Bloom's taxonomy. The Engagement stage can be included in the C1 (recognition) realm if the activity consists of perception in the form of identification activities. The Exploration stage can be classified as the C1 realm if the activities developed are recognizing or mentioning activities. The Explanation stage is classified in the C2 realm because the activities developed at this stage are explained. The Elaboration stage can be classified as a high-level thinking ability in the C4 realm if the

activity developed is an analytical activity. The last stage of Evaluation is classified as C5 high-level thinking ability if students can evaluate independently.

Several studies on the application of the learning cycle model have been conducted and proven to be effective in providing a positive influence including improving student learning outcomes (Arvella, 2020; Asthira P et al., 2016; Astuti & Muncarno, 2021; Fitriyani et al., 2016; Harefa, 2020). One of the studies was conducted by Bayani and Wahyuni (2014) by applying the learning cycle as a learning approach and orienting cooperative learning. The results of the study showed that the learning outcomes in the cognitive aspect increased significantly, the learning outcomes in the affective aspect showed that group activities developed well, as well as the psychomotor aspect showed good results. Likewise, the research (Rini & Amaliyah, 2021) explained that the results of the study showed that the Learning Cycle learning model had a significant influence on learning outcomes and naturalist intelligence of science.

Reviewing the cognitive thinking ability of grade 1 elementary school students who refer to Piaget's developmental theory, the author determines a learning cycle model to accompany student learning activities. This is considered with the hope that the learning cycle model can meet the needs of students to be able to learn actively according to the current student development. This study aims to analyze the cognitive thinking skills that can be developed by grade I elementary school students in learning using the learning cycle model based on Bloom's taxonomy theory.

METHOD

The method used in this study is a qualitative method. With qualitative research, researchers explore and understand the meaning of behavioral phenomena of research subjects both individually and in groups that describe a social problem or humanitarian problem (Sugiono, 2013). The research subjects in this study are 1st-grade students at SDN 175 Bonto Masunggu, Bone Regency, South Sulawesi. There are 26 students, consisting of 16 male students and 10 female students. The sample was determined using the purposive sampling technique. The subject was determined in grade 1 students with the aim of exploring whether higher-level thinking skills can be introduced to lower-grade students. In addition, researchers have observed that students can read, write, and be responsive in learning activities.

Data collection techniques are carried out by observation, testing, and documentation. Observations were made to observe teacher activities and student activities in learning activities using the learning cycle model. The test was carried out to obtain data on students' cognitive learning outcomes. Documentation is carried out to record the entire research process. The data from the research results were then analyzed descriptively. The validity of the data was tested using a credibility test, namely triangulation techniques (Alfansyur & Mariyani, 2020).

The analysis model used is an interactive model data analysis from Miles and Huberman. This interactive model data analysis has three components, namely data reduction, data presentation, and conclusion drawing or verification (Nugrahani, 2014). In the data reduction component, the researcher conducts a selection or selection process, focusing or focusing attention, a simplification process, and an abstraction process from information that supports research data from the results of data mining in the field. In the

data presentation component, the researcher narrates the data that has been reduced and organized systematically. Meanwhile, in the conclusion-drawing component, the researcher interprets the results of the analysis and interpretation of the data that has been obtained.

RESULT AND DISCUSSION

Student Learning Outcomes Based on Minimum Provision Criteria (KKM)

The results showed that the average class score was 67.30 with the highest score being 90 and the lowest score being 50. In addition, the table shows that as many as 18 students (69.23%) of the total students have received the same or more scores from the KKM, and as many as 8 students (30.77%) of the total students whose scores still have not reached the KKM. Comparative data on the cognitive learning outcomes of grade 1 students at SDN 175 Bonto Masunggu between the initial conditions, cycle I and cycle II can be seen in the following table:

Table 1. Comparison of Improving the Completeness of Student Learning Outcomes Based on KKM

