



ISSN Print: 2394-7500
ISSN Online: 2394-5869
Impact Factor: 8.4
IJAR 2022; 8(4): 392-397
www.allresearchjournal.com
Received: 06-01-2022
Accepted: 28-02-2022

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Application of the inquiry model to improve critical thinking skills and student learning outcomes in science learning in class IV at parepei catholic elementary school

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Abstract

Education is an effort that is carried out or carried out regularly and systematically to mature students by providing knowledge and training various skills, inculcating the values of good life attitudes, in accordance with the purpose of education, namely the development of the potential of students to become human beings who have faith and piety. to God Almighty, noble, healthy, knowledgeable, capable, creative, independent and become a democratic and responsible citizen. The results of observations made by researchers indicate that one of the main problems in learning, especially in learning science at the Parepei Catholic Elementary School, class IV is found that the absorption capacity of students is still low. This can be seen in the learning outcomes of students which are always very worrying. Where the average value in science learning in class IV is only below 6. This is because most of the teaching and learning activities are still dominated by teachers (teacher centered) and do not provide opportunities for students to develop independently through discovery and thought processes. This research aims to :1. Improving the critical thinking skills of fourth graders at the Parepei Catholic Elementary School through the application of the Inquiry Model. 2. Improving science learning outcomes for fourth graders at the Parepei Catholic Elementary School through the application of the Inquiry Model. The methodology in this research is a type of classroom action research, the research instrument used in this research is an observation sheet on the implementation of learning with an inquiry model, an analysis sheet for critical thinking skills and a pre-test and post-test sheet. Sources of data in this study were fourth grade students at the Parepei Catholic Elementary School, which amounted to 7 students and researchers, in this case teachers. From the discussion of the results of this classroom action research, the following conclusions can be drawn: by applying the inquiry learning model in science learning, force and motion material can help teachers improve critical thinking skills and learning outcomes of Parepei Catholic Elementary School students. This can be seen from the learning outcomes that achieve learning success indicators. The inquiry learning model is one of the models that plays a very important role in the success of learning and teaching. Because according to Roestiyah (2008: 76), the purpose of the teacher using the inquiry model when teaching is: so that students are stimulated by the task, and actively seek and research the problem solving themselves. Look for resources on their own, and they learn together in groups.

Keywords: Inquiry model, critical thinking, science learning

1. Introduction

We are currently entering an increasingly advanced era marked by rapid changes in various areas of life. In the era of the Industrial Revolution 4.0, complex competencies and abilities must be possessed by someone to be able to compete with others. According to Wagner (Linda Zakiah, MP.d, 2019:2) there are seven types of life skills needed in the 21st century, namely ^[1] critical thinking and problem solving skills ^[2], collaboration and leadership ^[3], dexterity and adaptability ^[4], initiative and entrepreneurial spirit ^[5], ability to communicate effectively both orally and in writing ^[6], able to access and analyze information, and ^[7] have curiosity and imagination (Wagner: 2010).

Another view is said by Frydenberg & Andone (Linda Zakiah, MP.d, 2019: 2), that in the 21st century everyone must have critical thinking skills, knowledge and abilities of digital literacy, information literacy, media literacy and mastering information and communication technology. More complex skills needed to face the 21st century stated by the US-based

Apollo Education Group, which identified ten skills needed to work in the 21st century, namely critical thinking skills, communication, leadership, collaboration, adaptability, productivity and accountability, innovation, global citizenship, ability and entrepreneurial spirit, as well as the ability to access, analyze, and synthesize information. From the view as stated above, mentioning critical thinking skills or abilities is a necessity for everyone living in the 21st century and of course in the era of the Industrial Revolution 4.0. And that means in the world of education, critical thinking skills are a necessity for students, so educators must be able to develop critical thinking skills in students.

Education is an effort that is carried out or carried out regularly and systematically to mature students by providing knowledge and training various skills, inculcating the values of good life attitudes, in accordance with the purpose of education, namely the development of the potential of students to become human beings who have faith and piety. to God Almighty, noble, healthy, knowledgeable, capable, creative, independent and become a democratic and responsible citizen (Indonesian Ministry of Education and Culture, 2004).

