1 (1), 2022, 16-22
Pedagogy Review
https://imrecsjournal.com/journals/index.php/pedrev

Improving Chemistry Learning Outcomes in Redox Concept through Problem Based Learning for Tenth Graders at SMKN 2 Palembang

Hesti Rizki Amalia[1*], Muhammad Hadeli[1], Rahma Aini[2]
[1]Department of Chemical Education, Universitas Sriwijaya, Indonesia
[1]Department of Chemical Education, Universitas Sriwijaya, Indonesia
[3]SMK Negeri 2 Palembang, Indonesia

Abstract: This class action research aims to improve the learning outcomes of chemistry on students Grade X Geomatics 1 SMK Negeri 2 Palembang by implementing the Problem Based Learning model. This dtudy is conducted in two cycles, each cycle consist of two meetings. The data are obtained from using the observation sheet and students' learning outcomes test which is given every meeting. The improvement of students' learning outcomes can be observed from the average number of students' learning outcomes before treatment (T0) in the amount of 68,97 with 38,23% learning completeness. The improvement happens on cycle I (T1) becomes 74,93 with the mastery 52,94% and on cycle II (T2) it increased to 85,79 with 88,23 % learning completeness. The application of Problem Based Learning model can improve learning outcomes.

Keywords: class action research, problem based learning model, students' learning outcomes of chemistry

▪ INTRODUCTION

The 2013 curriculum is one of the efforts made by the government to improve the quality of education in Indonesia. The current government has made it mandatory to implement the 2013 Curriculum in schools, both primary and secondary schools (Pratiwi et al., 2014). Refinements to the 2013 Curriculum in Indonesia continue to be made, one of which is a change in mindset. This change in mindset is a change from passive learning to active learning patterns. The 2013 Curriculum mandates the use of a scientific approach in the learning process (Hutabarat & Sirait, 2014).

The ability to learn independently is the success of learning in the 2013 Curriculum. In independent learning, the knowledge gained by students is the result of their own learning. The approach used in the learning process in the 2013 Curriculum is a scientific approach so that it is expected to create and foster a sense of not knowing to wanting to know. Studying chemistry means knowing about the bonds that relate between objects and their components. So that in learning chemistry must choose methods and learning media that are effective and efficient. In addition, the basic demands of chemistry learning in Vocational High Schools (SMK) are a challenge for teachers to innovate in delivering lessons (Wasonowati et al. 2014).

Pratiwi, Y et al in 2014 conducted relevant research on redox material for class X at SMA Negeri 5 Surakarta. According to the results of their research, it was concluded that the PBL model could be implemented on redox reaction material for class X SMA Negeri 5 Surakarta in the 2013/2014 academic year. This can be seen from the achievement of learning targets, namely; implementation of PBL syntax; students have good attitude competence in direct learning that is equal to 86.29%, achievement of learning targets is equal to 76.25%, equal to 81.25% of students achieve minimum completion score of redox reaction material; and 90.63% of students had a very good

Hesti Rizki Amalia
Email: : hestiamalia92@yahoo.com

Received: 18 March 2022
Accepted: 20 May 2022
Published: 07 June 2022

attitude through a questionnaire assessment and 82.29% of students had a good attitude through an observational assessment.

Based on the information obtained from SMK Negeri 2 Palembang, it is known that only about 60% of students achieve minimum completion scores which should be classical, namely 85% of students must achieve minimum completion criteria. Minimum completion score for the field of chemistry is 75. The low learning outcomes are caused by the average academic students at SMK Negeri 2 being lower middle class. In addition, students are less interested and interested in chemistry lessons, they prioritize practice in their areas of expertise, as a result their chemistry learning outcomes are low. Students are less actively involved during the learning process so that the response to the teacher's questions is still low. The facilities and infrastructure at this school are also not supportive, such as a chemical laboratory that is inadequate for carrying out practicum activities for students.

Based on this information, the Problem Based Learning learning model can be applied in SMK Negeri 2 because in the Problem Based learning model students are required to be active in the learning process. According to Akinoglu et al, in 2007 the PBL model had a positive impact on academic achievement and student behavior in science learning. Being able to make social interaction and student learning achievement increase is a virtue of the PBL model. Effectiveness in a study is marked by the achievement of all competency indicators that are the target of learning (Pratiwi et al., 2014). Therefore, to improve student learning outcomes, it is necessary to conduct research on the application of Problem Based Learning learning models so that researchers conduct research entitled "Efforts to Improve Student Chemistry Learning Outcomes Through the Application of Problem Based Learning Learning Models in Class X SMKN 2 Palembang".