Phase	Average Score	Completeness		Percentage	
		Complete	Not Finished	Complete	Not Finished
Initial Conditions	45	4	22	15,38	84,62
Cycle I	67,30	18	8	69,23	30,77
Cycle II	79,61	24	2	92,30	7,70

As shown in Table 1, student learning outcomes in the cognitive aspect increased significantly from the initial condition to cycle I to cycle II. The average score of the initial condition class was 45 while the average score of the first cycle class was 67.30 and the second cycle reached 79.61. The percentage of student completion from the initial condition to Cycle I and Cycle II also increased. At the initial condition stage, the percentage of students who completed was 4 students (15.38%) and the percentage of students who had not completed was 22 students (84.62%). In the initial observation of the student's cognitive learning outcomes, 4 people achieved completeness with a percentage of completeness of 15.38%. In the first cycle, there was an increase in completeness in the number of students as many as 18 people with a percentage of 69.23%. Meanwhile, in the second cycle, 18 students have achieved completeness with a percentage of 67.30%.

Students' Cognitive Thinking Ability Based on Bloom's Taxonomy in a Series of Learning Cycle Model Activities

In addition to achieving the completeness of learning outcomes that refer to the KKM, the researcher also observed the development of students' cognitive thinking skills. Observation of cognitive thinking ability is carried out by referring to the syntax/stages of the learning cycle model which is analyzed based on the Bloom taxonomy. In Bloom's (Sani, 2019) taxonomy, there is a classification of low-level thinking abilities consisting of the realms of cognition C1 (remembering), C2 (understanding), C3 (applying), and higher-level thinking abilities consisting of the realms of cognition C4 (analyzing), C5 (evaluating) and C6 (creating).

The subject of the study is 1st-grade elementary school students who are classified as lower grades. At this age (6-12 years) students' cognitive thinking ability is still at the stage of concrete operation (Amanaturrakhmah et al., 2017). With these abilities, the most feasible learning activities for students to achieve are activities in the C1-C3 realm. However, (Haryanti, 2017) states that critical thinking skills can be built by the habituation process through learning activities in the classroom. The habituation process in question is to provide learning activities repeatedly both in the level of difficulty, the type of activity, and the learning objectives. Therefore, the researcher will observe how the ability of low-grade students to participate in learning activities with high-level cognitive thinking skills is carried out with the guidance of teachers. The following Table 2 is a presentation of data analysis of students' cognitive ability achievement in the first meeting learning activity in cycle 1 using the learning cycle model.

Table 2. Students' Cognitive Ability in the First Learning Cycle I with the Learning Cycle Model

Syntax/Learning Steps	Cognitive Activities	Students Who Implement	Percentage (%)
Engagement (C2)	Demonstration, reading, opinion	18	69 %
Exploration	Conducting investigation/exploration activities, gathering information, solving problems, instructing models	18	69 %
Explanation	Using information for discussion activities, explaining solutions, listening to explanations, using data for explanatory materials	20	77 %
Elaboration	Apply knowledge/skills to new situations, relate concepts to real situations	16	61 %
Evaluation	Answer open-ended questions using observations, data, or information that you already have	20	77 %

The results of the study show that students' thinking ability can naturally easily participate in learning activities with cognitive scope in the realm of low-level thinking commonly called lower-order thinking (LOT). Students can participate in C1-C3 cognitive activities without the need for specific stimulation. In the C1 and C2 domains, 20 out of 26 students were able to participate in cognitive activities well. Meanwhile, not all students can participate in cognitive activities with a higher level of cognitive realm commonly called higher-order thinking (LOT). In cognitive activities with the C4 realm, teachers need to provide better stimulation and guidance so that students can participate in activities. However, 16 out of 26 students were able to understand and participate in this activity well.

