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LAVOISIER: CHEMISTRY EDUCATION JOURNAL

Vol. 3 (2), 2024

Application of Inquiry-Based Learning Model to Improve Student Learning Outcomes on Redox Reaction Material for Class X Students at MAS Al-Khoir

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Article History

Received 06 12th 2024
Revised 07 13th 2024
Accepted 07 16th 2024
Available Online 12 09th 2024

Kata Kunci:

Inquiry Based Learning
Learning Outcomes
Redox Reaction

Abstrak

This study aims to see the results of the application of Inquiry Based Learning Model in improving student learning outcomes in Redox Reaction subject matter for Class X Mas Al-Khoir Mananti Sosa Jae Village, Kec. Huta Raja Tinggi, Kab. Padang Lawas. The type of research used in this research is Classroom Action Research. The location used in this research is Mas Al-Khoir Mananti Sosa Jae Village, Kec. Huta Raja Tinggi, Kab. Padang Lawas. Data collection instruments are through tests and observations. The analysis method used in this research is quantitative analysis. Based on the results of the study, it shows that there is an increase in student learning outcomes with the application of inquiry based learning model of redox reaction material for students of grade X from pre-cycle, cycle I to cycle II. Where the percentage of students who completed was 25% in pre-cycle, then increased in cycle I session 1 to 33.4%, then increased in cycle I session 2 to 60%, then increased in cycle II to 86.7%. The percentage of students who did not complete decreased from 75% in the pre-cycle, decreased to 66.6% in Cycle I Session 1, decreased to 40% in Cycle I Session 2, and decreased to 13.3% in Cycle II. The average score of the students increased from 54.3 before the cycle, then increased from 59.3 in cycle I to 68, then increased to 80 in cycle II. In accordance with the indicators of success of this action, where students have passed the KKM (≥7).

1. Introduction

Efforts to improve the quality of national education are carried out in various ways. Improving the quality of education can be done by improving the education system and process, these two factors are interdependent. A good system supported by a good educational process is an effort to improve the quality of national education. Students are one of the main components in the process of teaching and learning activities (KBM). Students are a component of raw-input material that will be processed so that it will produce products (output) as expected. Through their learning experience at school, students will experience changes in terms of cognitive, affective, and psychomotor (Yohana, 2010).

One of the subjects at the secondary level of the teaching field of natural science (IPA) is chemistry, which has great potential to prepare qualified students because all life cannot be separated from chemistry. Chemistry is a part of natural science (science) that studies the properties and structure of substances, the composition of substances, changes and energy that accompany changes in these substances. Chemistry is also related to biology, physics, and other sciences.

The subject matter of chemistry is quite dense, and the limited amount of presentation time and the number of topics that students have to follow result in less than optimal student comprehension of the material taught by the teacher. In addition, chemistry concepts are abstract, with many formulas and calculations. This makes chemistry a rather complex subject for students to master, starting from memorizing, understanding, analyzing, applying, and using in everyday life. Students must have good math skills to solve the calculation problems correctly. As a result, students find chemistry difficult to learn and understand, and it becomes a problem for them.

Based on class X MAS AL-KHOIR observations, Mananti Sosa Jae Village, Hutaraja Tinggi District, Regency. Padang Lawas found that there was a lack of active participation in opinion, asking, or answering questions in the learning process. Based on the results of the observation, it is known that in general, in the teaching and learning process, interaction among students is also lacking in the learning process. Students tend to learn individually. In addition, the learning done by the teacher has been conventional, so the teaching and learning activities (KBM) are more teacher-centered. At the same time, the students mostly listen and watch without participating in meaningful activities. This goes on and on, so students will feel bored.

