

# The Heuristic Learning Model To Critical Thinking Ability In Elementary Science Study

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**Abstract.** Critical thinking is an ability that can create positive things, have broad insights, and can actualize meaningful knowledge. Through interesting and creative learning models, critical thinking can be created in fun learning. The implementation of this research activity is to develop students' critical thinking skills in elementary science learning. The research method uses Qualitative Research using classroom action research. the research sample of class IV students totaling 22 students. This research was conducted on June 21 - 26 2022 carried out online in three cycles. Cycle I was held on June 22, 2022, Cycle II on June 25, 2022, and Cycle III on June 26, 2022. The results showed that students' critical thinking skills were measured through tests made based on critical thinking indicators which increased in each cycle. In Cycle I it achieved an average score of 75.5. Cycle II achieved an average score of 78.3. And in Cycle III it achieved an average score of 82.5. Based on the results of this study it can be concluded that the Heuristic learning model can be used so that students have the ability to think critically in learning so that they can create situations that are more responsive and stimulate students to think.

**Keywords:** Heuristic Learning Model, Science Learning, Critical Thinking, Qualitative

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## INTRODUCTION

Natural Sciences (IPA) is included in the elementary school (SD) curriculum which discusses nature and its manifestations in life. IPA is a way to provide hands-on lessons about scientific understanding of the natural environment based on observation and experimentation. According to Samatowa (2011), a series of natural events that have been observed and tested by humans. Science learning refers to systematic natural learning so that it does not only manage a collection of observations in the form of results, but also the discovery process. The process is carried out in order to bring up the ability to think, analyze, curiosity, and the ability to explore students' nature. Science is also a fundamental force that can be used to improve people's lives through a scientific approach (Fitria, 2019). In addition, according to Arfianawati, Sudarmin, & Sumarni, (2016: 46). In learning there is also a process of forming the behavior and attitudes of students towards a better direction through the interaction of these students with their environment.

The definition of learning according to Sutikno (2009:32) is all the efforts of educators to ensure that the learning process takes place within students. the process can be seen as successful if there is an increase in student learning outcomes. Therefore, to develop an effective learning model, each teacher must have sufficient knowledge about the concept of the learning model and how to implement it in the teaching and learning process (Aunurrahman, 2009: 140).

In accordance with the characteristics of elementary school children and the character of learning science, learning should be designed around activities and oriented towards the environment so that it can motivate students from within to learn in a fun, independent and enjoyable way. Related to this, teachers should be able to make changes in designing learning activities that are in accordance with the characteristics of students so that learning becomes fun and students can find out and discover concepts from the lesson. So that what is desired in the current curriculum in accordance with Pemendeknas No.41 of 2007, namely the teacher as a facilitator who facilitates students can be achieved.

However, the reality in the field is still not as desired in the Permendiknas. The process that should have been carried out has tended to be neglected and has not been implemented optimally. Teachers are more comfortable with the old zone that was adhered to previously, namely by providing material according to the student books at school. Rasana (2009: 20) says that the teacher's role is very important as an information process, and students are only recipients of abstract and theoretical information. Such learning will only provide material information to students so students cannot develop their reasoning to think more critically so that students will be more monotonous in their knowledge. This will have an impact on the low science learning outcomes of students in elementary schools.

It is very important for students to develop better attitudes and behaviors because in the future these students will be involved and contribute to society. students' skills to think critically is a skill that students need to be able to contribute to society (Facione, 2015). (Paul and Elder 1999) says that critical thinking is the ability to reason and evaluate a thought to improve it. Another view says that critical thinking is an insight or reasoning ability in order to obtain, develop, and process in concluding a statement (Arfianawati, Sudarmin, & Sumarni, 2016: 46).

Marzano (in Yulita, R & Amini, R, 2015: 201) said that critical thinking is important to develop so that it can create positive classes, have broad insights, and be able to actualize meaningful knowledge. The lack of students' ability to think critically in learning is because the learning model used is not relevant. This is also explained by (Fatimah, 2016) that the irrelevance of the learning model used by students causes low students' ability to think critically to achieve better learning. Relevant forms of learning to improve students' skills in critical thinking are carried out through appropriate learning models to use. Another view also says that students must improve their critical thinking by giving students the opportunity to be able to solve various problems. (Hasnan, Rusdinal, and Fitria 2020). In addition, the cause of students' low critical thinking skills is that the application of their learning model does not foster students' motivation, interest, and critical thinking skills. One of the causes of students' low critical thinking skills is the application of learning models that have not increased (Usmeldi, Amini, and Trisna 2017).

