The Implementation of Lesson Study towards Science Process Skills In The Basic Chemistry Practicum Subject

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The lecturers' ability in planning and implementing the well learning is an important part of professionalism. The development of professionalism of lecturers in improving the quality of learning can be done through Lesson Study. Besides, Lesson Study is also the source of science in observing and collecting the documentation data. The results of observation and also documentation of the data can be used as a source of learning for other subjects. The Lesson Study implementation is able to change learning to be more effective and efficient, increasing sensitivity as an observer. The research methodology used qualitative descriptive research. The researchers play a role as model lecturer for open Class in Lesson Study. Lecturer model designs lesson by making RPP, Chapter Design Syllabus and Lesson Design with Lesson Study team. The Lesson Study team is all the lecturers of Faculty of Mathematics and Sciences University of Muhammadiyah Semarang. The stages of Lesson Study consist of Planning; Implementation (Do); Reflection (See). Based on the Lesson Study cycle 1 result on the chemistry practicum subject, it is found that students' skill in general science process is not maximal yet. This is seen from the ability of students' science process skills are good at indicators able to plan experiments, able to communicate experiments, and able to observe carefully. Whereas, the concept comprehension is still low and the ability to use the tool is also low. Moreover, the system used in the learning needs improvement which also needs approval first before practicing the practicum. Furthermore, the students more easily apply in the concept of calculation. Based on the results of Lesson Study reflection required well preparation so that the learning results are better and maximal.

Keyword: Lesson Study, Science Skill Process, Asidi-Alkalimetri, Problem Base Learning

1. Introduction

One of the profiles of the Chemistry Education Program is to be a professional teacher. The formation of four teacher competencies in the form of pedagogical, professional, personality and social competence can be fulfilled by applying curriculum. The skills-based curriculum of the science process being taught should be able to shape the characters and the four competencies. The learning process taught during the lecturing process provides an experience for prospective chemistry teachers.

In accordance with Permendiknas no 16/2007 that the chemistry teacher should be able to design, and carry out the chemical experiment properly and correctly. Achieving these goals can be achieved through the laboratory. Practicum is a learning method that serves to clarify the concept through contact with tools, materials directly. Increasing intellectual teacher candidate through observation, seeking complete and selective information is to support problem solving. The practicum also serves to train, plan, and implement the experiments, implement data and train the scientific work. This is also confirmed by Depdiknas (2007) that the lab is divided into five types according to the willingness of problems, tools and materials, work processes, and goals or answers achieved. Practicum is an activity that uses minds on approach (think logical or reasoning) and hands on (physical activity) (Supahar, 2010). So, in practice there is a skill of science process (Abigu, 2014).

Scientific process skills are skills that emphasize aspects of processes and products. The process of sciences is problem solving, formulation of hypotheses, observations, experiments, analyzing data, and draw conclusions. While product science means building systematic knowledge as a result of the process. This is also stated by Dawson in Dahniar (2006) that the product of science process skills can build knowledge of the results of the practice process. Some aspects of the science process that must be possessed by prospective chemistry teachers are designing, observing, forecasting, interpreting observations, applying concepts, and using tools and materials and communicating. Based on the findings of Hidayah (2015) that the ability of the

science process skill of chemistry teacher candidate of University of Muhammadiyah Semarang on the aspects understanding and application of material concepts and implementing are on low-key daily issues. The low ability of chemistry teacher candidate in constructs the concept of science to self actualization in practicum.

The ability of lecturers to plan and implement the learning well is part of professionalism. The development of professionalism of teachers in improving the quality of learning can be done through Lesson Study. The Implementation of Lesson Study starts from Plan or Plan that is curriculum observation, understanding teacher candidate characteristic, planning of learning (RPP, Syllabus, Lesson Design, and Design Chapter). The implementation or Do is to apply the planning results that have been designed before learning. The last stage of a Lesson Study cycle is See or reflecting on the activities that have been implemented as the basic consideration for improving the quality of the next lesson. According Susilo (2011) Lesson Study collaboratively consists of four stages which are learning the curriculum; designing learning; implement and observe a Lesson; reflection for subsequent learning planning.