The purpose of education as stated in the law must be understood and realized by all segments of education so that education is directed at the goals that have been set in carrying out elementary school education activities in particular. Basic education is a basic stage in an effort to improve the quality of human resources (HR) of the nation's next generation who master science and technology in the development of the Indonesian nation and state. To improve human resources (HR) education plays a very important role. According to Buchori, (Trianto 2007:1), that a good education does not only prepare students for a profession or position, but to solve the problems they face in everyday life.

The results of observations made by researchers indicate that one of the main problems in learning, especially in learning science at the Parepei Catholic Elementary School, class IV is found that the absorption capacity of students is still low. This can be seen in the learning outcomes of students which are always very worrying. Where the average value in science learning in class IV is only below 6. This is because most of the teaching and learning activities are still dominated by teachers (teacher centered) and do not provide opportunities for students to develop independently through discovery and thought processes. Teachers have not been able to guide and improve students' critical thinking skills, due to the lack of teacher preparation in preparing learning implementation plans using learning models. Teachers tend to use the lecture method and sometimes assignments, so that children are less interested in learning. Children tend to play or go for walks, only a small percentage pay attention.

To improve the quality of education, the teaching and learning process in schools is maximized and must be supported by adequate educators. This means that teachers in education are expected to be more professional in carrying out their duties as educators and guiding students. The professional ability of teachers is very important in order to improve the quality of education. Teachers must be able to generate motivation to learn students and be able to determine the appropriate method with the material being taught. Teachers in the teaching and learning process in schools have an important role, because teachers as educators are expected to be able to present subject matter

well. Especially in science learning. Because in science learning it deals with nature systematically so that science is not only the mastery of a collection of knowledge in the form of facts, concepts or principles. But it is a process of discovery. To generate interest and attention as well as students' ways of thinking, teachers are expected to use active learning strategies in their teaching and learning activities.

One strategy for students to learn actively and think critically is the inquiry learning model. Indrawati, (Trianto 2007:134) states that learning in general will be more effective if it is carried out through learning models that include information processing clusters. This is because information processing models emphasize how a person thinks and how it impacts the ways in which information is processed. Learning using the lecture method for science subjects is certainly not relevant and will lead to verbalism for children's understanding, even though there are still many teachers who like it. They reasoned this method was easier to implement.

To overcome the teacher's habit of teaching with the lecture method, Classroom Action Research is the easiest suggestion for researching, perfecting, improving, and evaluating learning management. The inquiry learning model is intended to make the authoritarian habit of the teacher a facilitator, so that the learning process becomes more effective. It is expected that students can be trained and get used to thinking critically independently to solve problems using various settlement strategies. So that science learning in Parepei Catholic Elementary School, especially Class IV can increase so that learning outcomes are achieved. This research aims to:

1. Improving the critical thinking skills of fourth graders at the Parepei Catholic Elementary School through the application of the Inquiry Model.
2. Improving science learning outcomes for fourth graders at the Parepei Catholic Elementary School through the application of the Inquiry Model.

2. Literature Review

2.1 Concept of Inquiry Learning Model

Hamzah (2007:15), the main objectives of the inquiry model are: Making students go through a process of how knowledge is created. To achieve this goal, students are faced with something (problem) that is mysterious, unknown, but interesting. However, keep in mind that the problem must be based on an idea that can be found and not made up. Roestiyah (2008:76), the purpose of the teacher using the inquiry model when teaching is: "so that students are stimulated by the task, and actively seek and research the problem solving themselves. Look for resources on their own, and they learn together in groups." From some of the concepts above, it can be concluded that the inquiry learning model is a way of presenting learning that provides opportunities for students to seek or understand information that involves students' abilities to the fullest so that they can formulate their own findings confidently. Roestiyah (2008:76), the purpose of the teacher using the inquiry model when teaching is: "so that students are stimulated by the task, and actively seek and research the problem solving themselves. Look for resources on their own, and they learn together in groups."

