Analysis of Fraction Conceptual Understanding Towards Thematic-Realistic Learning Based on Students' Character of Curiosity

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Article Info

Abstract

Background of this study is the low level of curiosity and conceptual understanding of fourth grade students of State Elementary Schools in Kendal Regency on mathematics subjects. The objectives of this study are to know the effect of the character of curiosity towards of conceptual understanding obtained by students to know the ability of students to understand fraction concepts after experiencing thematic-realistic learning. The method used was mixed method with sequential explanatory model. The sample in the research were all IV grade. While, the techniques of data analysis were t-test and z score test. The results of this study indicate that there is a significant effect of the character of curiosity towards ability of mathematical conceptual understanding obtained by students, the implementation of thematic-realistic learning is able to significantly improve students' ability of mathematical conceptual understanding than the class that use conventional learning.

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INTRODUCTION

Basic Education (Elementary School) is a form of education that focuses on laying the foundation towards physical and spiritual growth and development intelligence (power of thought, creativity, emotional intelligence, spiritual intelligence), socioemotional (attitude and behavior as well as religion) language and communication, therefore, education must lead to an improvement in the value of personality, education must be able to develop life skills of students.

The phenomenon that occurs is the learning approach used is still conventional which only emphasizes the procedure and the use of the formula. Furthermore, fraction understanding in fourth grade students, State Elementary School 1 Cacaban, has not achieved at the level of real examples and in solving fractions, they could not convert the result in mathematics formula. This makes students less accustomed to solve their own problems in everyday life that are often around them so that students cannot develop their activities and abilities optimally. As a result, students find it is difficult to understand the material conveyed by the teacher.

Based on these conditions, it is agreed that an alternative solution must change the common learning approach into an approach that can improve the students' understanding. The approach should courage students to do not feel bored but providing interactive, effective, efficient, and enjoyable learning conditions. To attract students involvement in learning, the teacher must use innovative learning.

A research that is conducted by Pitaloka and Mulyono (2013) on the effectiveness of Indonesian realistic mathematics learning PMRI models towards the ability to understand mathematical concepts shows that students who are taught with PMRI models, their learning results achieve mastery learning.

The research that is conducted by Wardono and Mariani (2014) result shows that the learning devices of innovative realistic learning with character education and PISA assessment which has been developed could be categorized as valid, practical, and effective to improve the junior high school students' mathematics problem solving literacy. The result also suggests that the learning quality can be categorized as good and the students' character improves better. Wardono et.al (2015) research results concluded that learning innovation model PMRI (Pendidikan Matematika Realistik Indonesia or Indonesian Realistic Mathematics Education in English) with character education and PISA assessment effective to develop students' ability in mathematics literacy compared with expository class.

Learning with concept of understanding is often the subject of study is very broad and deep in educational research. Dahar, states that learning concept is the result of education. The ability to understand the concept of a foundation for thinking and resolve problems. Concepts that will give a theorem or formula. Concepts or theorems that can be applied to other situations, the need for skills in using concepts or these theorems. The concept is the foundation for higher-level thinking processes or can mean that students understand the concept properly will be able to generalize and transfer knowledge than students who simply memorize definitions.

The students' ability of mathematical conceptual understanding that is taught by using PMRI models is better than students who are taught with an expository model, and students who are taught by using the PMRI model are more active than students who are taught with the expository model.

In this research, in order to improve fractional understanding ability, realistic thematic learning is used. A realistic approach is an approach to learning mathematics that applies mathematics to everyday life. In this case, the problem that occurs is the lack of understanding of students in the mathematics of fraction material. In mathematics learning, especially fraction, the material will be linked in the students' real world. So that it will facilitate students in understanding the material, because students have experienced it in their daily lives.

The purpose of this study is to know the effect of the conceptual understanding ability based on the curiosity character, to know the conceptual understanding ability of experimental class.

METHODS

The type of research used was a mixed method research method with a combination of explanatory sequential mixed-methods design (Creswell, 2009). In this research, data were confirmed with quantitave data. This research was conducted at State Elementary School 1 Cacaban located at Cacaban Sub-Village, Singorojo District, Kendal Regency , from April 2016 to May 2016, with the consideration that students' academic abilities were heterogeneous so it was interesting to be examined.

This research on BSNP (2006) was carried out in the second semester in the academic year of 2015/2016. The population in the study was the fourth grade students of State Elementary School I Cacaban. While the sample chosen was one class (the class that used thematic-realistic learning), they are the IVa class as the thematic class and the IVb class as the class which were using conventional learning, they were used as the population and 5 students were used as a sample to measure the curiosity character and the students' conceptual understanding ability in depth.

The variables used in this study were the students' understanding ability as dependent variables and curiosity character as independent variables. The data analysis including normality, homogenity, validity, and reliability of measuring instruments. To investigate the learning improvement between the class which was using thematic-realistic learning with the class which using conventional learning, the mastery test, comparative test, N - gain score test were conducted.

