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by Mursid Mursid

Submission date: 22-Dec-2021 10:09AM (UTC+0700)
Submission ID: 1734860146
File name: BIRLE_3_4_2020_Dyan_Loka_Vitha_Wacy.pdf (562.41K)
Word count: 5003
Character count: 26686

BirLE-Journal
Budapest International Research and Critics in Linguistics and Education
p.ISSN: 2655-2647
e.ISSN: 2655-1470
Budapest Institute

The Effect of Learning Models and Rational Thinking Abilities on the Outcomes of Students Learning Science Class V State Elementary Schools in Percut Sei Tuan District

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Abstract

The study aims to determine the learning outcomes of students who were taught with the POE learning model were higher than students who were taught with the Inquiry learning model and to find out the learning outcomes of students who had thinking high rational were higher than the science learning outcomes. The research method used in this research is a quasi experiment. The results of this study are: (1) The learning outcomes of students taught with the learning model POE are higher than those taught with the learning model Inquiry. Based on the results of the study, it was concluded that there was an interaction between the learning model and students' rational thinking on the science learning outcomes. (3) There is an interaction between the learning model and students 'rational thinking in influencing the students' science learning outcomes. This can be seen from the data analysis that obtained Fcount = 28.19> Ftable = 3.99. Based on the results of the study, it was concluded that there was an interaction between the learning model and students' rational thinking on the science learning outcomes. (3) There is an interaction between the learning model and students 'rational thinking in influencing the students' science learning outcomes. This can be seen from the data analysis that obtained Fcount = 28.19> Ftable = 3.99. Based on the results of the study, it was concluded that there was an interaction between the learning model and students' rational thinking on the science learning outcomes.

Keywords
learning model; POE and inquiry; thinking high low rational; science learning outcomes

I. Introduction

Education as one of the pillars in building a nation plays an important role in improving the quality of human resources. This improvement effort requires a very long process, starting from basic education in elementary schools. One of the main subjects studied in elementary school is natural science (IPA). Science learning is expected to be a vehicle for students to learn about themselves and their surroundings, as well as the prospect of further development in applying it in everyday life. However, the facts that occur in the field are that students' mastery of science lessons is still low. This statement can be seen based on data from the TIMSS (Trend in International Mathematics and Science Study) which was held in 2015 that Indonesia was ranked 45th out of 48 countries participating in the field of natural science (IPA). This proves that there is still low understanding of Indonesian students, especially elementary school students, about science lessons.

II. Review of Literatures

The teacher is someone who plays an important role in the learning process. A teacher must first know / understand the character of their students well so that in the teaching and learning process they can choose an appropriate learning model so that it can achieve learning objectives. Simanjuntak (2020) stated that the teacher is a very important factor in determining the success of the learning process. According to Amri (2016: 34) the 2013 curriculum learning model has four special characteristics that are not owned by strategies, methods or procedures. These characteristics are: (1) Logical theoretical rationale prepared by the creators or developers. (2) The basis of thinking about what and how students learn (learning objectives to be achieved). (3) The teaching behavior required for the model to be implemented successfully. (4) The learning environment necessary for the learning objectives to be achieved.

Based on data from the Education Assessment Center of the Ministry of Education and Culture of Indonesia, the results of the National Primary School Examination in 2019, the average value is obtained in Table 1.

Table 1. Average Score of National Exam Results for Primary School Level 2019 School Year

Subjects	Average Value
Indonesian	64.83
English	50.42
Mathematics	44.05
IPA	48.05

According to Joyce & Weil (1980: 3) the learning model is a pattern or plan that has been planned in such a way and is used to compile a curriculum, organize subject matter, and give instructions to teachers in their class. Each learning model directs us in designing learning to help students achieve learning goals.Bloom in Sudjana (2017: 22) classifies the types of learning outcomes into three, namely cognitive, affective, and psychomotor learning outcomes. But in this study it is limited to learning outcomes in the cognitive domain only. According to Anderson in Sudjana (2017: 25) the cognitive domain is divided into 6 categories, namely: remembering (C1), understanding (C2), applying (C3), analyzing (C4), evaluating (C5), and creating (C6). The learning model that will be an experiment in this study is the POE learning model and the Inquiry learning model.