Based on the description of the problems above, the formulation of the problem in this study is "How can the application of the PBL model improve the chemistry learning outcomes of class X students at SMK Negeri 2 Palembang? The purpose of this research is to improve the chemistry learning outcomes of class X Geomatics 1 at SMK Negeri 2 Palembang through the application of the Problem Based Learning learning model.

▪ METHOD

Classroom Action Research (CAR) was carried out in two cycles. Each cycle consists of four stages, namely planning, implementation, observation and reflection. Data collection was carried out at SMKN 2 Palembang from April 6 to April 27 2018. The subjects in this study were class X Geomatics 1 SMKN 2 Palembang in the 2017/2018 academic year, totaling 34 people consisting of 25 male students and 9 students Woman.

Planning Stage

The planning stage that will be carried out by the researcher is to determine the material, namely hydrocarbons, make a Learning Implementation Plan (RPP), determine problems regarding hydrocarbon material to be solved as the beginning of learning, make Student Worksheets (LKPD), arrange action observation sheet formats (students) , making evaluation test questions to measure student learning outcomes and making key evaluation test questions answers.

Implementation Stage

Carry out the RPP that has been designed and hold a final evaluation test with essay choice questions. In implementation, the teaching and learning process is carried out in accordance with the RPP that has been designed (RPP attached).

Observation Stage

Observations carried out during the implementation of learning activities. Observations were made using an observation sheet that had been made previously. At this stage, researchers are assisted by observers to observe students during learning activities.

Reflection Stage

At this stage an evaluation is carried out with the observer on the actions that have been taken. If the evaluation of student learning outcomes in cycle I has not shown an increase, then cycle II will be carried out by correcting things that are still lacking in order to obtain better results.

Data Collection Technique

Collecting data with techniques in research is a test in the form of essays and observations. Essay tests are carried out at the end of each cycle which aims to see students' abilities in answering questions related to hydrocarbons and petroleum material before and after getting the action. While observations are made in each cycle with the aim of seeing the learning process carried out by teachers and students.

Data Analysis Technique

Data collection techniques in this study used quantitative and qualitative data analysis where researchers focused more on student learning outcomes, the learning process and the linkages between activities, namely students' understanding of chemistry learning in redox material using the Problem Based Learning learning model. The data analysis used is as follows:

Learning Outcomes

Student learning outcomes are obtained through learning outcomes tests given at the end of each cycle. Increasing student learning outcomes from cycle I to cycle II indicates the success of the actions taken. The final score obtained for each cycle is expressed in percent, then compared with the percentage of learning completeness before the action. Individual learning completeness is achieved if students get a score of ≥ 75 and classical learning mastery is achieved if in that class 85% of students get a score of ≥ 75. To find the average score of all students use the formula:

Untuk m...

$$Mx = \frac{\sum x}{N}$$

(Sudijono,2010)

Information :
Mx : Average score of all students
∑x : Total value of all students N = Total number of students

N : Total number of students

To find out the percentage of completeness of student learning outcomes using the formula:

$$P = \frac{F}{N} \times 100\%$$

(Dewi, 2010 :188)

P : Achievement score
F : Number of students who have changed (completed)
N : Total number of students
A class is said to have studied thoroughly if the class has 85% complete learning.

Observation Results

Analysis for student observation used the formula:

$$\text{Presentase} = \frac{\text{jumlah aspek aktivitas yang teramati}}{\text{Jumlah seluruh aspek aktivitas}} \times 100\%$$

Criteria used:
< 60% active students : Less
60% - 70% active students : Enough
71% - 85% active students : Good
86% - 100% active students : Very Good

Analysis for teacher observation (researchers) used the formula :

$$\text{Persentase} = \frac{\text{jumlah descriptor yang teramati / dilakukan guru}}{\text{Jumlah seluruh deskriptor}} \times 100\%$$

Achievement Indicator

This research consists of two cycles. If the cycle shows that students' classical learning outcomes reach 85% of subject completeness, namely ≥ 75, then the cycle is considered sufficient because the indicator of success has been achieved. However, if it has not been achieved then the next cycle will be carried out.

▪ RESULT AND DISCUSSION

Data on student learning outcomes before the action (T0) were taken from students' daily test scores on the material before the research was carried out, namely regarding electrochemical cells. The value of student learning outcomes (T1) is taken from the final test scores of cycle I, followed by cycle II the student learning outcomes scores (T2) are taken from the final test scores of cycle II.