The benefits of Lesson Study are improving the quality of learning, the source of science in observing, and collecting data documentation. The results of observation and documentation of the data can be used as a source of learning for other subjects. The Lesson Study is able to change learning to be more effective and efficient, increase sensitivity as an observer too. According to Supahar (2010) that the Lesson Study makes teachers able to document their progress, they can get feedback from other members, and they can publish and disseminate the end result of the Lesson Study.

Based on the benefits of the Lesson Study above, the researchers implement Lesson Study to solve the problems arising from the learning activities in the basic chemistry laboratory subjects. The low concentration, the low readiness of students in carrying out practicum, as well as practical science process skills have not been observed by the researchers. Student learning outcomes have not been maximized to make the role of the importance of Lesson

Study implemented to perfect learning. Basic chemistry practice is the basis of other practicum activities in the chemical education subjects. In conclusion, the Lesson Study implementation on the science process skills for the basic chemistry practicum subject able to give positive contribution in learning.

Based on the description above, the existence of Lesson Study is able to solve the existing problems in the basic chemistry laboratory lectures to find out about 1. Why the students' science process skills in the lectures of the Basic Chemistry Practicum, 2. How to implement the Basic Chemistry Practicum lesson through Lesson Study, 3. How is the technique or methods appropriate for the basic chemistry laboratory. The Lesson Study has been done on the basic chemistry practicum subject that has objective such as; 1. To know the Student's Science Process skill; 2. To know the implementation of Lesson Study on the basic chemistry practicum subject; 3. To know the appropriate method or model for the basic chemistry practicum subject.

2. Research Methodology

The subject of this research is the students of Chemistry Education Program University of Muhammadiyah Semarang. The place of research is the laboratory of chemistry education program of University of Muhammadiyah Semarang. The research approach used in this research is qualitative descriptive research. The researchers play a role model lecturer for open Class in Lesson Study. The lecturer model designs lesson by making RPP, Chapter Design and Lesson Design syllabus with Lesson Study team. The Lesson Study team is all the lecturers of Faculty of Mathematics and Sciences University of Muhammadiyah Semarang. The Lesson Study stages are Planning; Implementation (Do); Reflection (See). First, the Planning Stage consists of Lecturer Model and Lesson Study Team makes planning of learning such as; RPP, Syllabus, Lesson Design Design, before entering the classroom, then doing briefing. The purpose of this briefing activity is to equate the perception of the lesson that is delivered for the open lesson. Secondly, the Implementation Phase meant that the model lecturer delivered the material according to the stages in the Lesson Design and observed

by some observers. Thirdly, the Reflection Stages meant that the stages of reviewing the learning outcomes that have been implemented, discussion of problems that arise and provide solutions in accordance with the problems that make input for the next learning process. Fourthly, the stages of Improvement is the action of some inputs that have been given then improves the results of the first cycle to proceed to the second cycle. The Lesson Study cycle can be seen in Figure 1 below.

Figure1. *Lesson Study Cycle Modification* (Dudly, 2011)

The instrument used in this research is the observation sheet. The data collection techniques are through the results of the observation instrument sheet, the documentation, the recording of learning outcomes, and the questions

integrated with the skills of the science process. The science process skills assessment can be measured through science process skill instruments (Cakir, 2010). IML-Based Student Sheet (Inquiry-Problem Based Learning) Asidi-Alkalimetri experimental material is prepared to facilitate students in the practicum practice. According to Karsli (2011), the use of student worksheets can provide motivation and increase students 'activity during the lecturing. The research data obtained from the qualitative data which uses the field note of lecturer model about the basic chemistry laboratory and the field note from the observer based on the learning process observation. Besides, the constraint field notes faced by lecturer model and observer become qualitative data. Next, the quantitative data is the result of the student's achievement of the science process skills score.