Based on these problems, it is necessary to improve the learning process that can improve student learning outcomes, which include cognitive, affective, and psychomotor domains. Students need to be given direct experience to improve scientific work skills and concept mastery. Students need to be directed to be able to work together and not learn individually. Student achievement depends on how the learning process is experienced. The poor way of learning can come from students, teachers, and the learning environment. An unfavourable classroom atmosphere in the teaching and learning process can reduce students' learning and learning outcomes, so it is difficult for teachers to overcome this. Therefore, an effort is needed to be able to improve the way students learn chemistry (Yohana, 2010).

One approach as well as a learning model that can facilitate this is Inquiry-based Learning. The inquiry-based learning model is a learning model that provides opportunities for students to be actively involved in the learning process and can stimulate students to think and find their answers to questions given to them or questions that arise from within themselves about the surrounding environment (Afiyah, 2022). The inquiry learning model has advantages because students will conduct research repeatedly and with continuous guidance. Students' curiosity will be fulfilled because this research model can strengthen and encourage naturally to exploit so that activities can be carried out with great enthusiasm and seriousness. This model is also expected to train students to have learning independence. Students are trained to collect an event that occurs and process it logically.

According to Bayu Segara, et al (Segara et al., 2023) the inquiry-based learning model can improve student learning outcomes and develop questioning skills, and work together in groups, to get good results. There is a significant influence on the learning outcomes of students with high creativity using the inquiry-based learning model (Arisca, 2017). For student learning outcomes in redox reaction materials to improve, it is necessary to apply the inquiry-based learning model as one of the steps to achieve learning goals.

The purpose of using the inquiry-based learning model in learning is to develop the ability to think systematically, logically and critically or develop intellectual abilities as part of the mental process. Thus, in the inquiry model students are not only required to master the subject matter, but how they can use their abilities optimally (Wina Sanjaya, 2011). As can be seen from the explanation above, the inquiry model is a form of student-oriented learning approach (student centered approach).

Among the concepts of chemistry subject matter at the high school level, one of the concepts studied is redox reactions. Redox reaction is one of the essential chemistry materials in general. The material contained in it is an abstract aspect of chemistry that also requires understanding and memorization, namely the determination of oxidation numbers, determination of oxidizers and reductants, autoredox reactions and the names of ionic compounds. These materials must be explained well so that students understand and master the basic concepts that will continue to be used until the next level. Barke et al (Barke, H.D., Al Hazari, Yitbarek, 2009). said that one of the chemical concepts that is often misunderstood by students is the concept of redox reactions (Barke, H.D., Al Hazari, Yitbarek, 2009). Hastuti in her research said that 43% of students still have misconceptions about redox-reactive materials (Hastuti, 2014). Students' failure to understand the concept is due to their imperfect understanding. Based on preliminary research data conducted, it was found that the greatest level of misunderstanding encountered by students was related to the concept of redox reactions. Redox reactions are considered difficult and confusing by some students. One of the causes of difficulty for these students lies in the characteristics of the environment at the abstract or micro level. Other difficult factors are students' lack of interest and attention during the learning process, students' reluctance to accept new concepts, and lack of emphasis on previous concepts (Fajarianingtyas & Yuniastri, 1970). In addition, solving redox reaction problems also requires proper understanding. Therefore, a learning model that can overcome these problems is needed (Yohana, 2010). So researchers are interested in using the inquiry-based learning model to see how students' learning outcomes on redox material.

Based on the background as stated above, it is necessary to research “Application of Inquiry Based Learning Model to Improve Student Learning Outcomes on Redox Reaction Amteri of Class X Students at MAS AL-KHOIR”.

2. Research Methodology

Location and Time of Research

This research was conducted at MAS Al-KHOIR Mananti Sosa Jae. The reason the researchers conducted research at MAS AL-KHOIR was because at that location no one had conducted such research so the researchers were interested in conducting research at the school. The research time was carried out in the even semester of class X MAS AL-KHOIR Mananti Sosa Jae. The type of research is class action research (PTK).

