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IMPLEMENTATION OF PROBLEM-BASED LEARNING MODEL ON SALT HYDROLYSIS MATTER TO TRAIN STUDENTS' CRITICAL THINKING SKILL GRADE XI-D SMAN 1 PAMEKASAN

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Abstrak

Penelitian ini bertujuan untuk melatihkan keterampilan berpikir kritis peserta didik pada materi hidrolisis garam yang ditinjau dari keterlaksanaan model pembelaran berbasis masalah, aktvitas peserta didik, dan keterampilan berpikir kritis peserta didik. Keterampilan berpikir kritis yang dilatihkan yaitu interpretasi, analisis, dan evaluasi. Rancangan penelitian ini menggunakan *One Group Pretest Posttest Design. S*ubjek penelitian yaitu peserta didik SMA Negeri 1 Pamekasan kelas XI-D. Hasil-hasil penelitian yang diperoleh menunjukkan bahwa (1) Keterlaksanaan model pembelajaran berbasis masalah pada pertemuan I, II dan III mendapatkan nilai rata-rata keterlaksanaan pada tiap-tiap fase dalam rentang 3,00 - 3,80 dengan kategori baik dan sangat baik (2) Aktivitas peserta didik pada pertemuan I, II dan III menunjukkan bahwa aktivitas yang dilakukan oleh peserta didik telah sesuai dengan sintaks model pembelajaran berbasis masalah dan peserta didik telah berlatih keterampilan berpikir kritis berdasarkan model pembelajaran berbasis masalah (3) Model pembelajaran berbasis masalah dapat melatihkan keterampilan berpikir kritis peserta didik, hal ini terlihat pada peningkatan keterampilan berpikir interpretasi, analisis dan evaluasi pada *posttest*. yaitu 28 peserta didik mencapai tuntas dan 9 peserta didik tidak tuntas untuk interpretasi, 29 peserta didik mencapai tuntas dan 8 peserta didik tidak tuntas untuk analisis serta 29 peserta didik mencapai tuntas dan 8 peserta didik tidak tuntas untuk evaluasi.

Kata-kata kunci: Model Pembelajaran Berbasis Masalah, Keterampilan Berpikir Kritis, Hidrolisis Garam

Abstract

This research aimed to develop students' critical thinking skill on salt hydrolysis matter that is explored from feasibility of problem-based learning model, students' activity, and students' critical thinking skill. Critical thinking skills that were trained were interpretation, analysis, and evaluation. It used research model of One Group Pretest Posttest Design. The subject of this research was students of SMAN 1 Pamekasan grade XI-D. Results of research showed that (1) Feasibility of problem-based learning model on meeting I, II, and III obtained average score at each phase between 3.00 – 3.80 on good and very good category (2) Students' activity on meeting I, II, and III showed that it was suitable with syntax of problem-based learning model and students had trained critical thinking skill based on problem-based learning model (3) Problem-based learning could train students' critical thinking skill, it could be seen from the development of critical thinking skill of interpretation, analysis, and evaluation on posttest, 28 students achieved completeness and 9 students didn't on interpretation, 29 students achieved completeness and 8 students didn't on analysis, and 29 students achieved completeness and 8 students didn't on evaluation.

Keywords: Problem-based learning model, Critical Thinking Skill, Salt Hydrolysis

Introduction

Chemistry is experimental science, which cannot be studied only through reading, writing, or listening. Studying chemistry is not only to comprehend the knowledge which are fact, concept, and principle, but is a discovery process and mastering science procedure or method [1]. One of abstract and complex matters that are learnt by high school students is Salt Hydrolysis [2].

Salt hydrolysis is one of chemistry matters that is considered difficult and confusing for students because it contains concepts that needs deep comprehension so affects its application into the formula. Salt hydrolysis introduces to students about acid and base reactions produce salt and its properties and identification, besides salt hydrolysis is a matter that its phenomena can be observed directly in daily life [3].