The selection and use of learning models must be considered based on the learning objectives to be achieved. These considerations include several aspects such as situations and conditions, learning resources, needs and characteristics of students faced in order to achieve these learning objectives. Students / students can be identified through 2 (two) types of characteristics, namely general characteristics and special characteristics. General characteristics include age, gender, and class level, level of intelligence, culture or socio-economic factors. Special characteristics include knowledge, abilities, and attitudes about the topic or material being taught. This is important because it directly influences the decision making to choose teaching models and media.

The learning objectives are not only to increase students 'knowledge but also to improve students' thinking skills. According to Saputra (2017: 6) the human way of thinking is divided into four parts, namely: natural, rational, supernatural and

suprarational. Among the many thinking abilities that humans have, this study will discuss students' abilities in thinking rationally. The ability to think rationally is the ability that a person has in thinking about something or solving a problem with rationality or is acceptable to reason.

Based on the above problems, the limitations of this study are limited to matters related to learning outcomes, including learning models and students' abilities in thinking rationally. The learning model is divided into the POE learning model and the Inquiry learning model as well as students' rational thinking abilities which are divided into students who have high rational thinking skills and students who have low rational thinking skills. Student learning outcomes are limited to the science learning outcomes of grade V SD Negeri students in Percut Sei Tuan sub-district.

Based on the problem boundaries that have been stated above, the problem formulation in this study can be formulated as follows: (1) Are the learning outcomes of students taught with the POE learning model higher than students taught with the Inquiry learning model? (2) Are the learning outcomes of students who have high rational thinking skills higher than students who have low rational thinking skills? (3) Is there an interaction of learning models and the ability to think rationally on the science learning outcomes of grade V SD Negeri students in Percut Sei Tuan sub-district?

In accordance with the formulation of the problems described above, this study has the following objectives: (1) To determine the differences in science learning outcomes of students who are taught with the POE learning model and students who are taught with the Inquiry learning model. (2) To find out the difference in the effect of students' rational thinking skills on student learning outcomes in grade V SD Negeri Percut Sei Tuan Subdistrict on science subjects. (3) This is to determine the interaction of learning models and the ability to think rationally on science learning outcomes of grade V SD Negeri students in Percut Sei Tuan sub-district.

III. Research Method

This research was conducted in two schools representing all schools in the Pesrcut Sei Tuan sub-district, namely 101774Sampali State Elementary School which is located in Sampali village, Percuta Sei Tuan sub-district and 106812 Bandar Klippa State Elementary School which is located in the Bandar Klippa village, Percut Sei Tuan District. The research schedule is carried out in the odd semester of the 2020/2021 Academic Year to be precise in September - October 2020.

The population in this study were all fifth grade students of State Elementary Schools in the Percut Sei Tuan District. Sampling in this study uses the cluster random sampling technique, which is a sampling technique used to determine the sample if the object to be studied or the data source is very broad. . " Because the researchers examined SDN Se, Percut Sei Tuan District, the researchers grouped the schools in the Percut Sei Tuan sub-district into per village then from the research village they took samples randomly through areas that were accessible to researchers in the study. Then the researchers took two schools from two villages that had the same characteristics such as number of students, status, study groups and the same school accreditation. Then obtained two schools, namely SD Negeri 101774 Sampali with 32 students of class V using the POE learning model and SD Negeri 106812 Bandar Klippa with 32 students of class V using the Inquiry learning model. So that the entire study sample amounted to 64 students.

This research method is a quasi experimental research method. According to Sugiyono (2016: 72), experimental research is a research that is used to find the effect of certain treatments on others under controlled conditions. This research design uses the Nonequivalent Control Group Design, namely a 2 x 2 factorial research design.

This study will compare two groups of students who are an experimental class who will compare a class that is influenced by the POE learning model with a class taught by the inquiry learning model. The data collection technique used is the test technique. The test is used to collect data on students' rational thinking skills and science learning outcomes.

IV. Discussion

4.1 Understanding Learning Outcomes

According to Dimyati and Mudjiono (2015: 3) learning outcomes are the result of an interaction of learning and teaching actions. From the teacher's side, the teaching act ends with a process of evaluating learning outcomes. From the student's point of view, learning outcomes represent the end of the cutting and the peak of the learning process. Arikunto (2017: 133) says that learning outcomes are the final results after experiencing the learning process, changes are visible in actions that can be observed and can be measured. Based on the expert's opinion about the learning outcomes, it can be concluded that learning outcomes are the abilities that a person gets after someone carries out learning activities as an impact or result of learning.

