

The Analysis of the Implementation and Problems of Lab Work on Chemistry Learning

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Abstract—The research is about the implementation and problem of lab work the student and teacher on chemistry learning. This study aims to analyze the implementation and problem of lab work on chemistry learning. This study employed purposive sampling as the sampling technique. The samples were 58 students and five chemistry teachers from two public senior high schools in Bangkinang city. The study design was exploratory research. It used descriptive data which were analyzed descriptively by using Miles and Huberman Model. The data were collected through questionnaire, interview, and observation. The findings of the study show that the teachers as the samples of the study gave positive responses or criteria good toward the implementation, the motivation, as well as the evaluation of report writing of lab work. Moreover, the students as the samples of the study also gave positive responses or criteria good enough toward the implementation, the motivation, as well as the evaluation of report writing of lab work. The findings from the interview and observation show that there were some problems in doing the lab work, such as the ineffective time, unavailable laboratory assistant, inadequate laboratory tools, and limited lab work manual. Furthermore, based on the research findings, it can be concluded that the lab work implementation on chemistry learning in two public senior high schools in Bangkinang city have been accomplished well in good criteria although there were still some lab work problems.

Keywords—chemistry; lab work implementation; lab work problems.

I. INTRODUCTION

Chemistry is known as the center of science since it is compulsory to learn other sciences, such as Physics, Biology, Geography, Geology, Health, and medical. Chemistry learning is not only about cognitive aspect, but also about affective and psychomotor aspect [1]. Chemistry learning

assert the students to actively engage in scientific process based on the facts so that they can achieve deeper understanding about the environment. One of the characteristics of chemistry learning is lab work which can be done in or outside the laboratory. A US chemistry education institute suggest that 30% of the learning should be done in laboratory activities [2].

Lab work activity is considered as experimental science which can develop research basic competence to be a medium to achieve science learning orientation. This orientation is not only focus on product but also on process [3]. The learning process in a laboratory can affect students' learning achievement compared to the conventional or other learning methods in classroom [4] [5]. It is because the knowledge that is obtained through research can improve students' motivation so the learning will be more meaningful [6].

Students' lab work can improve their factual and procedural knowledge [7]. A good or ideal lab work has some criteria. It should run smoothly and according to the lesson plan; require good facility, tools, and infrastructure, supported by lab manual and teachers' competence to assist students to have creative, critical, and analytical thinking skill to solve the problems. However, based on the researcher's observation in some schools in Bangkinang city, it was found that the implementation of lab work is not ideal yet and still found some problems.

The lab work in some schools in Karo region is still rarely done because there is no clearly lab work schedule [8]. Then the research finding in junior high school in Sojol sub district shows that there were low percentage of the lab work due to unavailability of laboratory tools and facility [9]. This fact suggests that there are some problems in implementing lab work in schools. They are limited chemistry lab work manual to assist students in doing their lab work, Inadequate guidance

for the teachers to assess the students psychomotor and affective skills, limited materials and tools for lab work since they are too expensive [10].

Based on the description, the implementation of an ideal chemical lab work with the fact in the schools has not run smoothly yet. The researcher considers that it is important to study more about this problem. Therefore, the researcher conducted a study about the analysis of the implementation and the problem of lab work on chemistry learning in public high schools.

II. METHODS

The study was conducted in June to August 2017 in 2 public senior high school in Bangkinang city, Riau. The population in the study were all students who studied chemistry as well as all the chemistry teachers in those two schools. The research samples were 58 of 11th graders and 5 chemistry teachers in both schools which were selected through purposive sampling technique. The study design was exploratory research design that is used for the initial step to explain and define a problem. The study consists of two steps; pre-research and the on research.

The study used qualitative data which were obtained through questionnaire, interview, and observation. The data are in form of primary and secondary data. Primary data were obtained from observation at schools. Secondary data were obtained from lab work observation as well as the analysis results of lab work manual. The data were collected by using questionnaire, interview, and lab work observation. The data analysis technique consist of the data from questionnaire of teachers' and students' responses were analyzed descriptively by using Huberman and Miels models with steps of data reduction, data presentation and CONCLUSION, the data from interview, and the data from observation result. Calculating the average percentage for each aspect, according to the formula (1) :

$$\text{average percentage} = \frac{\text{obtained scores}}{\text{amount of respondent}} \times 100\% \quad (1)$$

III. RESULT AND DISCUSSION

The data described in this study involve the analysis data of teachers' and students' responses toward the lab work implementation, the interview data to the teachers, and the observation result of students' lab work.