In the engagement stage, the researcher stimulates students so that they can be actively involved in learning activities physically and mentally. The researcher used a

children's song entitled "Dua Mata Saya" as a stimulus to attract students' focus and attention to be connected with learning materials about limbs. Students together with the guidance of the teacher sing a song while pointing to the limbs mentioned in the song lyrics. In the second stage, namely exploration, students interact with their peers by showing and identifying the use of the limbs in the lyrics of the song. Next, in the explanation stage, students are assigned to repeat the use of these body members in a loud voice in front of the class. The next stage is elaboration. In this activity, students develop understanding by playing a game of finding 5 differences between two pictures that look similar. With this activity, students practice conducting observation and investigation activities using their sense of sight. With this game, students carry out problem-solving activities which are shown by finding the object they are looking for. Then students explain the use of objects in pictures in daily activities. These activities are part of the analysis activity (C4). With this activity, students connect concepts and understanding with real situations. While conducting the investigation, the teacher provides feedback on student activities. Teachers appreciate students' achievements in ongoing learning activities and provide corrections to mistakes made by students. Meanwhile, what students do is listen and receive feedback given by the teacher. Along with this, teachers have carried out evaluation activities which are the last stage in the learning cycle model. Next, the research findings at the second meeting in cycle 1 are shown in the following table 3:

Table 3. Students' Thinking Skills in the Second Learning Cycle I with the Learning Cycle Model

Syntax/Learning Steps	Cognitive Activities	Students Who Implement	Percentage (%)
Engagement (C2)	Demonstration, reading, opinion	18	69 %
Exploration	Conducting investigation/exploration activities, gathering information, solving problems, instructing models	18	69 %
Explanation	Using information for discussion activities, explaining solutions, listening to explanations, using data for explanatory materials	20	77 %
Elaboration	Apply knowledge/skills to new situations, relate concepts to real situations	16	61 %
Evaluation	Answer open-ended questions using observations, data or information that you already have	22	85 %

The findings obtained in the second learning in cycle 1 stated that student activities in the realm of LOT cognition (C1-C3) appeared more than activities in the realm of HOT cognition (C4) which appeared in elaboration activities. However, C4 activity appeared better compared to the previous meeting. In cognitive activities in the LOT realm (C1-C3),

18-20 out of 26 students can naturally participate in learning activities. Meanwhile, in activities with HOT (C4) cognition, 16 out of 26 students were able to participate in the activity well. In the implementation of this activity, the teacher provides guidance to students carefully so that students can follow and understand what is being done in learning activities.

The learning activity of the second meeting in cycle 1 began by asking light questions related to learning materials and singing a children's song entitled "Kepala, Pundak, Lutut, Kaki" together. By singing this song, researchers have carried out engagement activities to involve students actively in learning activities both physically and mentally. In the second activity, students did exploration by working on Student Worksheets (LKS) together with their classmates. The images on the LKS show daily activities that use the limb movement function in the lyrics of the song. The pictures consist of children's activities cycling, playing seesaw, and other activities. Through the pictures, students describe the limbs and their uses based on guidance. In addition to containing the exploration stage, the activity of working on this LKS also includes explanation and elaboration activities. The researcher confirmed the results of students doing the LKS orally to explore explanation activities. With this, students can practice their ability to describe and explain their understanding and build confidence with stimulation from the feedback given by the teacher. When students relate the concepts of knowledge they have and try to provide descriptions and explanations, students are doing the stages of elaboration activities. Meanwhile, the evaluation activity takes place when the teacher gives feedback to students. The ability of students to listen, receive, and respond to the feedback given by the teacher is a student's achievement in this stage of this activity.

Thus learning activities using the learning cycle model in cycle 1. Next, entering the first meeting in cycle 2 learning, the researcher reflected on the shortcomings in cycle 1 for better achievement. The learning cycle model activities carried out by students in the first learning cycle 2 are shown in the following table 4.