4.2 Understanding POE Learning Model

The POE learning model is a learning model introduced by White and Gustone. According to White & Gunstone in Indriani (2015: 51), POE was developed to find students 'ability to predict and their reasons for making these predictions regarding the symptoms of something that aims to reveal students' ability to predict. White and Gunstone stated that POE is an effective model for obtaining and improving students' scientific concepts. This learning model is based on constructivism that is suitable to be applied in science learning. Because the essence of this model is to prove predictions through experiments and there is direct involvement of students in real activities. Haryono (2013: 44) explains that through the POE model, the teacher explores students' understanding by asking them to carry out three main tasks, namely prediction, observation, and providing explanations. Meanwhile, according to Warsono and Hariyanto (2012: 44) the POE learning model is based on the constructivism learning theory which assumes that through the activity of making predictions, observations, and explaining something observed results, the cognitive structure will be well formed.

4.3 Steps of the POE Learning Model

The learning steps to be carried out in this POE learning can be seen in table 2.

Table 2. Learning Steps in The POE Learning Model for Students and Teachers

Learning Steps	Teacher Activity	Student Activities
Stage 1 Forecast (Predict)	Provide an apperception regarding the material to be discussed. Can be through demonstrations	Provide predictions based on problems taken from student experiences, or books that guide an event or phenomenon that will be discussed

Stage 2 Observe (Observe)	As a facilitator and mediator	Observe by conducting experiments or experiments to prove the predictions that have been made, then recording the results of the observations
Stage 3 Explain (Explain)	Facilitating the course of the discussion	Discuss phenomena that have been observed conceptually-mathematically, comparing the results of observations with previous predictions with their respective groups. Presenting the results of observations in class, as well as other groups providing responses, in order to obtain conclusions from the problems being discussed.

4.4 Strengths and Weaknesses of the POE Learning Model

According to Yupani, Garminah, and Mahadewi (2013: 3) the advantages of the POE model are: (1) Stimulating students to be more creative, especially in proposing predictions, from predictions made by teacher students to know the initial concepts that students have. (2) Arising students' curiosity to carry out investigations, proving the results of their predictions. (3) Can reduce verbalism by conducting experiments. (4) The learning process becomes more interesting, because students not only listen but also observe events that occur. (5) By observing directly students will have the opportunity to compare theory (conjecture) with reality. thus students will have more confidence in the truth of the learning material.

The weakness of the learning model *POE* namely: (1) Requires more careful preparation, especially with regard to the problems presented as well as experiments and demonstrations to be carried out and the time required because usually more time is needed. (2) When conducting experiments, adequate tools and materials are needed for students. (3) More abilities and skills are required for teachers to carry out experimental and demonstration activities, and are required to be more professional. (4) Requires willingness and motivation good from the teacher concerned so that it is successful in the learning process.

4.5 Definition of Inquiry Learning Model

*Inquiry*means a statement or examination or investigation. The inquiry learning model is one of the learning models that can increase students' enthusiasm for learning. Sanjaya (2019: 196) says that the inquiry learning model is a series of learning activities that emphasize critical and analytical thinking processes to seek and find answers to a questionable problem. The thinking process itself is usually carried out through question and answer between teachers and students. The inquiry learning model departs from the assumption that since humans are born into the world, humans have the urge to find their own knowledge. Trianto (2015: 88) says that inquiry learning departs from the assumption that from birth into the human world they have the urge to discover their own knowledge.

4.6 Steps of Inquiry Learning Model

The steps for implementing the inquiry learning model according to Sanjaya (2019: 201) consist of: (1) The orientation step is a step to foster a responsive learning atmosphere or climate. This step the teacher conditions students to be ready to carry out the learning process. Some things that can be done at this stage are: (a) explaining the topics, objectives and learning outcomes that are expected to be achieved by students, (b) explaining the main activities that students must do to achieve their goals. (2) Formulating a problem is a step to bring students to problems that contain puzzles. The problem presented is a problem that challenges students to think about solving the puzzle. (3) Proposing a hypothesis is a temporary answer to a problem that is being studied. As a temporary answer, hypothesis needs to be tested for truth. (4) Collecting data is the activity of capturing the information needed to test the proposed hypothesis. (5) Hypothesis testing is the process of determining which answers are deemed acceptable in accordance with the data or information obtained based on data collection. (6) Formulating conclusions is the process of describing the findings obtained based on the results of hypothesis testing.