Based on the aim and function of chemistry matter on standard of content is to apply science attitudes which is to be critical to science question that is not easily trusting without a support empirical observation, understand chemistry concepts, and its application to solve technology and daily life problem [4]. The fact is students still be passive, only listening without developing the information they get and lack of critical thinking training in class discussion [5].

According to Facione critical thinking has six main aspects that are interpretation, analysis, inference, explanation, and self-regulation [6]. It shows in training of critical thinking can be used those critical thinking skill components. Those skills are trained to students in order to make them think critically. One of the ways can be done to develop critical thinking skill is by making group discussion or giving problem-solving exercise as stated by Meyers [6].

One of learning models that trains students to think critically is problem-based learning (PBL) [4]. Problem-based learning is a learning strategy that uses problem in real life to a context for students to learn how to think critically, problem-solving skill, and to acquire essential concept of matter. According to Meyers, class knowledge can facilitate students' division into small groups to discuss or problem-solving exercise. Problem-solving exercise in a small group can develop critical thinking skill, because in that group students interact each other and observe how the other thinking [6].

Based on pre-research result data in SMAN 1 Pamekasan showed that 21.62% students can conduct critical thinking skill of interpretation, 8.10% analysis, and 16.21% explanation, and 21.62% inference. It showed that students' critical thinking skill was still low. Two researches that were conducted by Zhou stated that students' critical thinking skill on analysis, evaluation, and inference were needed to develop [7] [8].

This research is supported by previews research was conducted by Laili concluded that students' critical thinking skill could be developed by implementing problem-based learning showed that score of posttest increased from pretest [9]. Besides, research was conducted by Mufidah concluded that after implementation of problem-based learning could increase students' outcome in cycle I,II, and III respectively 69.1, 78.9, and 85.6 with learning completeness 57.14%, 77.14% and 85.71% [10]. Based on the background, the researcher conduct a research of "The Implementation of Problem-based Learning Model on Salt Hydrolysis Matter to Train Students' Critical Thinking Skill Grade XI-D SMAN 1 Pamekasan".

Research Method

Research Design

The research design was *One Group Pretest Posttest Design*, which is experiment that is conducted on a group without comparing group.

Procedure

The stages of research procedure were:

1. Preparation stage

   On this stage, the instrument that was used during research was prepared.

2. Execution stage

   The activity on this stage was conducted learning design that had been prepared on preparation stage to solve learning problem that students deal with by implementing problem-based learning. During learning activity the observer observed students' activity and teacher's

ability in the class to know the effectiveness of problem-based learning model to students' affective knowledge. The last meeting was held posttest to know the effectiveness of problem-based learning model to students' cognitive knowledge and critical thinking skill.

3. Data Analysis

Data that obtained from execution stage were feasibility of problem-based learning model, students' activity, and students' critical thinking skill to feasibility of problem-based learning model to know the result of research that was conducted.

Data Analysis

1. Data Analysis of Learning Feasibility

This data analysis aimed to know the quality of learning feasibility that was conducted by teacher. The data was obtained from observation result of observer to teacher. It was conducted by observing syntax feasibility in problem-based learning. Quality of learning feasibility of each meeting would be recorded as an evaluation in the next lesson. Quality of feasibility assessment of learning using Likert scale with the following criteria:

4 = excellent
3 = good
2 = fairly
1 = bad
0 = not done

Assessments of learning feasibility were analyzed and input into the criteria of learning management restriction that can be seen in table learning feasibility assessment criteria.