3. Result and Discussion

The objective of this research is to know the implementation of Lesson Study on the chemistry practicum; to know the Student Science Process Skill through Lesson Study; to know the method or model appropriate for the basic chemistry practicum subject. Lesson Study activity on the basic chemistry practicum is done through three stages such as; Plan, Do, and See. Each stage has its own goal. Before entering into the stages of Lesson Study, the lecturer model analyzed the characteristics of the students and also the problems that had been happening in the learning of basic chemistry practicum.

3.1 The Problems and the Constraints on the Basic Chemistry Practicum

The low motivation of students made the readiness of students in the implementation of the laboratory is also low. This was reflected in the student's lack of discipline in entering the laboratory room. There were still students who did not bring laboratory coats which they forgot to bring it. There were unfinished practicum journal containing title, purpose, basic theory, and hypothesis.

Besides, the low students'motivation, the other problems that arose were the low sensitivity of students to the problems that existed in the environment. This happened because the students had not been accustomed to work on some

questions (tests) which were based on the problem based learning. There were the low-skill science processes in planning or designing experiments, observing, predicting, interpreting observations, applying concepts, using tools & materials, and communicating. Based on the results of student interviews practicum activities were very time-consuming because we were preoccupied with journals and reports, but the concept of understanding received was not maximized. The students were already exhausted by the steps of practicum activities by writing. Furthermore, if aspects of the science process were ruled out because lecturers only judged in terms of science products. It was also experienced by Dahniar (2006) that teachers provided a science products portion more than the process of science so that students ignored the process of science. In this case, "the student did not need to practice because later on the exam was the ability to calculate the amount of the heat".

The results analysis of the basic chemistry questionnaire integrated the skills of the science process in 2015 on the Asidi-Alkalimetri material. The observation result of science process skill on the observing indicator showed that some students were able to use the senses to observe TAT or end point of titration. The other part was still excessive in the use of titrant in the titration process. The color of erlenmayer should be pink instead of purple. The use of PP indicator as the indicator of acid-base titration. The activity of "observing" was reflected from the student's activity of observing miniskus. This experiment was a quantitative experiment, the role of tool validation, and highly observation is emphasized. The most still used the measuring glass as a tool to measure the solution of vinegar and KOH acid.

The second indicator was "interpreting observations". The students were able to record the observations well. This could be seen when students presented the data in tabular form. The titration process was carried out three times repetition. The students had been able to find the resulting volume patterns generated in forming the end point of the titration.

The third indicator was "applying the concept". The students were still confused about the concept used. Students were confused in distinguishing the

concept of alkali and acidimetry. One group had an error in the experimental alkalimetry. Student determined oxalic acid as a titrant and NaOH base as a titrat on NaOH standardization. The use of NaOH was as a standard for determining the level of vinegar acid. The concept errors occured when determining the level of vinegar acid, students did not know the formula that should be used.

The fourth indicator was "using tools and materials", used beaker glass to make and dilute KOH. Whereas, there were the available flasks for using in the process of dilution and manufacture of solution. The fifth indicator was "designing experiments. The students were able to design experiments by looking at the materials available in the laboratory by considering the similarity of the properties of the material. The students had not been able to determine the independent variable and the dependent variable. The students were able to determine the data to be observed. Appamaraka (2009) stated that observing, calculating, interpreting data, and interpreting observations could increase significantly with continuous practicum activities. All the science process skill indicators discussions above can be seen in table 1 below.

