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Implementation of the Problem Based Learning (PBL) Learning Model to Improve Chemistry Learning Outcomes in Vocational Schools

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Abstract: Implementasi Problem Based Learning Model to Improve Chemistry Learning Outcomes in SMK .This classroom action aimed to improve the learning chemistry achievement of class X students at SMK Negeri 4 Palembang through Problem based learning model specifically TKR 3class. This research was carried out in teo cycles, each cyscle consisted of two meetings. The data were obtained by using observation sheet and students' learning achievement test which was conducted at the end of the meeting. The improvement of students' achievement could be seen from the students' learning achievement average. The students' learning achievement average before the action was 59,44 with learning completeness was 38,89%. The improvement in cycle 1 was up to 70,55 with learning completeness 66,67% and cycle II improved up to 84,44with learning completeness was 86,11 %.

Keywords: learning, action, research, problem

▪ INTRODUCTION

Studying chemistry means knowing about the bonds between objects and their components. So in learning chemistry you have to choose effective and efficient learning methods and media. Apart from that, the basic nature of chemistry learning in Vocational High Schools (SMK) is a challenge for teachers to innovate in delivering lessons. (Pratiwi, 2014)

Based on information from the chemistry teacher at SMK Negeri 4 Palembang, it is known that the reality in teaching and learning activities is that the chemistry teaching and learning activity (KBM) process is guided by the learning hierarchy mandated by the 2013 curriculum based on Student Central Learning. However, various supporting factors for learning result in the progress of learning not running "maximally". This is not only due to the condition of the instructor (teacher), but more to the students' obstacles, including;

1. Students ignore chemistry subjects, which are not subjects in their area of expertise.
2. Students' initial understanding of chemistry subjects considers chemistry to be complicated and not useful for the student's area of expertise.
3. It is difficult for students in the TKR department to accept the connection between chemistry and the student's major.
4. Many chemical principles related to calculations are difficult for students to understand.

Apart from the above, school facilities and infrastructure related to chemistry laboratories and science laboratories do not yet exist so that experimental-based learning is difficult to apply to students. This has an impact on students' participation and adaptation in the learning process which is still lacking and they have not been able to reach the initial standard of good chemistry subject scores in accordance with the KKM

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because the students' KKM score is only 40%, especially for Light Vehicle Engineering (TKR) skills, especially class X TKR students. 3.

This condition results in students having difficulty and not being too interested in chemistry, which ultimately results in students' less than optimal understanding of chemistry material, and low achievement of students' KKM grades in chemistry lessons. Chemistry lessons for most students are considered an unimportant subject. This is because chemistry lessons are difficult to understand and have a high level of analytical understanding. This causes not all students to be interested in chemistry lessons. Even though in this case the 2013 Curriculum mandates scientifically based education to be achieved in the teaching and learning process, there are several learning models suggested by K13 to be applied to teaching and learning based on a scientific approach. One of them is the "Problem Based Learning (PBL)" learning model which adheres to constructivist theory. Constructivist-guided learning is learning that emphasizes the importance of student activity in building their own basic concepts of knowledge. (Sumaryani, 2014) One part of the chemistry material that students study at school is electrochemistry, which in practice teachers usually use discussion and assignment methods. From this explanation, research is needed with the aim of finding out the application of the Problem Based Learning Model to improve it

Chemistry Learning Results of students in class X SMK Negeri 4 Palembang. In this classroom action research, the researcher formulated the problem as follows: "How can students' chemistry cognitive learning outcomes be improved by implementing the Problem Based Learning learning model in class X TKR 3 SMK Negeri 4 Palembang?"

This research aims to: Find out efforts to improve students' chemistry cognitive learning outcomes by using the problem based learning model in Class X TKR 3 SMK Negeri 4 Palembang.

▪ METHOD

This research is classified as a type of action research. In this research, the subjects studied are groups of students in the class. The research is planned to be carried out at SMKN 4 Palembang in class X TKR 3. The research time is 11 April 2018 - 09 May 2018.

The subjects in this research were 36 students of class X TKR 3 SMKN 4 Palembang in the 2017/2018 academic year. The object of this research is students' ability to improve students' chemistry learning outcomes in electrochemical material using the Problem Based Learning model.

Research Steps

The steps in classroom action research are: (1) planning, (2) implementation, (3) observation, and (4) reflection. The implementation of classroom action research in this study will be carried out in two cycles based on the Kemmis and Taggart model as follows (Suyadi, 2012;19)

Cycle I

Planning Stage

In the planning stage, action is carried out in each cycle, namely: Developing a learning plan in the form of a learning tool, Determining problems regarding electrochemical cell material, namely voltaic cells, which will be given to students to be solved as the beginning of learning, Developing an observation sheet format that will be used in the action process about student activities and the implementation of learning carried out by teachers (researchers), Developing tests to measure student learning outcomes on voltaic cell material after cycle I.

