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The Effectiveness of Problem Based Learning Model to Improve Conceptual Understanding and Intrapersonal Skill

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Abstract: *This study aimed to determine the effectiveness of problem based learning model to improve the intrapersonal skill on solubility material and solubility product. The design of study was pretest-posttest control group design. The independent variable was the problem based learning model, while the dependent variable was the intrapersonal skill. The subjects of the study were students of class XI MIA 5 as experimental class and students of XI MIA 4 as control class. Intrapersonal skill was measured descriptively from the results of questionnaire and observation, while conceptual understanding was measured with essay test. The results of the study indicated that the conceptual understanding of experimental class was higher than the control class. The test results showed the t_{count} of conceptual understanding 5.54 which is higher than the $t_{critical}$ 1.66; hence the conceptual understanding of experimental class is better than the control class. The classical comprehension of conceptual understanding for experimental class and control class of was 86.49% and 32.43%. The results showed that the intrapersonal skill of experimental class student is higher than control class students. The self-reflection aspec increased from 12.86 with good criterion to 16.43 with excellent criterion. Emotional processing aspect increased from 13.22 to 15.86 with good criterion. Metacognition aspect increased from 23.78 with good criterion to 26.19 with excellent criterion. Based on the results of the study, it can be concluded that the problem based learning model effectively improves the conceptual understanding and intrapersonal skill of class XI Senior High School.*

Keywords: Effectiveness; Intrapersonal Skill; Problem Based Learning

1. Introduction

The world of education is required to prepare competent human resources in order to compete in the global job market. The Act of Education No. 20 of 2003 states that education is a conscious and planned effort to create learning atmosphere and learning process. Learners actively develop their potential to have spiritual strength, intelligence, personality, noble character and skills they, the society, nation and State need. Learning conditions that the students usually receive materials from teachers, take notes, and memorize the materials should be converted into knowledge sharing, searching, finding knowledge actively and solving the problem so that it will increase students' understanding (not memory). One of the efforts of the government to overcome these problems is through the implementation of Curriculum 2013 as the implementation of educational curriculum.

Curriculum 2013 is a curriculum that implements the learning process by using a scientific approach. Learning in Curriculum 2013 is implemented with four learning models, namely discovery learning, inquiry, problem based learning and project based learning. Implementation of learning model in Curriculum 2013 aims to enable students to learn independently so that the learning process is no longer teacher-centered.

One learning model which can be applied in the implementation of Curriculum 2013 is problem based learning model. Problem based learning model is an effective learning method to help students in processing information and build their own knowledge about the social world and its surroundings. Problem based learning model is a learning model that stimulates students to think and solve contextual issues (Mariani, 2014). This learning model trains students to solve problems with their knowledge.

One of state senior high schools in Semarang is a school that has implemented Curriculum 2013. Based on the results of field observations, the researchers find that during the learning process in the classroom, teachers tend to apply the methods of lecturing and giving assignment. The learning process is still centered on the teacher, so that the activeness and independence of students are still lacking. Students tend to be less tenacious and thorough in solving the problem, so that the student's ability in solving a given problem is still low.

Student's achievement can be influenced by several factors,one of which is internal factor derived from within the student himself. Those internal factors are such as maturity, intelligence, skill, practice, motivation and personal factor (Fitriyana et al., 2013). Based on the observations in the classroom,students' skills have not been optimal. The skill is closely related to internal skills, one of which is the intrapersonal skill. The skill that comes from one's self is an important aspect to support the learning process. Intrapersonal skill is the ability possessed by the individual to understand about himself, manage his emotions and desires. Intrapersonal skill is a part of the eight multiple intelligences of the human or known as *multiple intelligences* (Gardner, 1983).

According to Lazear (2004) intrapersonal skill can improve students' skills in collecting knowledge, analyzing problems, high order thinking and reasoning for developing the concept of problem solving. Intrapersonal skill consists of several aspects: (1) self reflection, (2) emotional processing, (3) metacognition, (4) values clarification, and (5) self identity.

Intrapersonal skill is the ability possessed by the individual to understand about himself, manage his emotions and desires. In chemistry lesson, intrapersonal skills are important to develop as it can help students to realize their ability in solving problems in learning chemistry.

Based on the description of the results of the observations, problem based learning model is very appropriate to be applied in order to improve students' intrapersonal skill. Syntax or learning steps that exist in problem based learning model according to Arends (2008) include (1) orient the problems to students, (2) organize the students to examine, (3) guide the investigation of students, (4) develop and present students' work, and (5) analyze and evaluate the results of the problem-solving process. Students will be trained to learn independently in the problem-solving process by developing the ability to analyze and manage the information obtained (Suprijono, 2009).