In an effort to instill concepts in science subjects, students are not enough just to lecture. Learning will be more

meaningful if students are given the opportunity to know and be actively involved in finding concepts from facts seen from the environment with teacher guidance. Problem-based learning has clear procedures for involving students to

identify problems. B Sund, (Yoki Aryana, MT *et al*, 2018:29). The working steps (syntax) of the disclosure/discovery learning model are as follows:

Table 1: Disclosure/discovery learning model syntax

Work steps	Teacher Activities	Student Activities
Giving stimulation	The teacher starts learning activities by asking questions, recommending reading books, and other learning activities that lead to the preparation of problem solving	Students are faced with something that causes confusion, then proceed not to give generalizations, so that the desire to investigate themselves arises. -Stimulation in this phase serves to provide conditions for learning interactions that can develop and assist students in exploring the material.
Problem Identification (Problem Statement)	The teacher gives students the opportunity to identify as many problem agendas as possible that are relevant to the lesson material, then one of them is selected and formulated in the form of a hypothesis (temporary answers to problem questions).	The selected problems must then be formulated in the form of questions, or hypotheses, namely statements as temporary answers to the questions posed
Data collection	When the exploration takes place the teacher also provides opportunities for students to collect as much relevant information as possible to prove whether the hypothesis is true or not.	At this stage the function is to answer questions or prove whether the hypothesis is true or not. Thus, students are given the opportunity to collect various relevant information, read literature, observe objects, interview resource persons, conduct their own trials and so on.
Data Processing	The teacher provides guidance when students perform data processing.	Data processing is an activity to process data and information either through interviews, observations, and so on, then interpreted. All information from reading, interviews, observations, and so on, is all processed, randomized, classified, tabulated, even if necessary, calculated in a certain way and interpreted at a certain level of confidence.
Verification	Verification aims that the learning process will run well and creatively if the teacher provides opportunities for students to find a concept, theory, rule or understanding through examples that he encounters in his life.	Students carry out a careful examination to prove whether or not the hypothesis was set earlier with alternative findings, linked to the results of data processing
Drawing conclusions generalization	Drawing conclusions is the process of drawing a conclusion that can be used as a general principle and applies to all events or the same problem, taking into account the results of verification.	Based on the verification results, the principles underlying the generalization are formulated.

Source: Yoki Aryana, MT dkk, 2018

2.2 Concept of Critical Thinking Ability of Science Subject Learning Outcomes

Critical thinking is an inseparable series of characteristics with one another. Every argument, claim or evidence must be analyzed which conclusion is either by inductive or deductive reasoning. From these conclusions can be assessed or evaluated so that it will produce a decision or a problem solving. Cece Wijaya (Linda Zakiah and Dr Ika Lestari 2019: 10) who mentions the characteristics of critical thinking, which are as follows:

- a. Know in detail the parts of the decision;
- b. Good at detecting problems;
- c. Able to distinguish fact from fiction or opinion;
- d. Can distinguish between constructive and destructive criticism;
- e. Able to identify the attributes of humans, places, and objects, such as in the nature, shape, form, and others;
- f. Able to list all possible consequences or alternatives to solving problems, ideas and situations;
- g. Able to make sequential relationships between one problem and another;
- h. Able to draw generalization conclusions from the data that is already available with the data obtained in the field;
- i. Able to make predictions from available information;
- j. Be able to distinguish between false and correct conclusions from the information received;
- k. Able to draw conclusions from existing and selected data.

According to Marzano (Herman Anis: 2022) there are 14 indicators of critical thinking, namely: a) looking for clarity of problems b) looking for reasons, namely looking for their own thoughts c) trying to get as much information as possible from other sources d) using and mentioning reliable sources e) paying attention to the overall situation f) trying to be consistent with the main problem g) sticking to the basis of the problem h) looking for alternatives i) open-minded i.e. speaking concretely j) taking sufficient reasons k) seeking decisions as carefully as possible l) solving problems regularly / using clear language m) use critical thinking skills n) sensitive to feelings and level of knowledge.