4.7 Strengths and Weaknesses of Inquiry Learning Model

According to Sanjaya (2019: 208), some of the advantages of the inquiry learning model are: (1) The inquiry learning model is a learning model that emphasizes the development of cognitive, affective, and psychomotor aspects in a balanced manner so that learning will be more meaningful. (2) The inquiry learning model provides space for students to learn according to their learning style. (3) The inquiry learning model is a learning model that is considered in accordance with the development of modern learning psychology which considers learning to be a process of changing behavior due to changes. (4) Another advantage is that this learning model can serve the needs of students who have above average abilities. This means that students who have good learning abilities will not be hampered by students who are weak in learning.

The weaknesses of the Inquiry learning model are: (1) The inquiry learning model is very difficult to control learning activities and student success. (2) This model is difficult in planning lessons because it collides with student habits. (3) In implementing it, it takes a long time so that teachers often find it difficult to adjust it to the predetermined time. (4) As long as the success criteria are determined by the student's ability to master the subject matter, the inquiry learning model will be difficult to implement by every teacher.

4.8 Definition of Rational Thinking Ability

Thinking is generally defined as a cognitive process or mental activity that can produce knowledge. In the process of thinking, there is a combination of perception and the elements in the mind. According to Mulyadi in Ismienar (2017: 48) thinking can be said to be a distinctive and directed form of reason, knowledge received through the senses is processed to reach the truth. In the process of thinking, there are two ways of thinking, namely basic thinking or what is called rational thinking, and complex thinking in order to solve problems. According to Saputra (2017: 6) rational thinking is a way of thinking that already uses innovation by involving reason, not only based on something routine or according to existing patterns.

The rational thinking process has 10 levels that must be passed by the development of students in general, from simple to complex. Basically, students who are still in elementary school, especially grade V students, are still in the transition stage from stage one to stage two, which is still at the stage of memorizing, imagining, classifying, generalizing and comparing.

The results obtained from this study include student learning outcomes in the experimental class and control class in science subjects with the theme of heat and its displacement, students' rational thinking skills in the experimental class and the control class in class V Public Elementary Schools in Percut Sei Tuan District, Academic Year 2020 / 2021.

The following is the data on student science learning outcomes taught by the POE Learning Model, namely students in grade V SD Negeri 101774 Sampali. The data description can be seen in Table 3.

Table 3. Students' Science Learning Outcomes Taught Using the POE Learning Model

No.	Interval Class	Fi	Relative Frequency (%)
1	58-64	3	9.38
2	65-71	4	12.50
3	72-78	6	18.75
4	79-85	6	18.75
5	86-92	9	28.13
6	93-99	4	12.50
Total		**32**	**100**

Table 3. Above shows that the mean value is in the class interval 79-85 with the number of students 6 by percentage 18.75% person. Students with grades below the average amount to 13 with a percentage of 40.63% of people. Students with scores above the average amount to 13 with a percentage of 40.63% of people.From the results of the ideal value with three categories on student science learning outcomes using the POE learning model tend to fall into the High category.

The following is the data on student science learning outcomes taught by the Inquiry Learning Model, namely fifth grade students of SD Negeri 106812 Bandar Klippa. The data description can be seen in Table 4.

Table 4. Science Learning Outcomes Taught with Inquiry Learning Model

No.	Interval Class	Fi	Relative Frequency (%)
1	53-58	3	9.38
2	59-65	4	12.50
3	66-72	3	9.38
4	73-79	11	34.38
5	80-86	7	21.88
6	87-93	4	12.50
Total		**32**	**100**

Table 4. Above shows that the average value is in the interval class 73-79 with a total of 11 students with a percentage of 34.38% of people. Students with scores below the average amount to 10 with a percentage of 31.25% of people. Students with scores above the average amount to 11 with a percentage of 34.38% of people. From the results of the ideal value with three categories of science learning outcomes students using the Inquiry learning model tend to fall into the Medium category.

The following is data on student science learning outcomes who have high rational thinking skills. The data description can be seen in Table 5.

Table 5. Science Learning Outcomes of Students who Have High Rational Thinking

No.	Interval Class	Fi	Relative Frequency (%)
1	53-59	4	10.81
2	60-66	2	5.41
3	67-73	2	5.41
4	74-80	10	27.03
5	81-87	5	13.51
6	88-98	14	37.84
Total		**37**	**100.00**

Table 5. above shows that the average score is in the interval class 81-87 with 5 students with a percentage of 13.51% people. Students with grades below the average totaled 18 with a percentage of 48.65% of people. Students with scores above the average amount to 14 37.84% of people. From the results of the ideal score with three categories on student science learning outcomes who has High Rational Thinking tends to fall into the High category.