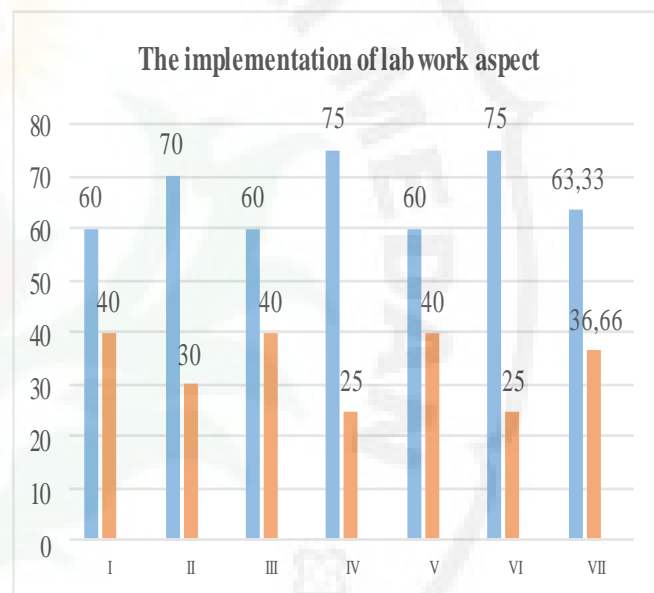
Research Findings

A. Questionnaire of the teachers' responses toward the implementation of lab work

The closed ended questionnaire was used in this study. There are three aspects of it. They are the implementation of lab work aspect, the teachers' motivation toward the implementation of lab work, and the evaluation of lab work result report. The result of the implementation of lab work can be seen in Fig 1. This aspect consists of seven

components: the time, the learning materials, the lab work manual, the teachers' roles, the availability of tools and materials, the compatibility between tools and materials, and the lab work assessment. The average scores of this aspect was considered as **good** criteria with the percentage as 66.19%.

The result of the teachers' motivation toward the implementation of lab work (the second aspect) can be seen in Fig 2. The average scores of this aspect was considered as **good** criteria with the percentage as 68.33%. Furthermore, for the last aspect, the result of the evaluation of lab work result report (the third aspect) can be seen in Fig 3. The average scores of this aspect was considered as **good** criteria with the



percentage as 71.66%.

Fig 1. Chart the teachers' responses toward the implementation of lab work

Information :

- I : Time
- II : Learning material
- III : Lab work manual
- IV : Teachers' roles
- V : Availability of tools and materials
- VI : Compatibility between tools and materials
- VII : Lab work assessment

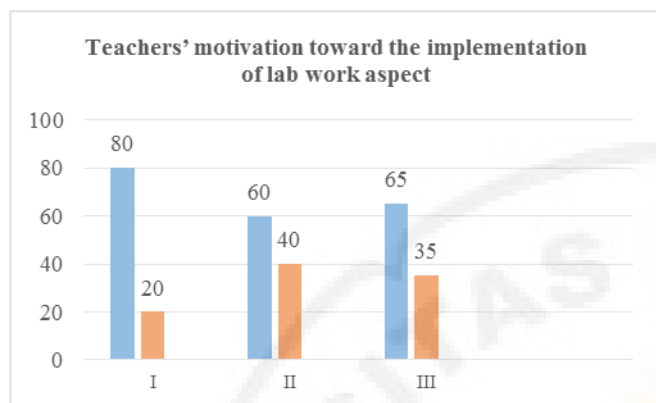


Fig 2. Chart the teachers' responses toward the teachers' motivation aspect

Information :
I : Teachers' own desire
II : Students' desire
III : Environment's desire