Tabel 1. Table Skills of Science Process
The Modification from (Phardan, 2000; Mei, 2007;Dahniar, 2006)

Science Process Skills	Sub Science Process Skills
Observing	✓ Using senses ✓ Collecting relevant fact ✓ Looking for the similarities and the differences
Interpreting the Observation	✓ Writing the activities individually ✓ Relating Observation result ✓ Finding the pattern in one model ✓ Making conclusion
Applying Concept	✓ Using information, conclusion, amd theory concept in the new environment
Using Tolls and Materials	✓ Using Tools and Materials well
Planning the Activities	✓ Using tools , materials, and sources ✓ Determining variable ✓ Determining what being observed ✓ Determining the steps and the ways of working ✓ Determining steps and how to analyze the observation results

Based on the table 1, some students have been able to apply the skills of the science process well. There was still a mistake in the use of tools and concepts in the application of asidi-alkalimetry materials because of the low of basic laboratory techniques. The improvements were implemented by using Lesson Study.

3.2 **The Implementation of Lesson Study in One Cycle**

The model lecturers prepared the learning achievement objectives that were expected in the learning process. The learning outcomes were discussed with a team of chemistry lecturers. The suggestions and inputs were obtained in the stages of this discussion. This step planned lecturer model to prepare Lesson. Design. The Lesson Design results can be seen in Figure 2.

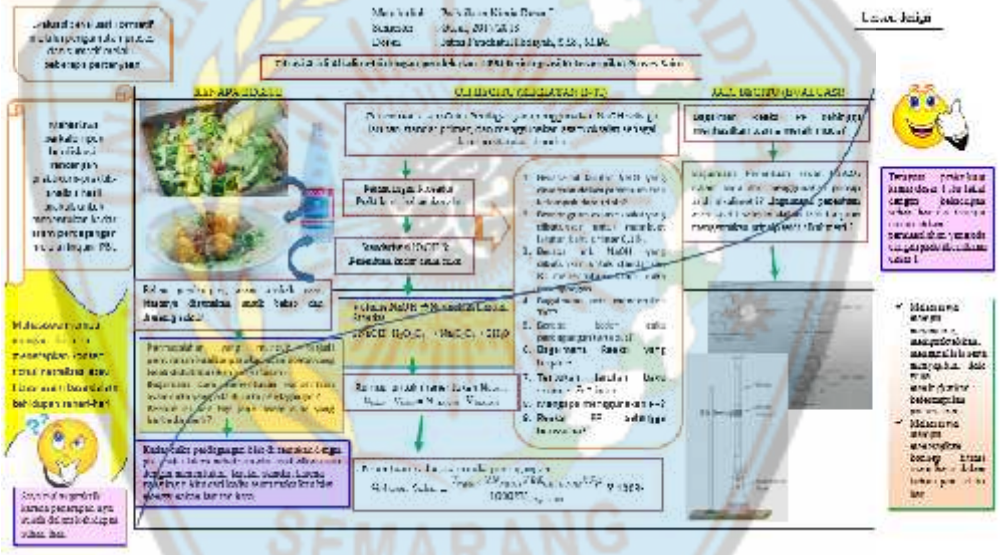

Figure 2. Lesson Design of the first phase of Basic Chemistry Practicum Subject

Based on the results of the constraints and problems of practice in 2015, the model lecturers applied learning through I-PBL or Inquiry-Problem Based Learning. In this study, science-based learning process of science skill emphasized the individual students' activities in constructing chemical knowledge but provided opportunities for students to interact socially through scaffolding to help students who had difficulty in learning. In the student discussion activities there could be scaffolding, interaction between students occurred in one group and

between groups. Students who understood the material well could help students who had not understood the material well.

Monson (2011) stated that "the concept behind inquiry-based construction education is the best practice of constructivist learning. The selection of Inquiry's learning model is able to reconstruct the students so that the independence and exploration of learning can be done by the students. It is also confirmed by Akinbolbola (2010) that the use of inquiry model can improve data manipulation (17.20%), calculate (14.20%), record (13.60%), observe (12.00%) and communicating (11.40%). The providing problems could make students more curious and able to solve the problem through the help of various learning resources. In Figure 3 was a picture of the problem given to the practicum activity.