This classroom action research (PTK) is carried out by conducting an assessment process through a cyclical system or cycle. The research cycle will be carried out repeatedly until the indicators that have been determined in learning have been achieved, if not yet achieved then the research cycle continues until the next cycle. According to Kurt Lewin, class action research is a series consisting of four stages, namely the planning, implementation, observation, and reflection stages.

Steps of Research Procedure

Based on the type of research conducted by researchers, namely classroom action research (PTK), this research was carried out by conducting an assessment process through a cyclical system. The research cycle will be carried out repeatedly until the indicators that have been determined in learning have been achieved, if not yet achieved then the research cycle continues until the next cycle.

According to Kurt Lewin, class action research is a series consisting of four stages, namely the planning, implementation, observation, and reflection stages.

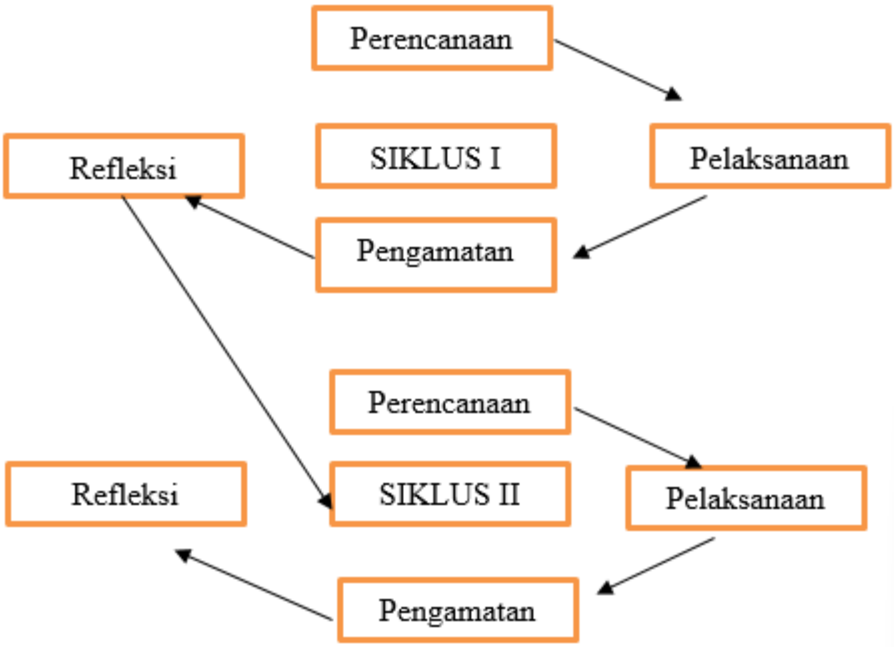

Figure 1. Research Prosedure

Cycle I

a. Planning Stage

Planning is the process of determining program improvements according to the researcher's ideas. The following activities are carried out at the planning stage:

1) Student orientation to the problem.
2) Analyzing and formulating the problem
3) Teachers prepare lesson plans (RPP) using the inquiry-based learning model that will be used when conducting research.
4) Making data collection instruments, namely:
    a) Make pretest and posttest test questions.
    b) Make an observation sheet
    c) Learning implementation plan (RPP).

b. Action Stage

Action is a treatment given by researchers in accordance with the planning that has been done by researchers before. The activities carried out are to carry out chemistry learning activities on redox reaction material using the inquiry-based learning model in accordance with the lesson plan that has been prepared.

c. Observation Stage

1) Collecting research data.
2) Making observations related to student and teacher activities on the application of inquiry-based learning models using observation sheet instruments.

d. Reflection Stage

At this stage, reflection is carried out by analyzing the data obtained from the research results. The results of the reflection are used as a consideration for lesson planning in the next cycle. If the expected results cannot be achieved, improvements are made in the second cycle and so on.