Problem Based Learning encourages students to find solution to a given problem that can help them to improve their ability. In addition, student's process in identifying and elaborating information, as well as discussing and evaluating procedure can improve intrapersonal skill (Wardani, 2014).

Solubility material and solubility product can be studied by applying the Problem Based Learning model. This material is one material that is considered to be difficult in terms of teaching, and the students' concept understanding (Hartati et al., 2104). Based on the background of the problem, the formulation of the problem is that whether Problem Based Learning model is effective to improve students' intrapersonal skill on the solubility material and solubility product. This study aims to determine the effectiveness of Problem Based Learning model to improve of students' intrapersonal skill on the solubility material and solubility product.

2. Methode

This study was conducted ina state senior high school in Semarang on the solubility material and solubility product. The study design used was pretest-posttestcontrol group design. The population in this study was class XI MIA1 to XI MIA 7. After being tested for normality and homogeneity test by using the data taken from first semester final exam scores, it was found that the population had normal distribution and was homogeneous so that the researchers can use cluster random sampling technique. After sampling, Class XI MIA 5 was classified as experimental class and Class XI MIA 4 as control class. The experimental class and control class were given conceptual understanding test in form of essay regarding the solubility material and solubility product before and after learning model applied.

The independent variable in this study was the learning model. In the experimental class, the learning model used was problem based learning, whereas the control class used lecturing and discussion. The dependent variables in this study were the students' conceptual understanding intrapersonal skill of experimental class and control class.

Instruments used in this study included pretest and posttest of conceptual understanding, observation sheet and questionnaire of intrapersonal skill. The data were analyzed by using T-test. In addition, the researchers also did an analysis of classical completeness to know the completeness achieved in the experimental class after being treated. The assessment of intrapersonal skill through observation and questioner was analyzed descriptively. Students' responses to learning were assessed through a student response questionnaire.

3. Result and Discussion

Intellogneces multiple approach is an idea that intelligence is not only focused on academic ability, but also includes a number of one's ability both physically and psychologically that work simultaneously to solve problems, adapt, and respond stimulus appropriately and correctly (Kwartolo, 2012). One learning model that can be applied is problem based learning which involves students to be active in the process of solving problems through the investigation to sharpen the intelligence possessed including the intrapersonal skill. Problem Based Learning model has a special feature that each student carries authentic investigation to solve the given problem (Lestari et al., 2015).

The experimental class and the control class were given a pretest to determine the initial state of the sample. The experimental class applied problem based learning model while in the control class applied lecturing model. After the experimental class and control class got treatment, both classes were given posttest. Data from pretest and posttest of students' conceptual understanding in the experimental class and control class are presented in Figure 1.

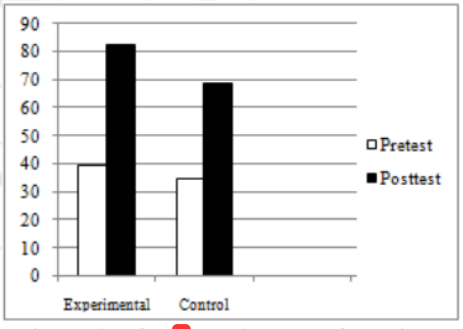

Figure 1: Results of pretest and posttest of experimental and control class

In the initial conditions, the experimental class and the control class had the same relative state. It can be seen from the pretest results of Class XI MIA MIA 5 and XI MIA 4, which showed that the pretest average score of conceptual understanding of the experimental class was 39.08 and control class was 34.76. Figure 1 showed that the experimental class, after being treated by applying the problem based learning model, obtained posttest average score of 82.05 for the conceptual understanding. Control class, which applied lecturing and discussion methods, obtained posttest average score of 68.73.

The results of paired-samples T-test with 5% significance level and degree of freedom 72 were t_{count} 5.54 for conceptual understanding posstest, and t_{table} 1.66. Based on the result of data analysis, it was obtained that $t_{count} > t_{table}$, which means that the posttest average score of the experimental class students was higher than the control class students. This corresponds toRusmiyanto (2012) which states that there is a difference to the learning outcomes of students with the application of problem based learning model. These results show that the problem based learning model can improve students' conceptual understanding of solubility material and solubility product.

According toMulyasa (2002), learning will achieve classical completeness if the number of students who master the competence is more than 85% of the total number of students in one class. The presentageresults of classical learning completeness of experimental class and control class are presented in Table 1.