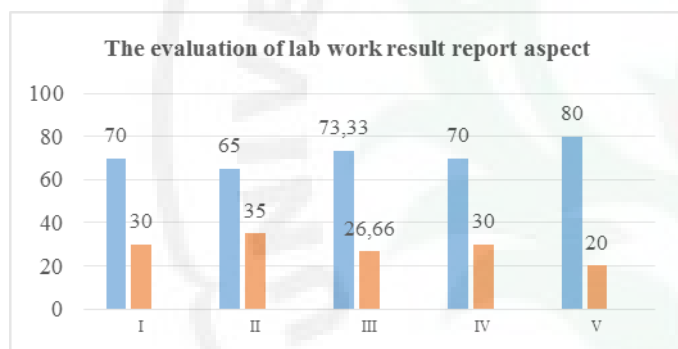


Fig 3. Chart the teachers' responses toward the evaluation of lab work result Report

Information :
I : Report submitted time
II : Content of students' report
III : Science teachers' roles
IV : Report writing
V : Teachers' understanding in assessment

B. Questionnaire of the students' responses toward the implementation of lab work

The questionnaire used in this study has three aspects. They are the implementation of lab work aspect, the students' motivation toward the implementation of lab work, and the writing of lab work report result.

The result of the first aspect, the implementation of lab work, can be seen in Fig 4. The average scores of this aspect was considered as **good enough** criteria with the percentage as 56.66%. Then, the result of the students' motivation toward the implementation of lab work (the second aspect) can be seen in Fig 5. The average scores of this aspect was considered as **good enough** criteria with the percentage as 53.23%. Furthermore, for the last aspect, the writing of lab work report result (the third aspect) can be seen in Fig 6. The average scores of this aspect was considered as **good enough** criteria with the percentage as 57.75%.

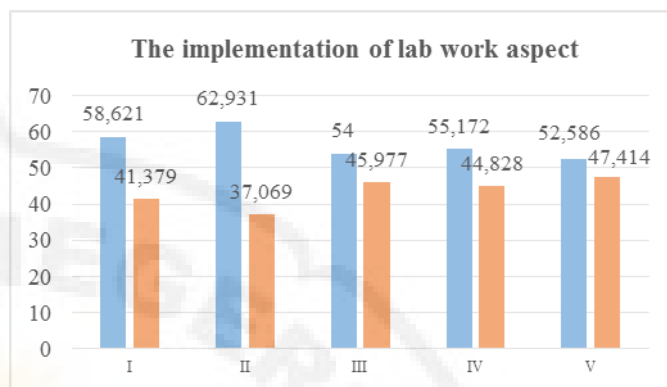


Fig 4. Chart the students' responses toward the implementation of lab work aspect

Information :
I : Time
II : Teachers' roles
III : Availability of tools and materials
IV : Compatibility between tools and materials
V : Lab work assessment

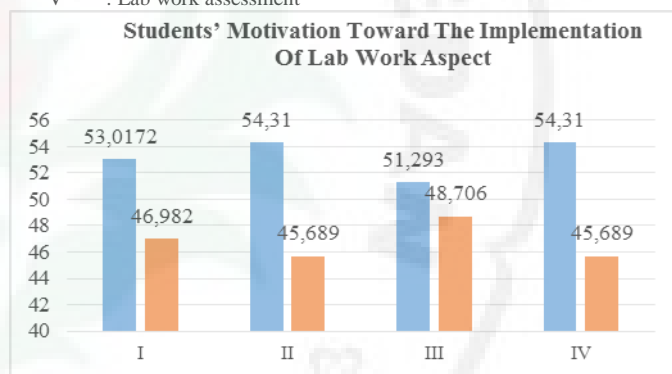


Fig 5. Chart the students' responses toward the students' motivation aspect

Information :
I : Teachers' own desire
II : Students' desire
III : Environment's desire
IV : Students' readiness

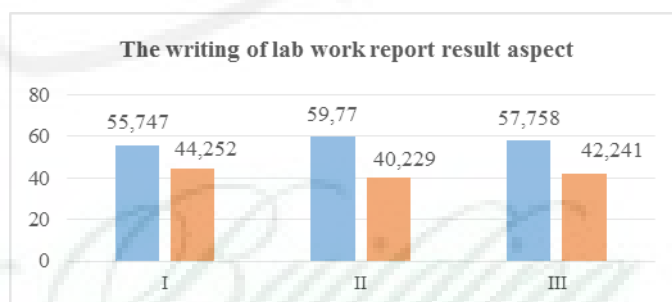


Fig 6. Chart the students' responses toward the writing of lab work report result

Information :
I : Report Writing
II : Report assessment
III : The obstacle in writing the report

C. Analysis of interview

The interview was done to the chemistry teachers as the facilitator to guide students in doing the lab work. The followings are some of the interview result with one of the chemistry teacher in a public senior high school in Bangkinang:

Is chemistry subject accompanied by lab work activities?