Cycle II

a. Planning Stage

Planning is the process of determining program improvements according to the researcher's ideas, the following activities are carried out at the planning stage:

1) Student orientation to the problem.
2) Analyzing and formulating the problem
3) Teachers prepare lesson plans (RPP) using the inquiry-based learning model that will be used when conducting research.
4) Making data collection instruments, namely:
    a) Make pretest and posttest test questions
    b) Make an observation sheet
    c) Learning implementation plan (RPP).

b. Action Stage

Action is a treatment given by researchers by the planning that has been done by researchers before. The activities carried out are to carry out chemistry learning activities on redox reaction material using the inquiry-based learning model by the lesson plan that has been prepared.

c. Observation Stage

1) Collecting research data.
2) Making observations related to student and teacher activities on the application of inquiry-based learning models using observation sheet instruments.

d. Reflection Stage

In cycle II this is the last cycle of researchers conducting action research. At the end of this cycle II action, the researcher provides a conclusion to the research results. The conclusion made is the overall conclusion of the cycle about whether or not student learning outcomes have increased through the inquiry-based learning model in chemistry lessons on redox reaction material.

From these two cycles, the next action is concluded, if it turns out that at this stage there are still some weaknesses, this research will continue to the next cycle.

Research Data Analysis Technique

To determine the effectiveness of a method in learning activities, it is necessary to analyze the data. In this class action research, qualitative description analysis is used, which is a research method that describes reality or facts per the data obtained to know the learning outcomes in learning chemistry redox reaction material achieved by students, as well as to determine student responses to learning activities, as well as student activities during the learning process. The data analysis used in this class action research is as follows:

1. Observation Data
   a. Student Activity Observation Data
   b. Student Activity Observation Data
2. Student Learning Data
   a. Individual Completeness

To find the percentage of individual student learning completeness, the formula is used:

$$I = \frac{SI}{SM} x\ 100\%$$

Description:
I: individual learning completeness
SI: the score obtained by the student
SM: maximum score of the test

Students will be said to be complete if the value of P≥ 76%

b. Classical completeness

Furthermore, it can be seen how the completeness of student learning classically with the formula:

$$K = \frac{ST}{SS} x\ 100\%$$

Description:

K = classical completeness

ST = number of students who have completed learning

SS = total number of students in the class

c. Average Student Score

To find the average student score, the following formula is used:

$$x = \frac{\Sigma \dot{x}}{\Sigma n}$$

Description:

x = average score

x = the sum of all students' scores

n = number of students

There are two categories of learning completeness, namely, individually and classically. Based on the instructions for implementing the study, the researcher considers that the application of chemistry learning in redox reaction material is said to be successful in improving the learning outcomes of students individually if students can improve their learning outcomes and meet the completeness which is at least ≥ 75%, and classical completeness ≥ 85% of the number of students in the class which is grouped into five categories as shown in the following table:

Table 3. Criteria for Student Learning Success Level in Percentage

Success Rate	Meaning
>80%	Very high
60-76%	High
40-59%	Medium
20-39%	Low
<20%	Very low

3. Result

The results showed that the use of inquiry-based learning models can improve student learning outcomes of redox reaction material in class X MAS Al-Khoir. The improvement can be seen from the data analysis on the acquisition of class average scores and the percentage of classical completeness used to determine the improvement of student learning outcomes in redox reaction material.

Table 4. Cycle 1 and 2 Comparison

No	Category	Cycle 1				Cycle 2	
		Meeting 1		Meeting 2		Meeting 1	
		Total	Persentage	Total	Persentage	Total	Persentage
1	Completed	5	33,4%	9	60%	13	86,7%
2	Not Completed	10	66,6%	6	40%	2	13,3%
	Total	15	100%	15	100%	15	100%

Adapun persentase hasil belajar siswa pada siklus I pertemuan 1 dan 2 ada peningkatan hasil belajar diamana pada pertemuan 1 terdapat 5 siswa yang tuntas dengan persentase 33,4% dengan nilai rata-rata 59,3% dan pada pertemuan kedua terdapat 9 siswa yang tuntas dengan persentase 60% dan nilai rata-rata 68%. Kemudian siswa yang tidak tuntas pada pertemuan 1 sebanyak 10 siswa dengan persentase 66,6% dan pertemuan dua sebanyak 6 siswa dengan persentase 40%. Kemudian pada siklus II pertemuan pertama jumlah siswa yang tuntas sebanyak 13 dengan persentase 86,7% dan siswa yang tidak tuntas sebanyak 2 siswa dengan persentase 13,3% dengan nilai rata-rata kelas sebesar 80%.