Table 4. Students' Cognitive Ability in the First Learning Cycle II with the Learning Cycle Model

Syntax/Learning Steps	Cognitive Activities	Students Who Implement	Percentage (%)
Engagement (C2)	Demonstration, reading, opinion	20	77 %
Exploration	Conducting investigation/exploration activities, gathering information, solving problems, instructing models	20	77 %
Explanation	Using information for discussion activities, explaining solutions, listening to explanations, using data for explanatory materials	22	85 %
Elaboration	Apply knowledge/skills to new situations, relate concepts to real situations	20	77 %
Evaluation	Answer open-ended questions using	22	85 %

	observations, data, or information that you already have

The results of the study at the first meeting of cycle 2 showed that student activities in the realm of LOT cognition (C1-C3) appeared more than activities in the realm of HOT cognition (C4) which appeared in elaboration activities. There was a better development compared to cycle 1. At this meeting, as many as 20-22 out of 26 students were able to participate in learning activities well. Meanwhile, in activities in the HOT (C4) realm, 20 out of 26 students were able to participate in learning activities well. However, HOT activity in the C4 realm with analytical activities appeared significantly better than the two meetings in the previous cycle. In LOT (C1-C3) activities, students can naturally participate in learning activities. Meanwhile, in activities with the C4 realm, the teacher provides guidance to students carefully so that students can follow and understand what is being done in learning activities.

The material discussed in this cycle is "Mengenal Pancaindra". The researcher uses Infokus to display videos and images as an aperception and enter engagement activities. Next is the exploration activity. Students are paired with their peers. Each pair came to the teacher's desk and observed the objects that had been prepared by the researcher. The objects observed by the students are surrounding objects with various textures, such as rice, flour, gravel, and sand. The objects are placed in a bowl and packed into a box. The front of the box is packaged using transparent plastic so that all students can see it from a distance. The top of the box is perforated so that the students involved can explore objects using their skin or sense of touch. The right and left sides can be opened and closed so that the researcher can change the contents of the box. In this activity, students carry out observation or investigation activities with the guidance of teachers. Students feel the texture and shape of the hand, then connect the concepts of knowledge they have and guess the name of the object being touched.

Next is the explanation activity. After the student observed the object in the box, the student whispered the perceived texture to his friend. Then his friend whispered an explanation in a relay to the researcher who acted as a teacher. This activity is carried out alternately using different objects. With this activity, students carry out activities to analyze explain, and convert information into an explanation. Then students convert it back into data by filling in the checkmark in the Student Worksheet (LKS) column using the information obtained. Students guess the name of the object they are observing and write it down on the worksheet. This activity is included in the elaboration activity because it can stimulate problem-solving skills in students and connect the concept of sensory function with real situations in the form of concrete objects around them. After that, students are given feedback on their work as part of the evaluation activity. The learning cycle model activities in the second meeting of cycle 2 with the findings of student activities are presented in the following table 5.

Table 5. Students' Cognitive Ability in Second Cycle II Learning with the Learning Cycle Model

Syntax/Learning Steps	Cognitive Activities	Students Who Implement	Percentage (%)
Engagement (C2)	Demonstration, reading,	25	97 %

	opinion		
Exploration	Conducting investigation/exploration activities, gathering information, solving problems, instructing models	25	97 %
Explanation	Using information for discussion activities, explaining solutions, listening to explanations, using data for explanatory materials	24	92 %
Elaboration	Apply knowledge/skills to new situations, relate concepts to real situations	20	77 %
Evaluation	Answer open-ended questions using observations, data, or information that you already have	24	92 %

The results of the study in the second meeting of cycle 2 showed that student activities in the realm of LOT cognition (C1-C3) appeared more than activities in the realm of HOT cognition (C4) which appeared in elaboration activities. Nevertheless, C4 activity appeared significantly better than the results in cycle 1 and the previous meeting. In C1-C3 activities, 25 out of 26 students were naturally able to participate in learning activities. Meanwhile, in activities with the HOT (C4) realm, 20 out of 26 students were able to participate in learning activities well. This shows that there is a significant development in students' cognitive abilities. If the teacher provides stimulation and guidance to students carefully, then students can follow and understand what is being done in learning activities.

