The Impact of Situation-Based Learning to Students’ Quantitative Literacy

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Abstract. Nowadays, the usage of quantities can be seen almost everywhere. There has been an increase of quantitative thinking, such as quantitative reasoning and quantitative literacy, within the context of daily life. However, many people today are still not fully equipped with the knowledge of quantitative thinking. There are still a lot of individuals not having enough quantitative skills to perform well within today's society. Based on this issue, the research aims to improve students’ quantitative literacy in junior high school. The qualitative analysis of written student work and video observations during the experiment reveal that the impact of situation-based learning affects students’ quantitative literacy.

1. Introduction
Quantitative literacy has been recognized as an important skill to cope with the numerical data that are in the activities of everyday life and the need of it has never been greater [1]. The issues range from education, workplace, government policies and more [2]. However, the skill in the education of the 21st century is not enough to face the more complicated and difficult situations [3]. Many adults and students still remain innumerate and possessing very few quantitative skills needed ([1]; [3]).

Teachers need to help students understand the usage of mathematics easier by relating mathematics to real-life context ([3]; [4]). Most students thought mathematics as a formal subject that constricts their thinking in symbols rather than expanding it [5]. Therefore, mathematics needed to make sense to students by presenting them as a context that is functional and relevant [3]. Quantitative literacy is similar, in that it needed to be related to real-life context. One way to do this is by implementing a learning model that is based on this idea.

The importance of implementing a correct model, strategy, and approach is hoped to be able to develop quantitative literacy in a student. Learning alternatives that can be used by teachers in teaching mathematics to students so that they will be more involved in learning, one of them is by using Situation Based Learning (SBL) model. In its implementation, SBL is consisted of 4 steps of learning process, among others: (1) creating mathematical situations; (2) posing mathematical problem; (3) solving mathematical problem; (4) applying mathematics ([6]; [7]).

The previous research related with SBL is Situated Creation and Problem-Based Instruction (SCPBI). This learning model has significant effects on student’s interest in learning math. One of them is the classroom instruction environment aimed at promoting student’s consciousness on mathematics ability. Teachers allow their students to propose their own questions and construct
problems through creating situations and teaching guidance [6]. Moreover, situation-based learning can improve students’ mathematical creative problem solving ability by applying mathematical problem solving techniques [7].

Based on the arguments presented above, the author is interested in researching about quantitative literacy, concerning that the study was to determine whether the students’ quantitative literacy proves to be higher when using SBL than the students using conventional learning. The problem proposed in this research is: *What is the impact of situation-based learning to students’ quantitative literacy?*

2. Research Method
The case study reported in this paper was a part of a larger experimental study. The population in this research was students of class VIII Public Junior High School, West Java and purposive sampling as technique in taking samples. The subjects of the research are 79 students which consist of 39 experimented group students and 40 controlled group students. The instrument used in collecting the data was essay test relates to the quantitative literacy. The data reported in this research included video observation and its corresponding students’ work. To address the problem proposed in this research, an integrative qualitative analysis on these data was carried out.

3. Results and Discussion
One of the problems that had been given to the students is the one about the relationship between quantities within the concept of volumes of 3D shapes. Students are given a problem to determine the amount of boxes that can be fit inside the mini truck container. The problem given is as follows.

*A mini truck container with the size of $3 \text{ m} \times 2 \text{ m} \times 1.8 \text{ m}$ will be filled with small boxes of instant noodles with each sizes of $35 \text{ cm} \times 20 \text{ cm} \times 24 \text{ cm}$. Find the amount of instant noodles boxes that can be filled inside the mini truck container!*

![Figure 1](image1.png)

**Figure 1. Illustrations based on the problem**

Based on the observation results from the answers provided by the students, some of the students gave the correct answer, while others still did mistakes when doing calculations. The following is an answer from a student that already has quantitative reasoning and is able to implement quantitative literacy to solve the given problem.
Figure 2. The examples of students’ response

Based on Figure 2(a) and 2(b), the students already have the capability to analyze the relationship between quantities efficiently, so that a correct calculation is being given. The answer shows that the student already has quantitative reasoning and is able to implement it to solve the problem. By assuming that there is a relationship between the length of the box and the length of the mini truck container, the width of the box and the width of the mini truck container, and also the height of the box and the height of the mini truck container, the student is able to assume how many boxes can be fitted inside the mini truck container.

The assumption for this research is the ability to develop assumptions and using them for evaluation, prediction, and data analysis [8]. Based on the results from the test, the sort of mistakes that students often did were creating prediction and models assumptions that had already been analyzed. Even though in the beginning of SBL, students were given a situation and asked to develop questions based on given situation (posing mathematical problem). According to Steen [9], by learning on how to ask the proper questions and asking to be clarified with explanations, students will develop autonomous reasoning by themselves, where quantitative learning was needed to develop the ability to create and evaluate assumptions.
Based on Figure 3, the student is still wrong in deciding the concept that should be used to solve the problem. The basic thing that the student don’t have is the understanding of relationship between concepts. The student uses the concept of volume for the mini truck container and the surface area for the box. Even though there is no relationship between surface area and volume to decide how many boxes that can be fitted inside the mini truck container. So, the quantitative reasoning and quantitative literacy has not yet shown within the student.

Based on Figure 4, the student already knows about the concept of volumes, however there is still a mistake done by the student. Based on interview, according to the student to find out how many boxes that can be fit inside the mini truck container is to divide the volume of the mini truck container with the volume of the box. The mistake done by the student is usually because the student doesn’t have the understanding of the relationships between the quantities. As a result, the student did not do an analysis of the problem and the student immediately wrote down the answer that he/she think is right. The student did not consider the problem of quantity within the problem, so that the students assumed that there is no relationship between the length, width, and height of the boxes towards the mini truck container. Figure 4 is a common mistake done by students.

Analysis is the ability to create decisions and to draw conclusions that is correct based on quantitative data analysis [8]. On the other hand, the achievement for analysis from students using SBL reached 75%. This is further supported by SBL, by which one of them was solving mathematical problem. Through this step, students would solve their own problems and create decisions based on their findings to obtain the currently studied mathematical concept. This also demanded students to
recognize the role of mathematics in their lives and create assessments while also making decisions that are currently needed [10]. Through this step in SBL, students can develop their analysis skill towards different and even more complex situations they might face in their everyday life.

4. Conclusion
Based on the results and analysis that have been described previously, it was concluded that the students using SBL is effect to students’ quantitative literacy. The basic mistake that students did is understanding the concept and relationship between the quantities. This finding suggests for the future research, teachers are hoped to be able develop students’ assumption skills through proper treatment.

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