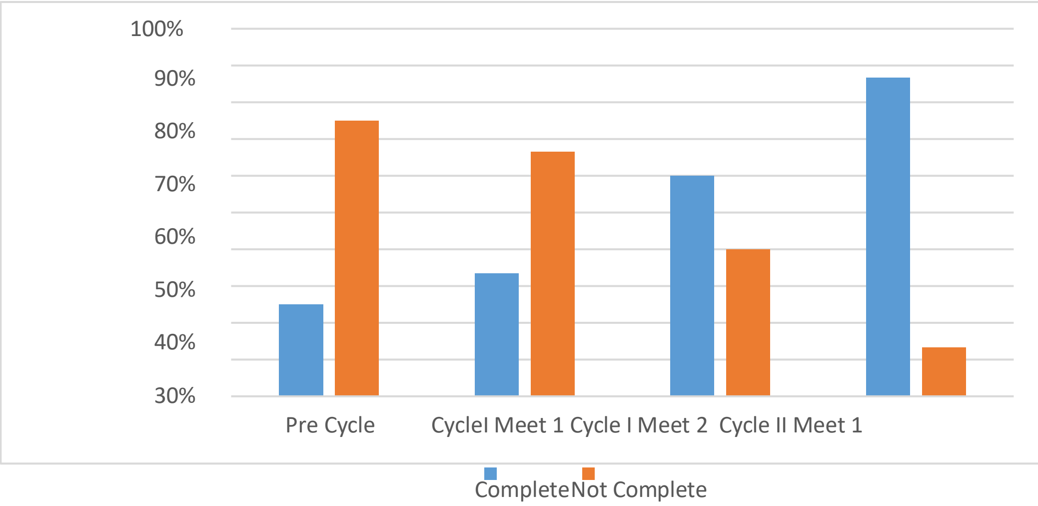

Figure 2. Diagram of Student Learning Outcomes from Pre-cycle to Cycle 2 Meeting 1

Based on the picture above, the classical completeness value has increased, namely in the initial condition / pre-cycle of 25% increased in cycle I meeting 1 to 33.4% and increased again in cycle I meeting 2 to 60%, then in cycle II meeting 1 increased again by 86.7%. This shows that student learning outcomes have increased in chemistry lessons on redox reaction material for class X students of MAS Al-Khoir.

4. Discussion

A learning model is a form of learning that is illustrated from beginning to end that is presented characteristically by the teacher. In other words, a learning model is a wrapper or frame of the application of an approach, method, strategy, and learning technique. The learning model is a form of learning that is described from start to finish and is presented uniquely by the teacher. In other words, the learning model is a wrapper or frame of the application of an approach, method, and learning technique (Afiyah, 2022) to achieve learning objectives, namely good learning outcomes for students. According to Dimyati, "learning outcomes are the result of the interaction of learning and teaching actions. From the teacher's side, the teaching action ends with the process of evaluating learning outcomes. From the student's side, learning outcomes are the end of the experience and the culmination of the learning process" (Dimyamti and Mudjono, 2009).

According to Sanjaya, the inquiry-based learning model is a learning model that emphasizes the critical and analytical thinking process to seek and find answers to questionable problems (Samuel, 2019). Learning with an inquiry-based learning model that requires active involvement of students is expected to improve learning achievement, especially students' understanding and communication skills. Inquiry learning aims to encourage students to be more courageous and creative in imagining. With imagination, students are guided to create discoveries, both in the form of improvements to what already exists, as well as creating ideas, ideas, or tools that have never existed before. Therefore, students are encouraged not only to understand the subject matter but also to make discoveries.