The following is data on the results of student learning science that have low rational thinking skills. Data description can be seen in Table 6.

Table 6. Science Learning Outcomes of Students who Have Low Rational Thinking

No.	Interval Class	Fi	Relative Frequency (%)
1	58-63	4	14.81
2	64-69	4	14.81
3	70-75	11	40.74
4	76-81	5	18.52
5	82-87	1	3.70
6	88-93	2	7.41
Total		**27**	**100**

Table 6. above shows that the average value is in the 70-75 interval class with 11 students with a percentage of 40.74% of people. Students with grades below the average amount to 8 with a percentage of 29.62% of people. Students with scores above the average amount to 8 with a percentage of 29.63% of people.From the results of the ideal score with three categories on student science learning outcomes who have Low Rational Thinking tends to fall into the Medium category.

The difference in learning outcomes obtained between students who are taught with the POE learning model and students who are taught with the Inquiry learning model looks significant, where the learning outcomes using the POE learning model are seen to be higher than the learning outcomes of students with the Inquiry learning model. Research using the POE learning model is in line with the research resultsconducted by Izza Aliyatul Muna (2017) with the title "POE learning model in improving understanding of science concepts and process skills" with the results of the research showing that students are able to develop their knowledge with scientific proof is to use the POE learning model which is expected to increase understanding. concepts and skills in the science learning process. The POE model provides an opportunity for students to generate their own conceptual

knowledge through reconciliation and negotiation between initial knowledge and new knowledge.

According to Khairani (2020) natural Science in elementary schools is one of the main subjects in the educational curriculum. Science learning in elementary schools is expected to increase students' awareness in maintaining, maintaining and preserving the environment so that students can maintain the balance of nature and take advantage of the natural environment for their daily lives. Lehawati (2020) states that the orientation to the success of education in schools is currently dominated by the evaluation of intellectual intelligence, not emotional intelligence. This shows that if the written test score is good, the student is considered a child who has succeeded in the lesson (achievement) even though it is obtained with the wrong score.The learning outcomes of students who have high and low rational thinking abilities also experience differences, namely students who have high rational thinking abilities get higher learning outcomes than students who have low rational thinking abilities. The results of this study are in line with the results of research conducted by Sopyan Hendrayana (2017) with the title "Improving Students' Rational Thinking Skills through the POE Learning Model on the Concept of Natural Resources" and the results of the study state that learning science in elementary schools using the POE model can improve thinking skills. Rational students supported by learning activities and scientific attitudes.

The results of this study found that there was an interaction of learning models and ability to think rationally on students' science learning outcomes. The interaction between the application of the learning model and the ability to think rationally occurs when both play a role in improving student learning outcomes. The interaction graph shown through the help of SPSS shows that the lines of interaction between the application of the learning model and students' rational thinking abilities intersect with each other. Students who are taught by applying the POE learning model and have high rational thinking skills get high learning outcomes too, students who are taught by applying the inquiry learning model with high rational thinking skills show lower learning outcomes than those who apply the POE learning model high rational thinking skills. This shows that there is an interaction between the application of the learning model and the students' rational thinking ability.

Based on the processing of the data obtained, there are differences in the learning outcomes of students who are taught with the POE learning model with students who are taught using the Inquiry learning model where the average value of student learning outcomes taught by the POE learning model and have higher rational thinking skills is 80 , 59, while the average value of the group of students who were taught using the Inquiry learning model and had high rational thinking skills was 72.72. This fact proves that the application of the POE learning model is better at improving students 'science learning outcomes than the application of the inquiry learning model with students' high rational thinking skills. Meanwhile, the science learning outcomes for students who have low rational thinking skills get higher scores with the Inquiry learning model than the POE learning model. Thus science learning on the theme of heat and its displacement by applying the POE model will be better than the application of the Inquiry learning model.

V. Conclusion

Based on the results of the research and discussion that has been stated earlier, in this study it can be concluded that: Science learning outcomes of students who are taught with the POE Model are higher than the results of students taught by the Inquiry Learning Model that are scientifically and empirically proven. Students who have a High Rational Thinking way get higher science learning outcomes than students who have a Low Rational Thinking result. Science learning outcomes of students who have high rational thinking are higher than science learning outcomes of students who have low rational thinking. There is an interaction between the learning model and rational thinking towards science learning outcomes.

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