Table 1: The Percentage Result of Classical Learning Completeness

Class	N	Average	Student completed	%	Criteria
Experimental (XI MIA 5)	37	82.05	32	86.49	Completed
Control (XI MIA 4)	37	68.73	12	32.43	Not completed

Based on data analysis result of science process skill posttest, as many as 32 out of 37 students of experimental class have reached individual learning completeness, whereas in control class as much as 12 out of 37 students reached individual completeness. The experimental class achieved learning completeness since the classical completeness percentage of 86.49% is more than 85% of the number of students in the class. Meanwhile, the percentage of classical completeness for the control class is 32.43%, so that control class has not reached the learning completeness. This is in accordance with the study of Husna (2013) that the problem based learning model showed classical learning completeness with a percentage of 86.38%. Based on the percentage results of classical learning completeness, it can be concluded that the results of science process skills of students that apply the problem based learning model is higher than the control class.

Basically, intrapersonal skill already exists within each student. This can be optimized in every learning activity undertaken, so that intrapersonal skill can be developed. The improvement of intrapersonal skill on the *self-reflection* aspect can be seen in Figure 2.

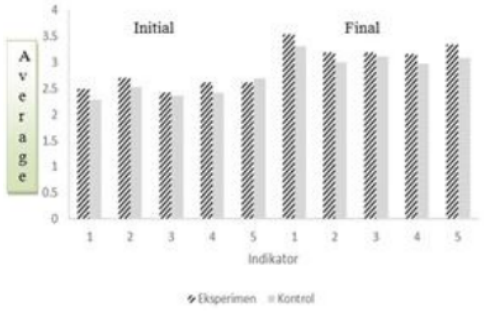

Figure 2: Results of self reflection questionnaire in the experimental class and control class at initial-final meeting

Figure 2 states that the average of five indicators of experimental class at its initial meeting including student's readiness for learning resources, reading material, preparation of presentations, and role of students in the discussions was higher than the control class. For the question and answer indicator, control class showed higher result than the experimental class. The results in the experimental class indicated three high-criteria indicators; they were reading the material before the learning, student's role in the discussion and question and answer session during the discussion with the highest indicator wasreading the material before the learning. At the final meeting, the analysis result showed that two indicators of the experimental class including student's readiness for learning resources question and answer session during discussion belong to the highest criteria, and the highest criterion in the control class was student's readiness for learning resources. The average of *Self Reflection* aspect at the end of the meeting of the experimental class and the control class respectively were 16.43 and 15.46 and belonged to excellent and good criteria. This is due to the experimental class learning with *Problem Based Learning* that requires students to be more active in the process of solving the problem so that science process skills of the students can be increased. This is in accordance with the opinion ofWardani (2014) who states that the intrspersonal skill on the *self-reflection* indicator can stand on thr learning of electrometric material.

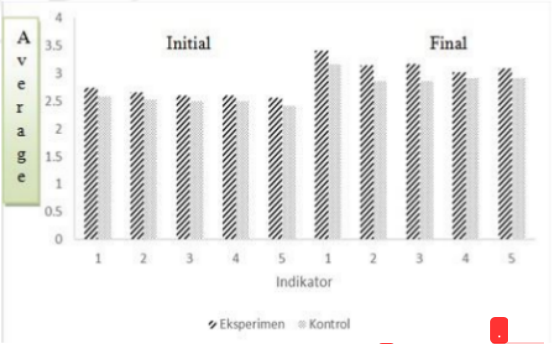

Figure 3: Observation results of emotional processing in the experimental class and control class at the initial-final meetings

Description:
1: Practicum readiness
2: Literature readiness
3: Practicum design
4: Activeness
5: Tenacity

Figure 3. Presents that the five indicators in the experimental class at the initial meeting belongs to high criteria with the highest indicator is the practicum readiness. In the control class there are three indicators that are included in the high criteria; they are practicum readiness, literature readiness, and student's tenacity. The average of intrapersonal skill on the *emotional processing* aspect in the experimental class is 13.22 which belongs to good criteria, while in the control class at the initial meeting is 12.60 which belongs to good criteria.

At the final meeting, the highest indicator is on the practicum readiness and four experimental class indicators; they are literature readiness, practicum design, activeness and student's tenacity of the students are included in the high criteria. The analysis results in the control class on the five high-indicators showed the highest indicator was the practicum readiness. The average of intrapersonal skill on the *emotional processing* aspect in the experimental class at the final meeting was15.86, while in the control class was 14.71. Both of them were included in good criteria. The *emotional processing* assessments in the laboratory activity showed improved results in the experimental class and also control class. This is because the laboratory activity can be done through exploration stages owned by students such as finding supporting journals and developing them, preparing for practicum activity (Wardani, 2014). This suggests that the *emotional processing* is closely linked to the seriousness of students in showing emotional response to the task given. The existence of high emotional intelligence in students will encourage them to perform well (Pamungkas, 2014).