Table 1. Recapitulation of student learning outcomes (T0), (T1) and (T2)

Siklus	Jumlah Siswa	Jumlah Siswa yang Tuntas (≥75)	Jumlah Siswa yang Belum Tuntas (<75)	Rata-rata Hasil Belajar	Persentasi Ketuntasan Klasikal
Sebelum Tindakan (T_0)	34	13	21	68.97	38.23%
Siklus I (T_1)	34	18	16	74.93	52.94%
Siklus II (T_2)	34	29	5	85.79	88.23 %

Table 2. Recapitulation of student activity in each cycle (T1) and (T2)

No.	Siklus	Jumlah Siswa	% Keaktifan Pertemuan Pertama	% Keaktifan Pertemuan Kedua	% Keaktifan Siswa
1.	Siklus I (T_1)	34	59.17 %	62.11 %	60.64 %
2.	Siklus II (T_2)	34	68.39 %	74.57 %	71.95 %

Classroom action research has been carried out by applying the Problem Based Learning learning model in class X Geomatics 1 at SMK Negeri 2 Palembang. Based on research data there is an increase in student learning outcomes and student learning activeness. An increase in student learning outcomes occurs in each research cycle accompanied by an increase in student learning activity in each cycle as shown in Table 1 and Table 2.

Based on Table 1, it can be seen that in cycle I, there was an increase in learning outcomes which can be seen from the average student learning outcomes before taking action (T0) of 68.97 with 38.23% mastery learning in electrochemical material experiencing an increase in average learning outcomes after being given action in cycle I (T1) it became 74.93 with 52.94% learning completeness on the subject of hydrocarbons with student learning activeness of 59.85%. This increase was due to the application of the Problem Based Learning learning model in class X Geomatics 1 SMK Negeri 2 Palembang. By applying this model, students are given the opportunity to analyze a problem with their own thinking skills through worksheets in which there are everyday phenomena that become problems discussed by students. Students actively seek information from various available information sources such as teaching materials, textbooks and other sources related to the material.

This was observed when students completed the problems in the LKPD regarding the nomenclature material for hydrocarbon compounds at the first meeting and the material for isomerism and the impact of burning hydrocarbons at the second meeting. It was seen from the observation data that 63.23% of students enthusiastically discussed to find solutions with the work instructions that had been prepared. given in groups, then 66.18% of students look for solutions from various sources such as reading teaching materials that have been given, notebooks or chemistry textbooks.

Even though there was an increase in learning outcomes after the implementation of cycle I, there were still some deficiencies so that the results were still less than optimal. Some of these shortcomings, among others, are that there are still many students who do

not make good use of their time when discussing with groups, only 64.71% of students who discuss with their groups and answer questions on the LKPD. In addition, there are still many students who go in and out of class when the discussion takes place.

Then during the presentation, there were still many students who did not actively ask questions and express opinions, it was seen that only 19.12% of students asked questions in another group consisting of 8 students at the first meeting and 5 students at the second meeting. This was because only two groups presented the results of their group discussions at the first meeting and 1 group at the second meeting, resulting in no opportunity for other groups to present the results of their group discussions and limited other students to ask questions. There are still many deficiencies in the learning activities that took place in cycle I, making some learning objectives at the first and second meetings still not achieved. This can be seen from the results of student learning which only amounted to 52.94% who achieved mastery learning in a classical manner and obtained student learning activeness of 60.64%.

Based on the deficiencies found in cycle I and the students' learning completeness had not been achieved as expected, then the action was corrected in cycle II, namely before entering learning, the teacher provided motivation and enthusiasm for students to be more enthusiastic in participating in lessons, such as by using powerpoint media and also the teacher displays a learning video. By using this learning media, students are more motivated and more interested in participating in learning. In addition, the teacher also guides one of the student representatives to read out the work steps or work instructions in the LKPD so that it makes it easier for students to complete the LKPD. The teacher guides students in completing LKPD and also guides the course of discussions in groups so that if students experience difficulties they can directly ask the teacher. By doing this guidance, it is hoped that the learning objectives can be achieved. During the presentation, the teacher asked all selected group members to present the results of the group discussion in front of the class. The teacher provides rewards in the form of additional cognitive value for students who are active in giving opinions or rebuttals during question and answer group presentations so that this can motivate students to be even more active in giving opinions or rebuttals to other groups during presentations.