Implementation Stage

Activities carried out to carry out learning according to the learning plan that has been prepared using the PBL learning model. Activities carried out at this stage include:

Explain the indicators for achieving the expected learning outcomes. Motivate students by providing an explanation of the learning process that will be carried out. Explaining the problem-based learning process, including:

Phase 1: Orienting students to the problem. Provide several statements related to redox materials such as how to determine oxidation and rusting of iron, or others.

Phase 2: Organizing students to learn. Guide students to form small groups consisting of 5-6 people in each group.. Explain the main points of electrochemistry material studied.

Phase 3: Guide students to solve problems. Ask students to solve the problems that have been given and discuss them in their respective groups. Monitor and go around each group and direct or guide groups that are having difficulty solving problems in learning.

Phase 4: Develop and present problem solving results. Direct and observe students in concluding the results of problem solving. Ask several group representatives to present the results of their discussion, while other groups provide responses or questions. Encourage students to respect each other's opinions and questions from their friends. (teacher acts as moderator and facilitator)

Phase 5: Analyze and evaluate the problem solving process. Analyze students' work results, Guiding students to conclude the subject matter they have studied and motivating students to develop reasoning abilities in solving problems. Provide real-time assessments to students during the learning process in the classroom.

Observation Stage

Observations in the learning process are carried out to determine student activities and the suitability of the actions taken by the teacher with the plans prepared. At this observation stage the teacher (researcher) becomes an observer as a collaboration partner, using a prepared observation sheet format and also various documentation to support observations in implementing actions and determining reflections in this research.

Reflection Stage

Reflection is carried out to analyze and provide meaning to the data obtained, clarify the data obtained and draw conclusions from the actions that have been taken. The results of this reflection are then used as suggestions for the improvement planning stage in the next cycle and as a temporary conclusion from the results of the research carried out.

Cycle II

All research stages were carried out, as in cycle 1, taking into account the results of the reflection from cycle I.

Data collection technique

Data collection techniques in research are tests and observations. The test is carried out at the end of each cycle with the aim of seeing students' ability to answer questions related to electrochemical cells before and after receiving the action. Meanwhile, observations are carried out in each cycle with the aim of seeing the learning process carried out by teachers and students in accordance with the planning and implementation of the actions that have been carried out.

Achievement Indicators

The Minimum Success Criteria refers to the Minimum Cumulative Criteria (KKM) value of 75 which will increase student activity in the learning process. So learning is successful if 85% or more of the number of students who take part in the teaching and learning process achieve a level of success that is less (below the minimum level), then the next teaching and learning process should be remedial.

▪ RESULT AND DISCUSSION

Data on student learning outcomes before the action (T0) was taken from students' daily test scores on the subject of the mol.material concept before the research was carried out. Student learning outcome scores (T1) are taken from the final test scores of cycle I, followed by cycle II, student learning outcome scores (T2) are taken from the final test scores of cycle II.

Table 1. Recapitulation of student learning results (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)	36	14	22	59,44	38,89 %
Siklus I (T_1)	36	24	12	70,55	66,67 %
Siklus II (T_2)	36	31	5	84,44	86,11

Table 2. Recapitulation of teacher activities in delivering learning

No	Siklus	Jumlah Aspek	% Pemenuhan Model Pembelajaran Pertemuan Pertama	% Pemenuhan Model Pembelajaran Pertemuan Kedua	% Pemenuhan Model Pembelajaran
1	Siklus I (T_1)		73,3%	86,67%	80%
2	Siklus II (T_2)		86,67%	100%	93,33 %

Table 3. 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)	36	62,27 %	54,17 %	55 %
2	Siklus II (T_2)	36	64,02 %	68,89 %	66,45 %

In cycle I, there was an increase in learning outcomes as seen from the average student learning outcomes before taking action (T0) of 59.44 with learning completeness of 38.89% in the electrolysis material, experiencing an increase in average learning outcomes after being given action in cycle I (T1), became 70.55 with learning completeness of 66.67% on the subject of voltaic cells with student learning activity of 55%. This increase occurred due to the implementation of the Problem Based Learning learning model in class X TKR 3 SMK Negeri 4 Palembang. In this model, students are given the opportunity to analyze a problem with their own thinking abilities through student worksheets in which there are everyday phenomena that become problems that students discuss. This activity is carried out using the LKPD media that has been provided. This model also involves students actively searching for information through various available information sources, such as teaching materials, textbooks and the Internet.

This was observed when students solved the problems on the LKPD regarding voltaic cell material related to anode and cathode cell reactions, the oxidizing and reducing power Eo of the cell in the voilta cell at the first meeting and cell notation material and spontaneous cell activity at the second meeting, seen through observation data 55.35% of students enthusiastically discussed the problems they got from the LKPD and searched for them solutions from learning resources provided teaching materials or internet networks from each group with their own cellphones, consisting of 18 students at the first meeting and 20 students at the second meeting and 57% of students who read notebooks or chemistry textbooks consisting of 18 students at the first meeting and 21 students at the second meeting.