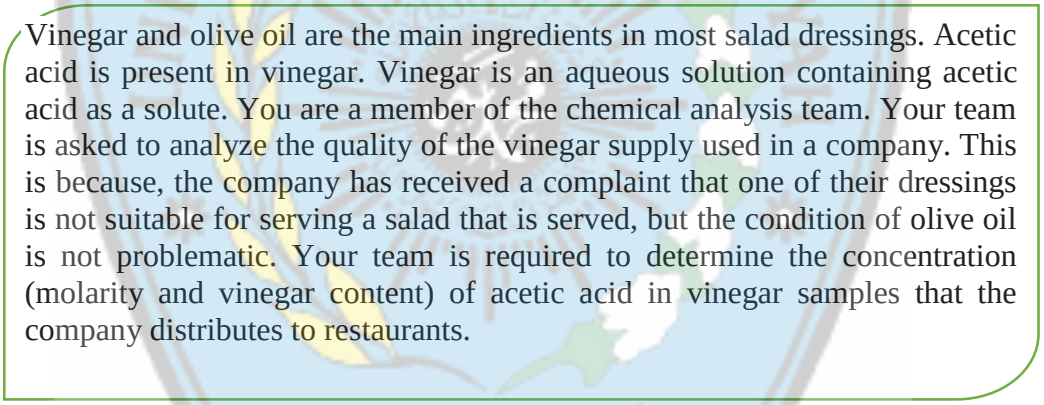
Vinegar and olive oil are the main ingredients in most salad dressings. Acetic acid is present in vinegar. Vinegar is an aqueous solution containing acetic acid as a solute. You are a member of the chemical analysis team. Your team is asked to analyze the quality of the vinegar supply used in a company. This is because, the company has received a complaint that one of their dressings is not suitable for serving a salad that is served, but the condition of olive oil is not problematic. Your team is required to determine the concentration (molarity and vinegar content) of acetic acid in vinegar samples that the company distributes to restaurants.

Figure 3. The Problem about vinegar acids

Based on figure 3, students helped the restaurant to determine the level of vinegar acids trade. Vinegar comes from three types of vinegar companies namely "virtual" vinegar, "Value Plus" and "Dixi". The concept of alkalimetry is used in the determination of the levels of commercial vinegar. In addition to alkalimetry, the principle of preparation of the solution, the dilution principle, the stoichiometric principle also supports this practicum. Practically, there are some prerequisite subjects that must be taken for the basic chemistry practicum courses, basic laboratory techniques and basic chemistry.

The implementation stages of Lesson Study began with briefing. The model lecturer inforeds about the stages and methods in the lecture. The Model lecturers and observer team equated the perceptions related to practice material in the form of determination of vinegar acids trade. The Students solved the problem of "How to determine the level of trade vinegar acids" in Figure 3. The flow of this practice activity can be seen in figure 4. There were five stages in I-PBL-based practice to improve students' science process skills. The Apperception carried out through the picture "meatballs and salads". The Students mentioned completeness of spice from the food. Furthermore, the lecturer gave the problem in Figure 3 for discussion.