After making improvements to the deficiencies found in cycle I, there was an increase in the average student learning outcomes in cycle II. This can be seen from the average student learning outcomes of 74.93 with 52.94% completeness in cycle I (T1) then increased to an average student learning outcome of 85.79 with 88.23% learning completeness in cycle II (T2) with the subject of petroleum. The increase in learning outcomes was accompanied by an increase in student activity of 69.90%. This increase was due to the fact that during group discussions and presentations, students looked enthusiastic and students were able to use the discussion time quite well as indicated by the observational data of 77.94% of students trying to ask questions during discussions.

During group presentations, there was an increase in students asking questions to other groups, namely 44.11% consisting of 12 students at the first meeting and 18 students at the second meeting. This shows that the Problem Based Learning learning model is able to increase the active role of students in learning. This statement is in line with the opinion of Sriwenda, et al., (2013) which states that Problem Based Learning is part of cooperative (group) learning so that in practice students will be actively involved in discussion activities in the learning process.

The increase in mastery learning outcomes in cycle II from cycle I increased by 35.29%, this result was greater than the increase in mastery learning outcomes from T0

to Cycle I, which was 14.71%. This is because there have been several corrective actions in implementing the Problem Based Learning learning model during the learning process in the classroom. This improvement was carried out by correcting some of the deficiencies found in cycle I. Although there were still other deficiencies, student learning outcomes in cycle II had achieved classical completeness of 88.23%, which meant that research could be stopped in cycle II, this was because the research conducted is limited to the classical completeness learning outcomes that must be achieved by 85%.

The research results always show an increase in student learning outcomes and active learning, this is in line with the opinion of Novianti, et al., (2017) which suggests that the use of the Problem Based Learning learning model will help students be more active in learning which will affect learning activities and outcomes during learning takes place. Based on the explanation above, it can be concluded that through the application of the Problem Based Learning learning model it can improve student learning outcomes in class X Geomatics 1 SMK Negeri 2 Palembang.

▪ CONCLUSION

From this study it can be concluded as follows: there is an increase in student learning outcomes by applying the Problem Based Learning learning model in class X Geomatics 1 SMK Negeri 2 Palembang. In cycle I (T1) there was an increase in learning outcomes as seen from the average value of student learning outcomes before action (T0) was 68.97 with learning completeness of 38.23%, increasing to 74.93 and learning completeness of 52, 94% and obtained student activity during the learning process took place at 60.64%. In cycle II (T2) there was an increase in learning outcomes with an average learning result of 85.79 and learning completeness of 88.23% with an increase in student learning activeness of 69.90%.

▪ REFERENCES

Akinoğlu, O., & Tandoğan, R, O. (2007) The effects of problem-based active learning in science education on students' academic achievement, attitude and concept learning. Eurasia Jurnal of Mathematics, Science & Technology Education. 3(1): 71-81

Dewi, R. (2010). Profesionalisasi guru melalui penelitian tindakan kelas. Medan: Pasca Sarjana Unimed.

Dimyati & Mudjiono. (2009). *Belajar dan pembelajaran*. Jakarta: Rineka Cipta

Djamarah, S. B. & Zain, A. (2010). *Strategi belajar mengajar*.Jakarta: Rineka Cipta

Izzaty, R, E. (2006). Problem based learning dalam pembelajaran di perguruan tinggi. Paradigma.ISSN 1907-297X: 77-83

Lustiyati, E, D., Farida, J., & Sugiyarto. (2009). *Aktif belajar kimia untuk SMA & MA Kelas XII*. Departemen Pendidikan Nasional

Nur, M. (2008). *Model pembelajaran berdasarkan masalah*. Surabaya: Pusat Sains dan Matematika Sekolah UNESA

Pratiwi, Y., Redjeki, T., & Masykuri, M. (2014). *Pelaksanaan model pembelajaran problem based learning (pbl) pada materi redoks kelas X SMA Negeri 5 Surakarta Tahun Pelajaran 2013/2014*. Jurnal Pendidikan (JPK). 3(3): 40-48

Sirait, T., & Hutabarat, W. *Pengaruh model pembelajaran problem based learning (pbl) dengan media powerpoint terhadap hasil belajar kimia siswa SMA pada Pokok Bahasan Konsep* Redoks.1-7

Sudijono, A. (2010). *Pengantar statistik pendidikan*. Jakarta: PT Raja Grafindo Persada.

Ujeng, H. S. & Paudi, R, I. *Peningkatan hasil belajar siswa dengan menggunakan alat peraga* IPA Kelas IV SD Inpres 1 Siney. Jurnal Kreatif Tadulako Online. 4(6) p