After implementing cycle I (T1), although there was an increase in learning outcomes, this was still less than optimal because there were still several weaknesses that occurred during the implementation of actions in Cycle I, such as, there were still students who came in and out of class during group discussions and there were still Also, students who did not use the time to discuss were seen as only 58.05% of students who attempted to ask questions on the LKPD sheet in their group, plus there was one group that made answers that were not in accordance with what was expected in achieving the learning objectives, the reason was because the students were still reluctant. to ask questions to both the teacher and their friends, which can be seen from the observation data of 10 students at the first meeting and 8 students at the second meeting. So that during the evaluation test at the first meeting with the subject of cell notation, student learning outcomes were lower than the results of the evaluation test at the second meeting with the subject of spontaneity E0 cell. This is because students are still adjusting to following the learning process using the problem based learning model, students seem shy about asking the teacher and are not used to sharing information with friends in the group formed by the teacher.

Then, during the presentation, students looked less enthusiastic, did not actively ask questions and express opinions, it was seen that only 38.89% of students asked questions to another group consisting of 14 students at the first and second meetings, and only 40.25% of students who expressed opinions consisting of 16 students at the first meeting and 18 students at the second meeting. This is because only two groups presented the results of their group discussions, resulting in no opportunity for other groups to present the results of their group discussions and limited other students to ask questions. So that in the first cycle, student learning outcomes were obtained at 66.67%, which had not yet reached classical learning completeness, and student learning activity was obtained at 55%, which was still in the medium category.

Based on the weaknesses and the students' learning completeness that was expected in cycle I, corrective actions were carried out in cycle II, namely before entering the lesson, the teacher provided motivation and enthusiasm for students to be more enthusiastic in following the lesson by bringing media images related to corrosion material. . Then students are also guided to read the LKPD instructions first so that they can be used as a source of information for students. The teacher also guides the discussion in the group when asking questions related to solving problems in learning so that the discussions carried out by students are as expected so that the learning objectives can be achieved. During the presentation, the teacher calls all group members selected for the presentation and for the presentation of the results of the discussion, a minimum of 3 groups are given at each meeting. Then the teacher gives rewards in the form of additional cognitive value so that students are more active in giving opinions or rebuttals during group presentations.

In cycle II, after improvements were made to the weaknesses found in Cycle I, there was an increase in the average student learning outcomes of 70.55 with 66.67% completeness in cycle I (T1) then increased to the average student learning outcomes amounting to 84.44 with learning completeness of 86.11% in cycle II (T2) on the subject of corrosion. The increase in learning outcomes was accompanied by an increase in student activity by 66.45% were included in the high or good category. This increase occurred during group discussions and presentations. Students looked enthusiastic during the discussion, where students were able to utilize discussion time quite well as shown by observation data of 61.11% of students trying to ask questions on the sheet during the discussion and discussing them within their respective groups which showed an improvement from the previous cycle. The same thing also happened to students' enthusiasm in discussing where 72% of students asked questions to the teacher and 77% of students asked their group friends to solve problems on the LKPD.

During group presentations, there was an increase in students asking questions or students asking questions to other groups, namely 55.91%, consisting of 15 students at the first meeting and 18 students at the second meeting. There was also an increase in student activity in expressing opinions by 44.74%, greater than the first cycle which was only 34.72%. This shows that the problem based learning model is able to increase students' active role 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 its application students will be actively involved in discussion activities in the learning process.

The increase in completeness of learning outcomes in cycle II from cycle I increased by 25.67%. This result was greater than the increase in completeness of learning outcomes from T0 to Cycle I, namely 18.12%. This is because several corrective actions have been carried out in implementing the problem based learning model during the learning process in the classroom. These improvements can be seen from the learning results in cycle I where there were several findings of weaknesses in learning actions which were then carried out corrective actions in the next cycle, namely cycle II, although there are still other weaknesses, the student learning outcomes in cycle II have achieved classical completeness of 86.11%, which means research can be stopped in cycle II, this is because the research carried out is limited to the classical completeness learning outcomes that must be achieved by 85%.

Research results always show an increase in learning outcomes and student learning activity, this is in line with the opinion of Novianti, et al., (2017) who stated that the use of the problem based learning model will help students be more active in learning which will influence the activities and learning outcomes during learning takes place. Based on the explanation above, it can be concluded that through the application of the problem based learning model, student learning outcomes in class X TKR 3 SMK Negeri 4 Palembang can be improved.

▪ CONCLUSION

Based on the objectives of this research, it was found that there was an increase in students' cognitive learning outcomes by implementing the Problem Based Learning learning model in class X TKR 3 SMK Negeri 4 Palembang. The increase in learning outcomes can be seen from the average value of student learning outcomes before action (T0) was 59.44 with learning completeness 38.89%, there was an increase in learning outcomes in cycle I (T1) with an average learning outcome of 70.55 and learning completeness was 66.67% and student activity during the learning process was 55% and increased in cycle II (T2) with an average learning outcome of 84.44 and learning completeness 86.11% which was accompanied by increased learning activity students amounted to 66.45%.

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