The Concept of Measurement in Pre-Service Teachers

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Abstract
This paper presents the results of phase 1 of the research project "pre-service mathematics teachers' mathematical conception in the context of lesson study and problem solving approach". The objective of this research was to explore mathematical concepts of pre-service mathematics teachers for fourth grader prior teaching in schools. The participants to the research included 121 fourth year students, in second semester of academic year 2014, Faculty of Education, Suratthani Rajabhat University. Mathematics conceptual questionnaires used as research instrument comprised 3 problems of 12 problems about measurement. Percentage and content analysis were used for data analysis.
The results showed that:
1) Problem 1: 90.08% of the students explained that if the tank measure 2 m by 2 m by 2 m, then the volume of this tank is 8 times of a tank is 1 m long, 1 m wide 1 high, and 7.44% of them explained that the volume of this tank is 2 times of tank is 1 m long, 1 m wide 1 high. and 2.48% of them are not responds.
2) Problem 2: 81.82% of the students explained that if we measure two lines and there are the same length, then two straight lines are equal length, and 18.18% of them explained that the length of line is not the end. we cannot measure the length.
3) Problem 3: 71.07% of the students explained that the time is 1 hour 15 minutes can be written as 1.25 hours, and 28.93% of them explained that 1 hour 15 minutes can be written as 1.15 hours.

Keywords: pre-service teachers, measurement

Introduction

Teachers' mathematical knowledge is important for teaching. (Hill, Shilling, &Ball, 2004; Rowland, Huckstep, & Thwaites, 2005; Davis & Simmt, 2006 cited in Tchoshanov, 2010) Concept is defined to explain human's knowledge. Despite mathematical concepts referring to knowledge in core substance, there were many research had been conducted about knowledge of In-service teacher or Pre-service teacher in several contents. Concept for measurement consists of measuring length, distance, area, volume and capacity, weight, value of money, time, and unit of measurement in other systems. The estimation about measuring of ratio, trigonometry, and the knowledge application in assumed circumstances (Makanong, 2014) obviously suggest the relevance between concepts and individual's daily life.

Researcher has been interesting in mathematical capability of mathematics student teachers in terms of content, that is mathematical concept. The research would be analyzed mathematical concept regarding measurement of students, which is one of key factors for instructional preparation.

Objectives of study

This research was aimed to study mathematical concepts about measurement of 4^{th}-year student teachers majoring in mathematics.

Method

Participants of this research were 121 persons from 4^{th}-year student teachers majoring in mathematics of semester 2014. They willingly participated in this study. The tool for data collection was questionnaire evaluating mathematical concept with contents in primary and secondary school levels. The questions was open-ended, consisting of 10 questions which three of them were about measurement concept. Data analysis was done by procedure of content analysis. Statistics used for analysis were mean and percentage and finally processed for conclusion by analytical description.

Results

Results of mathematical concepts from 4^{th}year student teachers majoring in mathematics given by open-ended questionnaire with 3 questions of measurement were detailed as follows:

Table 1. This shows the analysis of Question 1 asking: "Please answer whether this statement is correct? A water well with its width, length, and depth 2 m. of each side would be double in volume from a water well with 1 m. in its width, length, and depth of each side".

Number	Percentage	Reason
3	2.48	No answer
2	1.65	Incorrect because the 1^{st} well contains 4 cm^3. Whereas the 2^{nd} well contains less 0.5 cm^3 than the 1^{st} one.
3	2.48	Correct
6	4.96	Correct because the 1^{st} has width, length, and depth 2 m. each

Number	Percentage	Reason
		which considered double of the 2nd well.
3	2.48	Incorrect with no reason.
11	9.09	Incorrect because it should be 4 times.
93	76.86	Incorrect because: Volume 2 m. of each side = 2 x 2 x 2 = 8 Volume 1 m. of each side = 1 x 1 x 1 = 1 Therefore, the 1st has volume 8 times of the 2nd.

From Table 1, it represents analytical results of Question 1 about volume measurement. 90.08% of student teachers explained their reasons that the well with 2m. of each width, length, and depth must be the volume 8 times from the well with 1 m. each side. Students 7.44% responded that the well with 2m. of each side must be the volume 2 times from the well with 1 m., while there were 2.48% student given no answer.

Table 2. This shows the analysis of Question 2 asking: "Please answer whether this statement is true? The straight line measured found the same length that must be equal straight line"

Number	Percentage	Reason
64	52.89	True but no reason indicated
35	28.93	True because the straight line measured found the same length is considered the equal lines.
11	9.09	False because they have just the same length but different size.
2	1.65	False but no reason indicated
9	7.44	False because the straight line is endless. Therefore, the length can't be measured.

From Table 2, it represents analytical results of Question 2 about the length measurement of straight line. Students 81.82% suggested that the straight lines sharing the same length are equal lines. However, there were 18.18% indicated the endless length of line is not able to measure the length.

Conclusions

From three open-ended questions, these indicated mathematical concepts about measurement of 4thyear student teachers majoring in mathematics that most of them illustrated concepts in the correct way. This concluded from explanations of students 90.08% given for the question volume measurement, 81.82% for the question straight line measurement, and 71.01% for the time measurement which represented the correct perceptions of mathematical concepts.

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