Sukmadinanta (2005:102) suggests "Learning outcomes are the realization or expansion of a person's potential skills or capacities". Mulyani Sumantri, *et al.* (2007: 213) "Learning outcomes are changes in behavior that are relatively permanent in a person as a result of a person's interaction with their environment." Furthermore, Aswani (Zainul 2004:72) "Learning outcomes are changes in behavior obtained by learners after experiencing learning activities. ". Some previous research that can be used as a reference include:

1. Classroom action research by Ventri Adetia Jumintri (2019:1) entitled "Application of the Inquiry Model in Improving Critical Thinking and Science Learning Outcomes" concludes that after carrying out research and data analysis, the conclusion of this study shows that the Inquiry Model can improve thinking critical and science

learning outcomes of fourth grade students of SD Negeri 56 Kaur. The increase can be seen from the average score of students on the initial test/assessment, namely (53) which falls into the "Less" category; and the average score of students in the third cycle of the test/assessment is (65.88). It means that during the process of giving action for three cycles, students experienced an increase of (12.88) points. The improvement that is more important is the changes that occur in the learning atmosphere of students in the classroom, especially regarding: attitudes, learning motivation, and student interactions in class. During the action process, the learning atmosphere becomes more active, students reduce undisciplined actions such as chatting in class, students seem more enthusiastic and happy to follow lessons, and in group activities they can participate more actively and contribute to problem solving in their groups.

2. Classroom action research by Agustina Niki Safitri (2018:1) entitled "The Influence of the Inquiry Learning Model on Learning Outcomes and Thinking Skills of Class IV Students of Science Content About Plant Morphology at SDN Deresan" concludes that the inquiry learning model affects critical thinking skills and learning outcomes of fourth graders on science content about plant morphology at SDN Deresan. The results of the analysis of research data answer the research hypothesis.

The hypothesis in this study is: if learning science by applying the inquiry model, it can improve critical thinking skills and student learning outcomes.

3. Research Method

This The methodology in the research is a type of classroom action research at the Parepei Catholic Elementary School. Classroom action research is described as a dynamic process covering aspects of planning, action, action implementation, observation and reflection which are sequential steps in one cycle that are related to the next cycle. The implementation of this classroom action research is described in the form of an action spiral that refers to the Kemmis and Mc Taggart model (Zainal Aqip 2007:31). Sources of data in this study were fourth grade students at the Parepei Catholic Elementary School, which amounted to 7 students and researchers, in this case teachers.

The subjects of the research were all fourth graders at the Parepei Catholic Elementary School who received science subject matter for the 2021/2022 academic year with a total of 7 students, consisting of 4 boys and 3 girls. Sources of data in this study were fourth grade students at the Parepei Catholic Elementary School, which amounted to 7 students and researchers, in this case teachers. The types of data in this study are student learning outcomes obtained through observation data on learning activities, analysis of critical thinking skills obtained from LKPD results that have been adjusted to the scores of each critical thinking indicator, as well as pre-test and post-test data that have been analyzed. G. Data analysis techniques. The Ministry of Education and Culture (1995) states that the individual's absorption capacity has completed learning if it reaches 65% with 6.5 while for the absorption power of the group is complete if it has reached 85% of students who have achieved absorption 8.5. For the level of student learning outcomes, it is stated with a score of 0-100. The type of data presented by the criteria and measures of success in the assessment of this class action is 70% individual complete learning or a score of 7.0 and for classical complete learning 85% of the total

number of students who obtained a score of 7.0 (achieved a score of 70).

4. Result and Discussion

This classroom action research was conducted at the Parepei Catholic Elementary School, having its address at Parepei Village, Remboken District, Minahasa Regency. The subjects are fourth grade students with a total of 7 students, consisting of 4 males and 3 females with heterogeneous academic abilities. At the first meeting there were 7 students present, the second meeting 7 people, and the third meeting 7 people. At the time of the final exam, there were 7 people present. The implementation of the action was carried out in three cycles using an inquiry approach. The schedule of learning activities is carried out according to the lesson schedule at school. This is done so that learning runs effectively so that students can receive lessons well and do not interfere with other lesson hours. Each cycle discusses different material but still has one theme, namely force and motion. The series of activities for each cycle in classroom action research consists of planning, implementing, observing, and reflecting.