In the second meeting of cycle 2, learning activities are designed by taking into account previous reflection notes. The topic of learning at this meeting was "Menjaga Bagian-bagian Tubuh". The engagement activity was carried out by stimulating students' focus and attention physically and mentally by singing a children's song with the title "Wake Up My Continued Bath". After that, the teacher guided the students to do light questions and answers about maintaining limbs in daily activities. In the exploration activity, students made observations on demonstrations conducted by researchers who acted as teachers. The teacher demonstrated how to brush teeth using props in the form of toothbrushes and dental mannequins. Then some students are welcome to try to brush the tooth mannequin in the way that has been demonstrated by the teacher. After that, students face each other with their benchmates and take turns demonstrating how to brush their teeth correctly. One student in the group demonstrated how to brush their teeth, and then the other students observed and corrected if there were any mistakes. Then students take turns.

In this activity, in addition to exploring, students can also do explanation and elaboration activities at the same time. Students carry out explanation activities by evaluating and explaining to their group friends about mistakes and improvements in how to brush their teeth correctly. Elaboration activities arise by associating concepts and information in daily activities by demonstrating directly how to brush teeth correctly. In

addition, even students can directly evaluate the activities of their groupmates. At this evaluation stage, the role of teachers is very prioritized to straighten out and provide appropriate feedback on student activities.

Learning with the Learning Cycle model can be said to be effective during the study. This statement is evidenced by the developments that have been observed. Based on Piaget's theory of development, students are currently in the pre-operational and concrete operational stages. So students need objects in real form as a medium to understand a concept. Likewise, from the point of view of Bloom's taxonomy, the cognitive ability of students today as a whole is at a low level of cognitive ability. Meanwhile, the level of difficulty in the Learning Cycle model stage is relatively difficult for grade 1 students. Therefore, the researcher developed a strategy to introduce high-level thinking skills in students using the Learning Cycle model.

Games can make learning more exciting and motivate students to like a learning activity (Susanti et al., 2021). Cognitive games can be a solution to introduce various kinds of thinking activities. With games, students can be stimulated to practice their thinking skills without giving a mental burden that at that time the student is learning. Significantly, the results of the study show that students can carry out learning activities in a sustainable manner in the C4 realm. Similar results were found in a study that stated that critical thinking skills can be built by the habituation process through learning activities in the classroom (Haryanti, 2017). In this study, it was explained that the researcher explored critical thinking skills in students at the elementary school level. The researcher habituates students to improve their critical thinking skills by repeating the stages of the problem-based learning model in classroom learning activities.

CONCLUSION

Based on the results of the research analysis that has been presented, the learning cycle model can support the development of students' cognitive thinking skills. The syntax/steps contained in the learning cycle model can be developed into several learning indicators with various areas of cognition that can be adjusted to students' thinking skills. In the research subject who is a 1st grade student, the steps of engagement, exploration, and explanation can be achieved by students naturally. Students can easily participate in these activities because they are relevant to the thinking skills of students who are in the concrete operation stage. The engagement step in the learning cycle model is developed with indicators in the realm of C3 cognition (applying). The exploration step in the learning cycle model is developed with indicators in the realm of C3 cognition (applying). Then the explanation step is developed with indicators in the realm of C2 cognition (explaining). In the elaboration step, indicators are developed in the C4 realm (analyzing). This activity is a high-level thinking activity. Therefore, the implications for grade 1 students are focused on how students can participate in analytical activities guided by teachers.

The results of this study show that grade 1 elementary school students can carry out analysis activities if teachers can package activities with better interest and guidance. In this case, the teacher packages analysis activities by playing, so that students have an interest in being active and focused on learning activities. Meanwhile, the last step in the learning cycle model, namely evaluation, is developed in the C1 realm (understanding)

with indicators of listening to feedback. Therefore, it can be concluded that the learning cycle model can support the development of students' thinking skills with the process of habituation in learning. Teachers can provide a habituation process by slowly introducing cognitive thinking activities in stages. Improvement in students' cognitive abilities at a low level (C1-C3) has been shown to improve significantly. In addition, there was a significant increase in student activity in analyzing activities (C4) even though it required better efforts in packaging activities and providing guidance.

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