"Yes, the chemistry subject is accompanied by lab work activities in which the lab work materials are in line with theoretical ones"

Is there any specified lab work manual for chemistry subject?

"The school provides the lab work manual for chemistry subject from a specified publisher"

How is the time management for the lab work?

"The lab work is conducted for about two hours of study for one research activity"

D. Analysis of Observation

The research findings from the observation in both public high school in Bangkinang show that every laboratory has certain facility such as tables, chairs, washbasins in every table, cabinets to store chemical materials, electricity supply, fans, and trash bins. However, the laboratory for chemistry, biology and physics are merged into one. Moreover, the findings also show that both schools do not meet the standards yet in terms of the building and the furniture [11].

The laboratory facility in both schools do not meet the standard as a good one because there is no fume cabinets, preparation room, fire extinguishers, safety tools, emergency alarm, refrigerator, first aid kit, and sewerage. Because of the limited facility, the lab work activity cannot run well.

Based on the result of questionnaire of teachers' responses toward the implementation of lab work aspect from the 5 chemistry teachers as the research samples, it was found that this aspect was considered as **good** criteria. However, the teachers were still found difficulties in facilitating the students to do the lab work. This problem was also related to the time allocation setting for the lab work for all the chemistry subject materials, the inadequate laboratory condition, and the incompatibility between the lab work manual and the 2013 curriculum. Furthermore, Another problem is that the teachers have limited ability to develop lab work manual based on the students' needs. The manual has already integrated to the characters or the innovation. Then, in doing the lab work, the teachers do not give initial response to the students, so the teachers have no clue whether the students already understand the concepts or the principals of the materials to be used in lab work activity or not.

Based on the findings from the questionnaire of students' responses toward the implementation of lab work from the 58 samples, it was found that the average scores obtained from the implementation of lab work aspect, the students' motivation toward the implementation of lab work, and the writing of lab work report result was considered as **good enough** criteria. In the implementation of lab work aspect,

students found some difficulties in terms of limited laboratory tools and materials. Afterward, the place was also an obstacle in doing the lab work. The students did the lab work in a chemistry laboratory in which it is also used in biology and physics subjects. In terms of motivation, the students have limited curiosity. They did the lab work only for doing the assignment from the teachers, not from their own desire. It can be seen from the fact that they were not ready in doing lab work.

The findings from the interview with the chemistry teachers show that there were some problems in doing lab work. One of them is that the teachers could not prepare the lab work manual by themselves. They used the manuals from the publishers although they know that those manuals were not relevant with the competence achievement indicators and the content of 2013 curriculum. Furthermore, the limitation tools and materials was also an obstacle in doing the lab work. This limitation is because the tools and the materials were hard to find and the price was high.

The limitation of laboratory facility causes the lab work did not run well, even sometimes it cannot be conducted at all. Some of the solution for this problem is that the teachers can use the materials form the nature or use the virtual laboratory system. Virtual laboratory is a learning environment in which the students convert the practical knowledge into the research. Virtual experiments more effective than doing real experiments in the laboratory [12] [13] [14] [15].

IV. CONCLUSION

The CONCLUSION of the study is that the implementation of the lab work in public high schools in Bangkinang, Riau was considered in **good** criteria. However, there were still some problems about it. The problems involve the limitation of laboratory facility, the incomplete tools and materials, the irrelevant lab work manual to the students' needs, inadequate teachers' readiness in facilitating the students which cause that the students have less curiosity to do the activity.

The solution and the suggestion to decrease the obstacles or the problems about doing the chemistry lab work in school is by using virtual laboratory system to solve the limitation of laboratory facility. Then, the teachers also can use chemistry lab work kit is a smaller scale. By using that kit, the teachers should not do the lab work in the laboratory which also will save the time consuming. Furthermore, another solution is that the teachers and the laboratory assistant need to be able to master the basic laboratory techniques by joining in certain training about laboratory techniques.

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