Table 1. Score Criteria of Learning Feasibility

Score achieved	Criteria
3,1 - 4	Very good
2,1 - 3	Good
1,1 - 2	Enough
0,5 - 1	Less
0	Not done

[11]

Calculation of quality learning feasibility in every learning process was done in the following way:

$$KP = \frac{\Sigma \text{score on each learning step}}{\text{total of learning step}}$$

Note:
KP = Learning Feasibility

2. Data Analysis of Students' Learning Activity

This analysis was to determine the activity of students during the learning process. Students' learning activity data obtained from the observation observer on students' during the learning process. Data observation activities of students during the learning process using problem-based learning model could then be calculated using the formula:

$$\text{\% Time Students' Activity} = \frac{\text{spesific time avtivity}}{\text{total learning activity}} \text{ x } 100\ \%$$

3. Data Analysis of Critical Thinking Skills

Data of students' critical thinking skills can be seen from the results of pretest and posttest given to students. Students were said to have completed the study if they have reached a minimum completeness criteria (KKM). So it can be said to be a student has completed if it has reached the KKM with the calculation:

$$\text{Score} = \frac{\text{achieved score}}{\text{maximum score}} \text{ x } 100$$

The calculation of the percentage of students in classical completeness is by using the following formula:

$$\text{Percentage of classical completeness} = \frac{\text{number of students who completed}}{\text{jnumber of students in total}} \text{ x } 100\ \%$$

Furthermore, these scores are converted into the predicate in Table 2.

Table 2. Score Conversion and Result Predicate of Critical Thinking Skill

Cognitive	
Average Score	**Predicate**
3,85 – 4,00	A
3,51 – 3,84	A-
3,18 – 3,50	B+
2,85 – 3,17	B
2,51 – 2,84	B-
2,18 – 2,50	C+
1,85 – 2,17	C
1,51 – 1,84	C-
1,18 – 1,50	D+
1,00 – 1,17	D

[12]

Students individually were achieved completeness when the score was ≥2,67 suitable with standard of Education and Culture Ministry Number 104 Year 2014 and a class was considered completed classically if minimum percentage of completeness was 75%.

The percentage of classical completeness can be calculated using the formula:

$$Classical\ completeness = \frac{\Sigma\ students\ who\ completed}{\Sigma students} x\ 100\%$$

Result and Discussion

1. Feasibility of Problem-based Learning Model

Feasibility of problem-based learning model in this research had shown very good criteria. The criteria showed that teacher mastered and conducted learning process in proportion with the syntax of problem-based learning model and had trained critical thinking skill to students.

The learning activity conducted three meetings made the students actively applied the concept they had to solve problem by using critical thinking skill in daily life. Teacher in this learning model had role as mentor and facilitator for students so they could learn how to think and solved their problem.

Problem-based learning model that was implemented on meeting I, II, and III contained of six phases according to Arends, namely (1) orientation of students to problem, (2) organizing students to study, (3) guiding the investigation of individuals, (4) guiding the data analysis, (5) guiding and building up the work and (6) analyzing and evaluating the problem-solving process.

Critical thinking skill (CTS) component trained each meeting in phase 1, 2, and 3 were interpretation, in phase 4 trained was analysis and evaluation, while at phase 5 CTS trained was evaluation. The average score of feasibility in each phase by phase 1, 2, 3, 4, and 6 respectively were 3.80, 3.75, 3.43, 3.75, and 3.50 with excellent criteria and phase 4 was 3.00 with excellent criteria at meeting I. The average assessment for two meetings at each phase by phase 1 to 6 respectively were 3.60, 3.25, 3.30, 3.25, 3.25, and 3.75 with excellent assessment criteria, as well as at each phase in three meetings with the phase 1, 2, 3, 4, and 6 respectively were 3.87, 3.66, 3.87, 3.66, 3.75 with excellent assessment criteria and phase 5 was 3.00 with excellent assessment criteria.

2. Students' Activity

At the first meeting, the activities of students most dominant namely students discussing with a friend to analyze the phenomena, it was because at the first meeting the material being studied is a new material that many students do not understand the material being studied, followed by participants students collect data and record the results of the experiment. At the meeting II, the activity of students was the most dominant students collect data based on the phenomena due to this activity the students presented an issue of how expediency salt hydrolysis in everyday life especially in agriculture, followed by students discussing with a friend to analyze phenomenon. At the third meeting, the activity of students is the most dominant students collect data based on the phenomenon, followed by a discussion with a group of students to analyze the phenomenon.