Based on the results of the above research, it is known that student activities in the learning process with the application of the inquiry-based learning model have increased from each meeting. In cycle 1, student learning outcomes were still low in redox reaction material, but in cycle two, learning outcomes in redox reaction material had increased, as seen from the data on student learning outcomes. This is following previous research conducted by Iriana Putri Chaidir titled Effect of the Application of the Inquiry Model on the Achievement of Chemistry Students and Students' Science Process Skills on Redox Reaction Material. Where from the results of the study, there was an increase in learning outcomes after learning was carried out using the inquiry-based learning model (Iriana Putri Chaidir, 2017).

Based on the results of the data analysis obtained, it is known that the application of the inquiry-based learning model can improve student learning outcomes in the redox reaction material of class X students of MAS Al-Khoir Mananti Sosa Jae Village. This is under what researchers expect, namely the percentage of student completeness, which is at least ≥85%, which meets the criteria for learning completeness to improve student outcomes.

5. Conclusion

Based on the research that the authors conducted, the results showed an increase in student learning outcomes with the application of the inquiry-based learning model of redox reaction material for class X students from pre-cycle, cycle I to cycle II. Where the percentage in the pre-cycle of students who completed 25%, then increased in cycle I meeting 1 to 33.4%, then in cycle I meeting 2 increased to 60%, then in cycle II increased to 86.7%. The percentage that was not complete decreased from pre-cycle 75%, decreased in cycle I meeting 1 to 66.6%, then decreased in cycle I meeting 2 to 40%, and in cycle II decreased to 13.3%.

The average value of students increased from pre-cycle 54.3, then increased in cycle I to 59.3 to 68, then increased in cycle II to 80. Following the indicators of the success of this action, where students have passed the KKM (≥75) with an average value of 80 and meet the classical completeness value of 85% with a percentage of completed students of 86.7%. From the results of this study, it can be concluded that the application of the inquiry-based learning model in the redox reaction material of class X students of MAS Al-Khoir can improve student learning outcomes.

Based on the results of research conducted with steps that are arranged in such a way with full care so that the results obtained can be as good as possible. Getting perfect results is very difficult because in the implementation of research, there are limitations, including:

a. Students' ability to understand terms or concepts in redox reaction material is still lacking due to language barriers.

b. The use of inquiry-based learning models in the learning process has never been applied to class X students so it makes students rigid or confused in following the learning steps.

c. In the test questions, because they use multiple choice tests, it is not visible how students work on the questions.

d. At first, the application of the inquiry-based learning model is quite time-consuming

The following are the implications of the research results with the title "Application of Inquiry-Based Learning Model to Improve Student Learning Outcomes on Redox Reaction Material for Class X Students at MAS Al-Khoir". Increased understanding. The application of the inquiry-based learning model can improve students' understanding of redox reaction material. Through this model, students are actively involved in the learning process, which allows them to build a deeper understanding of the concepts involved in redox reactions. With this model, students do not memorize but deeply understand chemical materials.

Increased student participation and motivation. The inquiry-based learning model puts students at the centre of learning, allowing them to be active agents in the learning process. This model can increase students' motivation and participation in learning, as they feel they have full responsibility for their understanding. As a result, learning becomes more interesting and meaningful for students. It is expected that the results of this study can be used as input for teachers in improving deficiencies in learning activities and as a consideration in determining methods, models, and strategies that can be used to improve student learning outcomes. For other researchers or readers, for writers who conduct similar research, namely the application of inquiry-based learning models, the results of this study can be used to add insight into increasing learning outcomes of redox reactions and are expected to try to apply them to other subjects with a wider scope.

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