RESULTS AND DISCUSSION

Mastery Test

Based on the calculation results, it is obtained the value of $t_{count} = 7.39$. The significant level of 5% and df = (n -1) = 20, it is obtained the value of $t_{table} = 1.72$, then $t_{count} > t_{table}$, which is meaning that H_0 is rejected. This also means that the students' average of conceptual understanding ability in the experiment class exceeds the Minimum Mastery Criteria.

Based on the calculation results, it is obtained the value of $z_{count} = 2.64$ while the value of $z_{table} = 1.72$ then it is obtained $z_{count} > z_{table}$. This means that H_0 is rejected, that the proportion of students' learning mastery is classically reaches 75%. This, it can be concluded that thematic learning meets the minimum criteria of mastery learning at least 70 to 75%, so that effective learning instrument can help students to complete the Minimum Mastery Criteria. Based on the calculation, the classical mastery is 95.23.

This shows significantly the success of the thematic-realistic learning instrument. This success is due to the learning by using developed learning instrument according to the characteristics of thematic-realistic learning models, where the teacher manages learning by managing and integrating subjects in one theme and discussing problems in groups to find solutions. Another thing that makes this mastery is the developed instruments that are arranged systematically and gradually.

Both in terms of material and the delivery of examples of questions and exercises given from the simple stage to the complex stage, the embedded of a clear concept is instilled so that students' ability of mathematical conceptual understanding can be well developed. The learning method for its implementation helps students who have difficulty in comprehending the material by themselves become easy to do discussions so that students' understanding is not abstract.

The research that is conducted by Bachman (2015) result shows of procedural math instruction were asociated with higher calculation and conceptual math skills. Children's conceptual math skills were also positively associated with high amounts of science instruction.

Comparative Test

Average difference test

The average test scores of the students' ability of mathematical conceptual understanding in the experiment class and the class that is not treated are 77.52 and 55.77. From these results, it can be concluded that the average test scores of experiment class students are better than the average test scores of the class that is not treated. The value of t_{table} for df = 21 + 22 -2 = 41 with a significant level of 5% is 1.98. The conclusion if $t_{count} > t_{table}$, then H_o is rejected and H_1 is accepted.

Based on the calculation of t_{count} of 11.201 > t_{table} of 1.98 then H_1 is accepted, the average test score of the students' ability of mathematical conceptual understanding in the experiment class is better than the class that is not treated.

The average difference test in the class that does not get treatment and the class that receives the treatment towards the value of ability of mathematical conceptual understanding is conducted by independent sample test assisted by SPSS 21 (Sukestiyarno, 2012).

The following is a comparative test of two samples in Table 1.

Table 1. Two Sample Comparative Test

	F	Sig.	t	df	Sig (2-tailed)	Mean difference	Std. error difference	95% Confidence interval of the difference	
								Lower	Upper
Equal variances assumed	6.42	.01	11.2	41	.00	21.75	1.94	17.82	25.67
Equal variances not assumed			11.32	35	.00	21.75	1.92	17.85	25.65

Table 1 shows that the significant value is 0.000 or 0.0%, meaning that sig = 0.0% < 5%, then H_0 is rejected or H_1 is accepted, it is the average ability of fraction conceptual understanding ability of students who use thematic-realistic learning is different compared to students in the class that uses conventional learning.

Different proportion test results

The number z from the standard normal list with $\propto$ = 0.05 is 1.96. The criteria used are H_0 is accepted if -1.96 < z <1.96; whereas, in other cases, H_0 is rejected. The value of z_{count} = 6.28 is outside the reception area H_0, so, H_0 is rejected and H_1 is accepted, it can be interpreted that the class that uses thematic-realistic learning is better than the class that uses conventional learning.

The thematic learning in the class that receives the treatment runs well. The students can build their knowledge through the problems given, find information needed independently, and discuss to solve problems so that the activeness of learning can be well-trained and supported by the curiosity character that is built through fraction learning. This is in line with the research conducted by Haqiqi (2017) which shows that the improvement of mathematical reasoning abilities that receive mathematics learning by using thematic learning is better than the improvement of mathematical reasoning abilities that obtain mathematics learning by using conventional approaches.

Effect test

To test whether or not the effect of students' curiosity characters on the students' ability of mathematical, conceptual understanding that is done with SPSS by using a simple regression test. The regression model used is the value of the students' ability of mathematical conceptual understanding that is predicted, and X is the students' curiosity character. The hypothesis is as follows.

H_0 = there is no effect of X on Y
H_1 = there is an effect of X on Y

The values are obtained from output results after the data are entered into the SPSS program; they are presented in Table 2.