Overall in the first meeting that showed activity students practice critical thinking skills gained by 89.04%, at a meeting II showed the activity students practice critical thinking skills gained by 93.69% and in the third meeting showed activity students practice skills critical thinking was obtained 93.53%. At meeting I and II frequency students activity increased from 89.04% to 93.69%. This was in accordance with the constructivist Vygotsky. Constructivism learning theory involving students are actively in learning. Activities students during problem-based learning related to the teacher's ability to manage learning. The percentage of students observation activities in accordance with

the phase in problem-based learning to train critical thinking skills.

3. Students' Critical Thinking Skill

Students' critical thinking skills of trained during the learning process. These critical thinking skills were trained through problem-based learning model performed pretest and posttest method. Pretest was used to determine the critical thinking skills of students prior to learning and posttest are used to determine the critical thinking skills after learning by using problem-based learning model. Students individually achieved completeness when the score was ≥2.67 and a class was classically achieved completeness if minimum completeness percentage was 75% of students achieved score ≥2.67[12].

The test results showed the critical thinking skills of interpretation otherwise 18 students were completed in the skills and 19 students were not completed on time, while 29 students pretest otherwise completed and 8 students otherwise not completed at the time of the posttest. The completeness of a class showed that 75.67% students classically achieved completeness on interpretation critical thinking skill.The test results indicate the analysis skill otherwise 12 students were completed in the skill and 25 students are not completed at the time of the pretest, while 29 students declared complete and 8 students otherwise not completed at the time posttest. The completeness of a class showed that 78.37% students classically achieved completeness on analysis critical thinking skill. Critical thinking skills test evaluation indicated otherwise 12 were completed students in the skills and 25 students are not completed at the time of the pretest, while 29 students declared complete and 8 students otherwise not completed at the time of the posttest. The completeness of a class showed that 78.37% students classically achieved completeness on evaluation critical thinking skill. Students who did not complete still scored below ≤ 2.67. Students who did not completely understand because there was a problem that has not been able to interpret, analyze, and evaluate data. Baharudin, said that according to Piaget, humans have the knowledge structure in the brain, such as boxes, each box has a different meaning. Every new experience will be connected with box or structure of knowledge in the human brain [13]. Difference understanding of students allows for different interpretations in interpreting, analyzing, and evaluating the data. The cause of the lack completensess students also because when the teacher guided students who paying less attention were left.

Conclusion

Based on the analysis of research and discussion can be concluded that:

1. Feasibility of problem-based learning model to train students' critical thinking skills in the meeting I, II and III obtained the average score at each phase in the range of 3.00 to 3.80 with good and excellent categories.
2. Students' activities during 90 minutes of learning activities that took place at the meeting I, II and III showed that the activities undertaken by students were in accordance with the syntax of problem-based learning model and had shown that students practice critical thinking skills based on problem-based learning model.
3. Problem-based learning could train students' critical thinking skill, it could be seen from the development of critical thinking skill of interpretation, analysis, and evaluation on posttest, 28 students achieved completeness and 9 students didn't on interpretation, 29 students achieved completeness and 8 students didn't on analysis, and 29 students achieved completeness and 8 students didn't on evaluation.

Suggestion

Based on the research that have been made, there are suggestions to be considered by teachers in implementing problem-based learning model for training critical thinking skills of learners:

1. The test of critical thinking skills pretest and posttest should be made differently in

order to more easily determine the ability of learners before and after applied problem-based learning model.

2. The evaluation criteria for each component of critical thinking drilled (interpretation, analysis, and evaluation) in this study was made separately for the ability of learners differ in each component.
3. Behavior that was not relevant on students activity sheet need to be explained to make it operationally and easily understood by observer.

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