University student’s self-reflection ability on thermal insulation concept

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Abstract. We have already probed students’ self-reflection ability on thermal insulation concept. Self-reflection is needed to investigated because it influences the development of students’ conceptual understanding. The thermal insulation problem has been given to 20 preservice physics students who have been enrolled in the Introductory Physics I. Qualitative way has chosen to analyze the test. The data analysis has mainly fixated on students’ self-reflection on thermal insulation problem. Stand on data analysis, it can be decided that students’ self-reflection ability on thermal insulation concept is still poor category.

1. Introduction

It is vital for everyone in particular university students to realize that limiting the waste of energy resources such as internal heating is important. Thermal insulation is a great answer to decrease energy consumption by preventing heat increase or loss through the building cover. Schiavoni et al. [1] stated that one of the greatest methods to decrease the energy ingestion is thermal insulation. The essential part in reduce the energy consumption is played by insulation things meanwhile the choosing of the right matter [2], its fatness [3] and its situation, tolerate getting good inside thermal luxury situations and passable energy hoards [1]. Lee [4] has founded that students can comprehend the concepts better when analogy and routine life impressions are used whereas initially students could not describe the concept of thermal insulation and heat transfer. White and Gunstone [5] stated that opportunities for students to analysis their understandings for instance self-reflection would stimulate metacognitive thinking. Students should improve self-reflection skills for their personal sake because these skills has been correlated to enhancements in conceptual understanding. Students with great conceptual gains have been shown more reflection on learning than students with lesser conceptual gains [6]. Reflection has always been a very important part of learning for university students [7]. Reflection has been extensively suggested as a qualified practice and process that ropes students to study through experience. Actual reflection for learning through experience requires a great level of self-examination and open-minded self-analysis, a capability for abstract learning, and self-regulation and agency that a small number of students in higher education naturally have [8].

The importance of reflection in backup the sustained qualified learning of pre-service practitioners has been known well. Sutherland, Howard, and Markauskaite [9] stated that making the shift from student to teacher, pre-service teachers form their own professional identity. Their ability to articulate this identity is examined through interpret and reinterpret of pre-service teachers experiences over the processes of reflection. Self-reflection on both how and what learners have learned does lead to
enhancements in academic performance and influence the ability to think [5, 6, 10]. Gün [11] stated that while teachers are persistently encouraged to "reflect" on their teaching, they are unable to do so successfully except they are precisely trained in how to reflect. Teachers can increase their ability to recognize their strong point and faintness and take action towards improving themselves as better teachers when they obtain response for example through colleague and learner observations.

Self-reflection ability have mainly been linked to students learning processes. To the best of our knowledge, there is no available self-reflection test related to certain concept for example learning processes of thermal insulation concept. The aim of this research is to investigate pre-service physics students’ self-reflection ability on thermal insulation concept.

2. Methods
Participants who were involved in this research were 20 undergraduate students (4 male and 16 female, whose aged were around 20 years old). They were originated from different towns and enrolled in introductory physics I courses. The research was accompanied in the first semester of the academic year 2017/2018 at the Program of Physics Education in Universitas Tadulako. A class of 20 undergraduate students were taught thermal insulation concept using problem based learning [12]. The aim of this qualitative research was to investigate student’s ability to review their own learning processes on thermal insulation concept.

The participants are identified using list of questions of self-reflection on thermal insulation concept. The test has precisely analyzed in qualitative way. An analysis of collected data has mainly focused on students’ self-reflection on thermal insulation problem. Student answers are grouped into three categories: partial done (PD) category, not done (ND) category, and well done (WD) category. Thermal insulation concept was chosen because important to realize that a great answer to decrease energy consumption by preventing heat increase or loss through the building cover. List of questions of self-reflection is shown in Figure 1.

| List of questions of self-reflection |
|-------------------------------------|
| 1. What did not you do related to learning activities? |
| 2. What more do you want to know related to thermal insulation problems? |
| 3. Do you satisfy with your concept attaining in this learning? Why? |
| 4. What are the new knowledge that you have learned? |
| 5. What do you have learned from problem solving processes in this meeting? |

Figure 1. List of questions of self-reflection.