Table 2. The Significance of the Effect of the Curiosity Character on the Conceptual Understanding Ability

Model	Sum of regression	df	Men square	F	Sig.

Regression	.11	1	.11	30.47	.00[b]
Residual	.07	19	.04		
Total	.18	20			

Dependent variable = Conceptual understanding ability
Predictors (constant) = Curiosity character

Table 2 shows sig. value = 0.000 < 0.05, which means that H_0 is rejected. This means that there is a significant effect on the curiosity character on the ability of mathematical, conceptual understanding that is obtained by students. Then, determine the regression equation formula is presented in Table 3.

Table 3. Linear Regression Test of Curiosity Character on Conceptual Understanding Ability

	Unstandardized coefficients		Standardized coefficient beta	t	Sig.
	B	Std. error			
Constant	-.7	.25		-3.02	.07
Curiosity character	.02	.04	.79	5.52	.00

Dependent variable = the conceptual understanding ability

Based on Table 3 the regression equation is obtained: Y = -0.769 + 0.02X, which means that each addition of curiosity character of the variable (X) of one unit, it will add the test value of the ability of mathematical, conceptual understanding (Y) of 0.02 or 2 %. The value of the effect of the students' curiosity character on the ability of mathematical conceptual understanding is presented in Table 4.

Table 4. The Value of The Effect of The Students' Curiosity Character On Conceptual Understanding

R	R square	Adjusted R square	Std. error of the estimate	Change statistics			
				R square change	F change	df1	df2	Sig. F change
.78[a]	.61	.59	.06	.61	30.47	1	19	.00

Predictors (Constant) = Curiosity character
Dependent variable = Conceptual understanding ability

The SPSS output in Table 4. shows the R square value of 0.616 or 61.6%. This means that students' curiosity influences the students' ability of mathematical conceptual understanding by 61.6% and the remaining 38.4% is due to other factors.

The characters that are embedded in the learning process have a positive effect on the students' mathematical conceptual understanding. The indicator that is applied as the implementation of the value of the curiosity character can be realized, hence, the curiosity in students is well formed as a support for the formation of the students' ability of mathematical conceptual understanding. Besides, from the character of students, external factors are able to influence the students' achievement also. For example, the students' ability in understanding the concept.

This is in accordance with the theory proposed by Burns (2011) which explains that character can be seen as a measure or means of measuring the goodness or eccentricity of an individual related to morality.

Improvement test

Based on the calculation in the treatment class, it is obtained N-gain of 0.64 and included in the medium criteria. Based on the calculation of the class that is using conventional learning, it is obtained N-gain of 0.27 and included in the low criteria.

After elaborating the improvement of the curiosity of each selected research subject in each group, the results of the recapitulation of the curiosity characters from all the meetings of the five selected students are presented in Table 5.

From the recapitulation of the value of the curiosity character in the students' learning process in Table 5. It is obtained the total average of 3.64 means that the application of thematic-realistic learning of the five selected subjects have the curiosity character, so that the researcher can compare that thematic-realistic learning instrument is suitable for the use in the research

subjects in all groups, this is supported by the evidence of the gain test scores of the five subjects of the research.

Table 5. The Recapitulation Results of Curiosity Character of 5 Selected Students

	Meeting 1	Meeting 2	Meeting 3	Meeting 4	Meeting 5	Average
Student 1	3.65	3.85	4.15	4.5	4.80	4.19
Student 2	3.15	3.35	3.65	4.00	4.30	3.69
Student 3	3.10	3.30	3.60	3.95	4.25	3.64
Student 4	2.85	3.05	3.35	3.70	4.00	3.39
Student 5	2.75	2.95	3.25	3.60	3.90	3.29
Average	3.10	3.30	3.60	3.95	4.25	
Total average			3.64			

Although, the students can be categorized as gifted but the creative level of mathematics is not necessarily high. The students in this study do not seem to develop mathematical abilities when solving the problems. Amiripour (2012) states the reason for success in the learning is the character of students who can motivate to solve problems. Akinmola (2014) states that teachers can develop problem-solving skills and understanding concepts to students through the process components, the process of acquiring and applying mathematical knowledge. Therefore, it can be concluded that learning with thematic models has improves the conceptual understanding ability.

CONCLUSION

Based on the research and discussion, it can be concluded that the students conceptual understanding ability in class, which is using thematic-realistic learning has achieved individual and classical mastery. The conceptual understanding ability by using thematic-realistic learning in terms of the curiosity character is better than the class that uses conventional learning. There is a significant positive effect between the curiosity character and the students' conceptual understanding ability in thematic-realistic learning. The curiosity character can improve the students' conceptual understanding ability, so it improves students' learning mastery. The suggestion that can be conveyed is the teacher is advised to get used to interacting with students through the level of real examples so it will improve the conceptual understanding ability and the curiosity character.

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