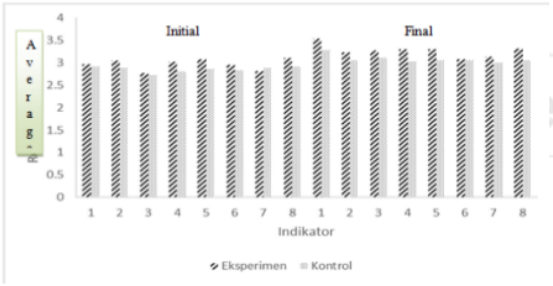

Figure 4: Metacognition questionnaire result of the experimental and control class at the initial-final meeting

Description:
1: Ability to do the task
2: Ability to solve the problem
3: Ability to design the investigation
4: Ability to answer the question
5: Ability to arrange the data
6: Ability to elaborate information
7: Ability to analyze the data
8: Ability to apply the concept

Based on Figure 4, it shows that each metacognition indicator in laboratory in the experimental class and control class at the initial meeting belongs to the high criteria. The highest indicator in the experimental class is the ability to apply the concept whereas in the control class is the ability to do the task. The average score on the metacognition aspect of the experimental class is 23.78, while in the control class at the initial meeting is 22.86, in which both of them belong to good criteria.

At the final meeting, the experimental class that implements the *Problem Based Learning* model shows an increase which is higher than the control class. The average indicator in the experimental class belongs to excellent criteria. In the control class, there is one indicator that is the ability to do the task that has excellent criterion. At the final meeting, the highest indicator in the experimental and control classes is the ability to do the task. This is in accordance with the opinion of Kipnis and Hofstein (2007) who concluded that the activity in the laboratory can train metacognition in various stages. Another study by Sa'adah (2015) which shows that *Problem Based Learning* model provides empowerment to the students' metacognition because the stages contained in *Problem Based Learning* syntax that emphasize students to actively solve the problem. Problem Based Learning model provides power for learners in empowering their metacognition, sinceit is process-oriented and it emphasizes student's involvement actively, both physically and mentally by solving problems (Danial, 2010).

The high intrapersonal skill result of the experimental class students is supported by a statement in the questionnaire response towards the *Problem Based Learning*. The result of the questionnaire stated that almost half of the students chose the responses of strongly agree and agree. This can be seen from the activeness, enthusiasm, way of solving the problem and the curiosity of students. In addition, students also stated that the *Problem Based Learning* model can be applied to other materials because it can improve the student's intrapersonal skill. The questionnaire analysis result of the student's response is shown in Figure 5.

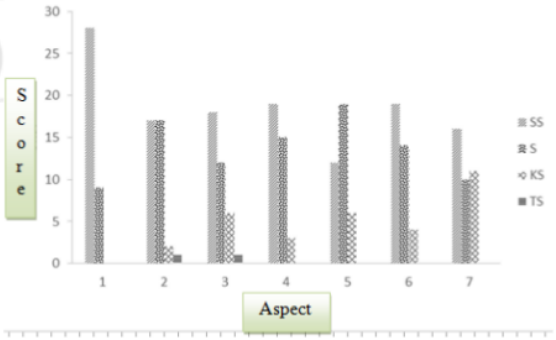

Figure 5: Analysis result chart of student's response to the *problem based learning* learning model on the solubility material and solubility result

Based on the results of the study and discussion, it shows that the *Problem Based Learning* model is effective to improve students' intrapersonal skill. This is showed by the increase of intrapersonal skill in the experimental class that implements the *Problem Based Learning* model, which is

better than the control class that implements conventional teaching methods such as lecturing and discussion. Constraints that occur in students during the learning is that students still lack in optimizing intrapersonal skill because they are not fully aware of the abilities that exist within themselves. In addition, students are also not familiar with the *Problem Based Learning* model, so it needs good time management in the learning activities so that timing in problem-solving activities can be streamlined.

4. Conclusion

Problem Based Learning learning model is effective to improve the concept understanding and intrapersonal skill of the students. This is indicated by the results of classical completeness achieved by the experimental class up to 86.49% which shows that 25 of 37 students have reached the completeness score.

The increasing of intrapersonal skill is shown through the average score of *self-reflection* aspect of the experimental class which increases from 12.86 with good criterion to 16.43 with excellent criterion. In the aspect of *emotional processing*, it increases from 13.22 to 15.86 with good criteria. In the aspect of *metacognition*, an increase happens from 23.78 with good criterion to 26.19 with excellent criterion.

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