3. Result and Discussion
In terms of investigating students’ self-reflection ability on heat conductivity concept, we present at Figure 2.

| Percentage of Students Responses |
|---------------------------------|
| ND | PD | WD |
| 0  | 20 | 40 |
| 60 | 80 |

Figure 2. Pre-service physics students’ responses.
Based on the data in Figure 2, overall 30% of students (n = 6, 5 female and 1 male) have mainly been categorized as partial done (PD) category. In contrast, the self-reflection ability for 14 students (70%, 11 female and 3 male) has been categorized as not done (ND) category and no students in well done (WD) category. The high percentages in ND category showed that 70% students unable to reflect their own learning on thermal insulation in accordance with the study result stated that the concept of heat energy and insulation are poorly understood [4]. The result has already categorized that S5, S6, S7, S9, S12, and S18 in PD category. On the other hand, the result has been showed that S1, S2, S3, S4, S8, S10, S11, S13, S14, S15, S16, S17, S19, and S20 in ND category. The result has been revealed that all of students in PD category had similar answers. All students stated that they had not yet do experiment during learning heat conductivity concept. List of self-reflection questions were deliberately structured to investigate students to reflect on how evaluate their own learning, as illustrated by the excerpt below.

Q1 : what did not you do relate to learning activities?
S5 : I think that this concept needs experiment in its learning process.
Q2 : what more do you want to know related to thermal insulation problems?
S5 : I have no idea.
Q3 : do you satisfy with your concept attaining in this learning? Why?
S5 : I have no idea.
Q4 : what is the new knowledge that you have learned?
S5 : I got new understanding about heat conductivity influence to conductivity heat flow in particular thermal insulation concept.
Q5 : what do you have learned from problem solving processes in this meeting?
S5 : I have learned about heat conductivity concept and its application in how to decide the materials to build insulation wall of house.

Despite of incompleteness of her answers, S5 has reflected her own learning. For instance, when she stated that she decides needs experiment and thermal insulation as a new knowledge attaining. S5 was not the only student to reflect that heat conductivity concept needs experiment, new understanding gained is thermal conductivity but also students S6, S7, S9, S12, and S18. Students in PD category did not know what more they want to know related to thermal insulation problems and evaluate whether satisfy or no with the concept attaining during learning processes when answering question 2 and 3. It became evident that students did not have their own learning goals so that they could not explain other things to be learned and satisfaction during the learning process.

Question 4 asked students about what the new understanding that they have learned are. Six students reviewed that in particular they got new understanding about thermal insulation concept. Analysis of worksheet showed that students were able to select insulation material to build comfort building using thermal insulation concept. This finding is consistent with the result that insulation matters play an significant part in reduce the energy consumption meanwhile the choosing of the right matter [2], its fatness [3] and its situation, tolerate getting good inside thermal luxury situations and passable energy hoards [1].

Self-reflection question 5 asked what students have learned after class do. Students S6, S7, S12, and S18 correctly answered which has been learned from the problem-solving process is the selection of materials to build house with thermal comfort concept. Diversely, S9 reflected that designing a high ceiling associated with the concept of convection.

Q5 : what do you have learned from problem solving processes in this meeting?
S9 : I have learned about designing a high ceiling associated with the convection concept.

Recently, there are many researches investigate about materials to construct building with thermal comfort concept. Oushabi et al. [13] showed that date palm wood of the Boufeggous varieties is suitable for further expansion and design of natural efficient and safe thermal insulating materials for people's daily life. This finding is consistent with the result that woven fabric sub waste (WFS), as thermal insulation building material [14].
Based on data in transcript, it became evident that six students in PD category possessed self-reflection ability. Students in the PD category have a high concept understanding. It supports the results of research that students who have high conceptual gains have been shown more reflection on learning than students with lesser conceptual gains [6]. Students’ views about how they approach physics courses is affected by the nature of knowledge and learning. For instance, a student who trusts physics knowledge to contain mainly of disconnected realities and principles will study contrarily from a student who views physics as an interrelated web of concepts [15].

Reflection has always been a very important part of learning for university students [7]. The importance of reflection in backup the sustained qualified learning of pre-service practitioners has been known well. Sutherland, Howard, and Markauskaite [9] stated that making the shift from student to teacher, pre-service teachers form their own professional identity. Self-reflection on both how and what learners have learned does lead to enhancements in academic performance and influence the ability to think [5-6].

4. Conclusion

Six of twenty students have reflected their own learning on thermal insulation whereby they answered substantially three out of five lists of reflection questions. Students in PD category lacked both decide their own learning goals and satisfaction during the learning process. Five of six students in PD category have similar reviewing about they realized that it is important deciding right materials to construct comfort building using thermal insulation concept. One student has different view about what does she have learned from problem solving processes. Fourteen unsuccessful students lacked the self-reflection ability necessary success in review their own learning. Student exploration results providing information for use in concept exchange to rebuild their theoretical outline in an intelligible way.

Based on the data analysis, it can be concluded that students’ self-reflection ability on thermal insulation is still in poor category. Constructivist approach that related to the application in daily life and opportunity for dialogue should be utilized to promote students’ self-reflection ability.

5. References

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