After the action was taken and observed by the observer, in this case the fourth grade teacher, the following things were found:

1) Pre-test and post test results

Science learning outcomes of students by conducting pre-test and post-test on the material of various styles, consisting of 10 multiple choice questions. The results are as follows:

Table 2: Learning Outcomes of Science Pre-Test Cycle III

No	Student	M/F	Hasil Test			Test Result	Description
			Correct	Wrong	Score		
1	Student 1	M	7	3	7	70	Finished
2	Student 2	M	6	4	6	60	Not Finished
3	Student 3	M	6	4	6	60	Not Finished
4	Student 4	M	8	2	8	80	Finished
5	Student 5	F	7	3	7	70	Finished
6	Student 6	F	7	3	7	70	Finished
7	Student 7	F	8	2	8	80	Finished

The number of participants taking the test was 7 students. Those who completed were 5 students and those who did not completed were 2 students. The percentage of participants who finished studying was 71.42%, who had not finished was 28.58%

Table 3: Learning Outcomes of Science Post Test Cycle III

No	Student	M/F	Hasil Test			Test Result	Description
			Correct	Wrong	Score		
1	Student 1	M	8	2	8	80	Finished
2	Student 2	M	7	3	7	70	Finished
3	Student 3	M	8	2	8	80	Finished
4	Student 4	M	6	4	6	60	Not Finished
5	Student 5	F	9	1	9	90	Finished
6	Student 6	F	7	3	7	70	Finished
7	Student 7	F	9	1	9	90	Finished

The number of participants taking the test was 7 students. Those who completed were 6 students and those who did not completed were 1 student. The percentage of participants who finished studying was 71.42%, those who had not finished were 28.58%.

Table 4: Average percentage of pre-test and post test

Activity	Jumlah Peserta Didik	Finished	Not Finished	Percentage	
				Finished	Not Finished
Pre test	7	5	2	71,42%	28,58%
Post test	7	6	1	85,71%	14,29%

Based on the data obtained there is an increase in value after the action. The number of students who completed the pre-test was 5 students, then after the post-test rose to 6 students.

Based on the existing data, students' critical thinking skills, indicators of critical thinking skills with the criteria of identifying or formulating questions, finding similarities and

differences, answering questions why, providing answers to factual questions, and researching occupy the highest level of 85.71%. The number of presentations is still categorized as good. This can be interpreted that there is an increase in students' critical thinking skills in dealing with a problem in science learning. Based on the observation sheet on the implementation of learning in cycle III filled with observers during the learning activities, the results showed that in general the learning activities carried out by the teacher had run smoothly. The teacher had mastered the steps of learning the inquiry model. Students are also enthusiastic in following lessons and there are no behavioral deviations. Students are seen to be active in learning activities.

Table 5: Comparison of pre test and post test cycles I, II, III

No	Student	M/F	Result						Description
			Pre test			Post test			
			I	II	III	I	II	III	
1	Student 1	M	50	60	70	50	70	80	Finished
2	Student 2	M	40	50	60	50	70	70	Finished
3	Student 3	M	50	60	60	60	60	80	Finished
4	Student 4	M	60	60	80	70	70	60	Not Finished
5	Student 5	F	70	70	70	70	80	90	Finished
6	Student 6	F	60	70	70	70	70	70	Finished
7	Student 7	F	80	80	80	80	90	90	Finished
Result			410	450	490	450	510	540	85.71%
Average			58,57%	64,29%	70%	64,29%	72,85%	77,14%	

Based on the data obtained, there was an increase in the results of pre-test and post-test from cycle I to cycle II and to cycle III. Pre-test cycle I showed a percentage of 58.57%, then the second cycle rose to 64.29% and the third cycle to 70%. Post test cycle I 64.29%, cycle II 72.85% and cycle III 77.14%. there is an increase in the assessment criteria which were originally in cycle I, now quite good. Based on the results of the research in the third cycle, there were 85.71% of students who had achieved the indicators of success. For this reason, this research can be stopped until the third cycle and is not continued again, but there are still 14.29% of students who have not completed, therefore enrichment / remedial can be done in the form of assignments such as practices, products, and projects.

5. Conclusion

From the discussion of the results of this classroom action research, the following conclusions can be drawn: by applying the inquiry learning model in science learning, force and motion material can help teachers improve critical thinking skills and learning outcomes of Parepei Catholic Elementary School students. This can be seen from the learning outcomes that achieve learning success indicators. The inquiry learning model is one of the models that plays a very important role in the success of learning and teaching. Because according to Roestiyah (2008: 76), the purpose of the teacher using the inquiry model when teaching is: so that students are stimulated by the task, and actively seek and research the problem solving themselves. Look for resources on their own, and they learn together in groups.

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