The facts from several research findings indicate that student learning outcomes are still not optimal, including those carried out by Toeraliyah 2013; Djarwati, 2013; Mungajilah, 2013. Based on the three researchers, it is known that several factors cause low student learning outcomes also in learning, where the teacher only emphasizes memorizing facts and concepts, the teacher tends to use the lecture method and does not involve students. In learning, the teacher is only interested in the final results of learning and has forgotten. process skills and teachers who rarely use media in learning.

Other causes namely science learning in elementary schools which is focused on the knowledge aspect only so that students are asked to memorize, which students should be able to develop skills in thinking and develop actualization concepts from experimental activities and experiences. In addition, from the presentation of the problems above, to innovate in teaching and learning activities so that teachers are not monotonous, they need an accurate learning model. Not only that, the learning model can make students able to think critically by increasing attention, concentration and motivating student learning.

To overcome these problems, it is necessary to innovate in the learning process by designing learning models and new resources that can optimize student learning outcomes. One of them is the heuristic learning model.

According to (Adiarta, 2014) explaining the *Heuristic learning model* is a learning model in which activities make students have the opportunity to be able to develop their knowledge individually by constructing questions starting from what the problem is, what solutions can be used to solve the problem, and how to solve the problem. that well. So that based on the knowledge obtained from students' ability to think critically, students will get the answer. Others according to Lala Mutiara Sari (2022) say that the heuristic approach is presenting a number of data and students are asked to make conclusions from the data they study based on their creative ideas.

Heuristics are strategies that ignore part of the information, with the aim of making decisions more quickly, economically and/or accurately than more complex methods. (Gigerenzer and Gaissmaier 2011). So, the Heuristic learning model is a learning model created to obtain how

to build and use knowledge. Students can understand the meaning of learning that takes place where previously the focus of questions has been determined, so students are required to think critically with the help of this learning model.

The steps in heuristic learning are orientation, discovery of students' original ideas, concentration of questions, generation of new knowledge and evaluation of students' ideas. At the orientation stage, the teacher attracts students' attention by mentioning some everyday phenomena related to the subject being studied. In the early stages of expressing ideas, the teacher asks students to express their thoughts by asking questions related to everyday life. In the focus question phase, the teacher presents problems related to the research conducted in the form of key questions. In the phase of creating new knowledge, students are asked to experiment with simple tools that are adapted to the learning material. After that, students complete the questions and answers under the guidance of the teacher during the idea evaluation stage. The teacher defines central ideas according to scientific concepts and discusses them with students. This allows students to first see conflicts in their minds and then change them.

Based on the above, it can be concluded that there are differences between heuristic learning and conventional learning models. These differences can be seen from the steps of its application in the learning process. According to Sunartombs (2009) conventional learning uses more lecture and discussion methods. In this condition, the teacher only plays his role because he thinks that teaching only transfers knowledge to those who are learning.

Meanwhile, according to Warpala (2009) said that the teacher's job is to convey knowledge or information to students. The student's task is to receive, store and perform other functions according to the information provided. Monotonous activities make students bored and lazy to study. In contrast to the heuristic learning mode, students in the learning mode are given the opportunity to explore their knowledge through specific and topic-related activities. In addition, students have the opportunity to discuss and exchange ideas with their friends. It promotes students' ability to solve problems through critical thinking. The purpose of this research is to improve students' critical thinking in the application of science education in elementary schools.

## METHOD

This article wants to describe the use of the heuristic learning model as an innovative learning model for teachers in elementary schools so that teachers can improve students' critical thinking skills in the learning process. In searching, collecting, and disclosing this article using descriptive qualitative analysis research. Hadari Nawawi (2015: 67) defines the descriptive method as a way of explaining an objective event or certain event based on observable facts, or how it should be and then describing that history. To finish the article objectively, the researcher conducted interviews, observations and literature studies to collect data. Observation is a method of making direct and systematic observations.

This research approach uses a qualitative approach. This approach is used to clearly and specifically describe ongoing learning. This research includes descriptive research, namely PTK (Classroom Action Research). PTK in one cycle consists of: (1) planning, (2) implementing activities, (3) observation, (4) reflection. This research was conducted for 3 periods, each consisting of one meeting. Every meeting consists from two lesson (JP). a week learning IPA in Class IV consists from three time meeting. Survey conducted since Thursday 21 June 2022 until Tuesday 26 June 2022. Researcher Act as teacher model and work same with teacher class. In study this every cycle consists from four stages that is planning, action, observation, and reflection. Subject study this is student class 4 elementary school 20 bottom Alung Subdistrict Ampek Nagari Kab. Religion year lesson 2021-2022. Sample study based on observation first student class IV SD Negeri 20 Lubuk ALung Kab. Agam that is as much 22 student. If process study student no optimal. Thing this be marked with many student which passive in process learning. Method collection data which used in study this is observation for measure implementation use model learning heuristic and test for measure ability think critical student.