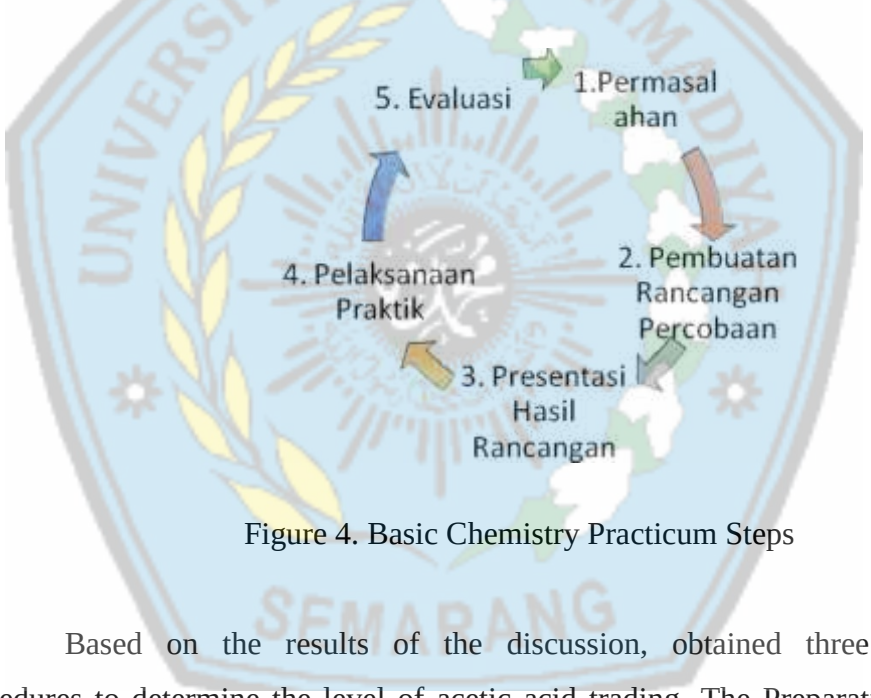

Figure 4. Basic Chemistry Practicum Steps

Based on the results of the discussion, obtained three working procedures to determine the level of acetic acid trading. The Preparation of the experimental plan was expected to enable students to design high school level practice. Based on the draft, students carried out the practice in accordance with the practice procedure of each group design.

The results of each group's design had different uniqueness. Figure 5 shows the results of experimental designs beginning with the KOH standardization process, and determination.

Figure 5. The Results of Experimental Design Determination of Acid Trading

The analysis of the use of tools and materials was complete but there were still some tools that had not been thought of to be used were stative, glass funnel, tray, spray bottle, clamp, scales or balance, round bottom flask or pumpkin *takar*, some used measuring glass. It was able to determine the material needed in the determination of vinegar acid levels. The initial plan for the use of base as a secondary standard solution was NaOH. But students replaced it with KOH solution. Students were able to analyze the similarity of the properties of both materials. Based on the description, students had been able to determine the material as a secondary solution. Students were not transfixed by exploration results from other sources of reading.

This group had been able to determine the variables to be observed that is the volume of KOH used for acid base titration. In addition, it was able to determine the point of titrasi (TAT) well. It was happened because of some mistakes that did not pay attention to miniskus when the titration process, so the result of titration was not maximal. Generally, all groups had been able to write down the work steps correctly but the work that made was still lack of detail. The need for improvement in accuracy and coherency of the ability to write the working procedure through the picture needs to be trained again so that there were no misunderstanding in the use of tools. The drawing was considered trivial, but it required precision to be able to visualize laboratory equipment.

The ability to communicate the experimental results is not maximized. It was seen there was still one group not yet confident with the results of the experiment. The activity of throwing paper notes from one member to another made the indicator of self-confidence. According to Wening (2011) group work can give students the opportunity to cooperate in their group comfortably without feeling ashamed to communicate and the students are free to issue their ideas without fear in criticism. But ,it is not well understood by students.

The system of practice flow in learning needed improvement namely the existence of prior approval before practicum. Furthermore, the students more easily applied in the concept of calculation. So, it would form a learning system that was directed and more optimal. The experimental path began with the design-presentation-approval-evaluation-design-issue feed.

4. Conclusion

The ability of students' science process skills is good on the indicators capable of planning experiments, able to communicate experiments, and able to observe closely. Whereas, the concept comprehension is still low and the ability to use the tool is also low. Moreover, the system used in the learning needs improvement which also needs approval first before practicing the practicum. Furthermore, the students more easily apply in the concept of calculation. Based on the results of Lesson Study reflection required well preparation so that the learning results are better and maximal.

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