The observation sheet contains indicators for assessing the use of the Heuristic learning model using the formula:

$$P = \frac{F}{N} \times 100 \% \text{ (Arikunto, 2015)}$$

Information :

P = Percentage level of use of the Heuristic learning model

F = Number of Values

N = Number of Total Values

The value obtained from the calculation above is then adjusted to the level of achievement rating in the following table :

**Table 1.** Criteria for Using the Heuristic Learning Model

No	Percentage( %)	Classification
1.	90 ≤ A ≤ 100	A (Very Good)
2.	75 ≤ B ≤ 90	B (Good)
3.	55 ≤ C ≤ 75	C (Enough)
4.	40 ≤ D ≤ 55	D (Less)
5.	0 ≤ E ≤ 40	E (Very Less)

Test the load indicator for evaluate ability think critical, that is. 1) use fact which appropriate and honest, 2) Settings and use thinking which logical, 3) differentiate logic which valid from conclusion logical which disabled, 4) deny argument which no relevant and serve argument which significant. argument and 5) question view and question consequence from view . The average results of students' critical thinking skills tests are measured using the formula:

$$P = \frac{F}{N} \times 100 \% \text{ (Arikunto, 2015)}$$

Information :

P = Average Score of Students' Critical Thinking Ability

F = Total Value of All Students

N = Number of Students

The value obtained from the calculation above is then adjusted to the level of achievement rating in the following table :

**Table 2.** Criteria for Using the Heuristic Learning Model

No	Percentage( %)	Classification
1.	81.25 ≤ A ≤ 100	A (Very Good.)
2.	71.50 ≤ B ≤ 81.25	B (Okay.)
3.	62.50 ≤ C ≤ 71.50	C (Enough.)
4.	43.75 ≤ D ≤ 62.50	D (Less,)
5.	0 ≤ E ≤ 43.75	E (Very Less.)

Analysis data use results reflection every cycle, used 3 cycle in study. Reflection occur after learning or on Step implementation PTK. Results reflector help para researcher for interpret data. Teacher eye lesson help researcher with think, so that data which generated no subjective. Thinking critical student analyzed in a manner qualitative based on level success activity. Degrees success activity determined with review and analyze sheet observation which used During learning and test which conducted on every cycle. Determination level success activity analyzed by researcher and teacher class. If results process learning and analysis which planned on period first no reach level success which has determined, so researcher and teacher specialist continue to period next. Something cycle study considered succeed if results analysis data show suitability with level success or growth which has determined, especially in relation with think critical student.

## RESULTS AND DISCUSSION

This research was conducted in 3 cycles in class IV SDN 20 Lubuk Alung, Ampek Nagari District, Kab. Religion. On approach problem statement, student requested for look for problem which related with topics which delivered, after that iswa requested formulate problem and write formula problem the in worksheet which has prepared by teacher (researcher). Teacher ask a number of group for come to the front of the class to read formula problem and hypothesis which has prepared. Teacher give statement which explain arrangement say from Duty day this.

In step collection data, students are asked to gather information for formulate problem from various source or Internet, Interview from source Trusted, or observation. Syntax processing data ask student for process information from various source. Student verify results processed information which obtained with review literature which there is and hypothesis which made.

Syntax Generalizations student requested for interesting conclusion from his job, and a number of group student requested for present something. In end learning, teacher give affirmation about Theory day that.

21st \_ June 2022 Preaction for evaluate ability think critical student class IV before application model learning heuristic. Found that teacher student use method discussion group and presentation for enable learning. Discussion conducted in accordance with guidelines student worksheet which given by teacher. After analyze worksheet which used teacher, questions which entered only on level knowledge C1 and C2. Thus failing to train students to optimize their thinking skills. Students only have understanding knowledge and skills, students lack the ability to think more sensitively, carefully and train logical thinking (Critical and Logical), as well as motivate and develop attitudes that are more experienced. Following are the results obtained after the initial steps of students' critical thinking:

### **Table 3. Average Pre-Action Critical Thinking Ability Score**

Total Score 1756  
Average 73 .16  
Highest Rated 84  
Lowest Score 68  
Number of Completed Students 6 (23%)  
Number of Students Not Completed 16 (73%)

Cycle I took place in one meeting, namely on Friday 22 June 2022 for 2 JP, with material on adjusting the shape of the animal's body to its environment. The results of observations using the Heuristic Learning Model in cycle I reached 77.38 % and entered in good grades. The results of students' critical thinking skills tests in cycle I can be seen in the following table:

### **Table 4. Average Score of Critical Thinking Ability Cycle I**

Total Score 1808  
Average 75 .5  
Highest Rated 86  
Lowest Score 67  
Number of Completed Students 14 (63 .63 %)  
Number of Students Not Completed 8 (36 .36 %)

Cycle II took place in one meeting, namely on Monday 25 June 2022 for 2 JP, with material on adjusting animal behavior to its environment. The results of observations using the Heuristic Learning Model in cycle II reached 93.85 % and were included in the very good category. The results of students' critical thinking skills tests in cycle II can be seen in the following table:

### **Table 5. Average Score of Critical Thinking Ability Cycle II**

Total Score 1848  
Average 78 .3  
Highest Rated 89  
Lowest Score 69  
Number of Completed Students 18 (81 ,8 %)



Number of Students Not Completed 6 (18.2 % )

Cycle III takes place in one meeting, namely on Tuesday 26 June 2021 for 2 hours of lessons, with material on animals' adaptation to their environment. The results of observations using the Heuristic Learning Model in cycle III reached 95.42 % and were included in the very good category. The results of students' critical thinking skills tests in cycle III can be seen in the following table:

**Table 6. Average Score of Critical Thinking Ability Cycle III**

Total Score	1948
Average	82 .5
Top Rated	95
Lowest Score	73
Number of Completed Students	21 (95.45 % )
Number of Students Not Completed	1 ( 4.55 %)

Score ability think critical from Pre activity, Cycle I, Cycle II and Cycle III experience enhancement. rated before appearance 23% (8 student), Cycle I 63.6 % \_ (14 student) done second. Enhancement on Cycle II 81.8 % \_ (18 student) and 95.45% (21 student) on Cycle III. The application of the heuristic learning model improves critical thinking skills. The four categories of thinking processes, namely problem solving, decision making, critical thinking and creative thinking, are included in advanced or complex thinking (Sugiarto (Amri and Ahmadi, 2010: 3) . We are faced with problems that we must deal with. with. We can solve the problems we face and find solutions. To solve a problem, we need the ability to think logically and systematically. you must have it. In this case , you need advanced thinking skills . This can be a measure of success in life.

Critical thinking according to Morgan, 1999 (Nurhayati, 2011:67) consists of the ability to define problems, the ability to choose information for solving problems, the ability to identify assumptions, the ability to hypothesize and draw conclusions. Meanwhile, according to (Adiarta, Candisa and Dantes , 2014 ) the learning model guides students through learning by asking questions if there are alternative solutions and their advantages, what are the right solutions and how to apply them correctly.

Function learning this conducted in accordance with steps method heuristic. This is technique analytical which started with evaluation which appropriate and checking repeat before decision made for increase thinking critical student. Think critical student no could memorized with rote rote. Model Learning which The same (Fadillah, 2019) is framework reference which detail preparation and delivery learning, and student could adapt draft or Theory which they learn with method which different or in format which different for more understand draft or understand Theory. more good. educated .

The application of the heuristic method trains systematic thinking. Systematic thinking, that is, students follow the pattern of the scientific method, the teacher gives suggestions, students find problems and form their own hypotheses, collect information and formulate problems, and process the information collected. Combine with hypotheses, verify the processed information , and finally draw conclusions. Students' thinking skills are stimulated when students formulate problems. By formulating the problem, students recall concepts related to observation activities carried out to optimize their prior knowledge. As shown by Anggraeni and Widiyani (2013), students' prior knowledge has a positive effect on them. In other words, students will further strengthen the concept of long-term memory.

## CONCLUSION

heuristic learning model can improve students' critical thinking in science by studying how living things adapt to their environment SDN 20 Lubuk Alung, Ampek Nagari Subdistrict, Agam District semester I academic year 2021/2022 class IV Cycle I 5 , 5 % (12 students) Good and 9.09% (2 students) Very Good; Cycle II increased again with 68.18% (15 students) Good and 13.63% (3 students) very good. Critical thinking skills are improved through the application of

heuristic learning models. This is indicated by the fulfillment of the research success criteria, namely. 95.83 %, ie. 97.5 % of the 21 grade IV students who took the critical thinking test achieved the KKM and the results of observations using the heuristic learning model. In applying the heuristic learning model, teachers are expected to familiarize students with learning to find answers to existing problems so that students' critical thinking skills develop, teachers must ask questions that can train students' critical thinking, teachers apply appropriate learning . namely the heuristic learning model. This heuristic learning model guides students through the learning process by asking problems , finding solutions, benefits and the most appropriate way to implement them, namely conclusions, so that they can solve problems appropriately and methodically using students' abilities thinking, and applying the heuristic teacher learning model should be more adept at stimulating students' thinking activities so that they can create situations that are more responsive and stimulate students' thinking.

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