The Application of Holistic Mathematics Education (HME) Model based on *Among* System toward Learning Motivation

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Abstract. This study aims to develop a Holistic Mathematics Education (HME) model based on *Among* system for primary school students. However, this study focuses on exploring the impact of applying the model to the students' learning motivation and uses quasi-experimental research by applying *The Randomized Pretest-Posttest Only Control Group Design* that conducted on third grade elementary school students in Indonesia. The samples are two classes chosen randomly after they meet the requirements for analysis test. One class is taken as an experimental class and one class as a control class. The data instrument used is the students' learning motivation questionnaire. The data is analyzed quantitatively using the *Wilcoxon* test and t-test by comparing the gain score between the experimental and control class. The results of the analysis show that: 1) the students' learning motivation after the treatment is better, 2) the students' learning motivation taught by the model is better than using conventional learning models. It can be concluded that the model is useful to be applied for improving the primary school students' motivation in learning.

Keywords: *Among* system, Holistic Mathematics Education (HME), learning motivation, and primary school students

INTRODUCTION

Mathematics is often considered to be a less attractive subject for students because it still uses abstract learning method. This problem causes the lack of the students' motivation and the low of the students' achievement in learning (Fauzan, 2002; Indriani, 2013; Maryunis, 1989; Nirwana, 2003; Ruseffendi, 2009). This statements are also confirmed by the results of other studies which state that motivation is very influential on the students' learning outcomes (Indriani, 2013; Ng, Liu, & Wang, 2016; Opolot-Okurut, 2010).

Further, *The Trends in International Mathematics and Sciences Study* (TIMSS) survey proves that Indonesia has low ability on math and science literacy compared to other countries. The TIMSS results show that the 4th grade Indonesian students was ranked at the 6th lowest of 49 participating countries in 2015 (Mullis, Martin, Foy, & Arora, 2015). The TIMSS study lies in the strength of the students' mathematical reasoning and the ability to apply it in daily life. This matter shows the students' weaknesses in connecting formal mathematical concepts with the real problems in their daily life when they begin to know mathematics. The contributing factors are the students' low interest and motivation which ultimately affect the students' learning outcomes (Indriani, 2013; Ng et al., 2016) because learning is still dominated by remembering facts and concepts, computating aspects, and applying formulas (Fauzan, Plomp, & Gravemeijer, 2013), and methods, as well as a less interesting learning environment (Opolot-Okurut, 2010).

Based on these problems above, mathematics learning should be more meaningful and fun for the students in order not to be less desirable for them. Moreover, the role of teachers is very important in learning mathematics to overcome these problems. Some researches stated that the teacher performance affects the students' achievement (Bringula, De Leon, Rayala, Pascual, & Sendino, 2017; Sanberk & Bağiş, 2016) because the quality of early childhood education is determined by this factor (Bertram & Pascal, 2016; Sun, Rao, & Pearson, 2015). The teachers must be able to develop and improve learning effectively in the early years of school (Anthony & Walshaw, 2009).

Furthermore, some studies also state that the good teachers are able to motivate the students by playing interesting games, using useful teaching aids, and utilizing all potential students in learning, and carrying out lessons effectively (Shulman, 2000). In other words, the importance of the teacher's creativity is very needed so that mathematics learning becomes meaningful and enjoyable for the students at the beginning of school to increase the students' motivation because it is one of the factors that can improve the students' learning achievement.

Based on its characteristics, the lower class (3rd grade) prefers to see things holistically (see Hayati, Fauzan, Iswari, & Khaidir, 2017, 2018). Then, the high-quality of education for low-class students does not only develop potential academically, but also develops the students' non-academic potential, so that they can shape their abilities for the next stage (Bautista, Ng, Múñez, & Bull, 2016). For this reason, teaching mathematics holistically is importance to develop both types of potentials.

Emphasizing the importance of the teacher's role in learning, the Holistic Mathematics Education (HME) model based on *among* system is an effective model to improve the quality of mathematics learning in the lower class (Hayati, Fauzan, Iswari, & Khaidir, 2017b; Hayati et al., 2018). This concept helps the students to develop their full potential through experience in interacting with environment because teaching holistically helps the students who are in diversity to be successful and makes learning to be more effective (Bernold, Bingham, McDonald, & Attia, 2000; Lovat, Clement, Dally, & Toomey, 2010). Moreover, *among* system is the concept of Ki Hajar Dewantara's education in which the teacher as a tutor educates children on the basis of independence and freedom so that the students are developed according to nature (Dewantara, 1977). This system educates the students by: 1) giving independence to the students, 2) avoiding them from pressing and forcing of the learning methods, and 3) instilling the nature of independence which is very important to make their personality more enthusiast in learning (Firdiansah & Suprijono , 2013), as well as guiding them with full of love, and prioritizing the students' interest, so that they can develop according to their nature (Reksohadiprojo, 1989). By doing such learning, it will make learning to be more meaningful for the students in the purpose of increasing students' motivation (Bringula et al., 2017).

The foundation of the *among* system lies in the slogan "*Tutwuri Handayani*" which means giving freedom, opportunity, attention, and guidance that allow the students on their own initiative and experience to develop their learning according to their individual personal lines (Reksohadiprojo, 1989). This education system is also found in Finland which has the best education system in the world. Finland gives equal opportunities for the students in education and remove barriers to learning, especially for the students who are failed in learning (Määttä & Uusiautti, 2012). Beside, the teachers are also responsible for their students as well as the concept of *among* system from Ki Hadjar Dewantara (Määttä & Uusiautti, 2011).

RESEARCH METHOD

This study used a quantitative approach in the form of quasi-experimental design that applied *The Randomized Pretest-Posttest Only Control Group Design*. The population in this study was 3rd class of elementary school students. The sample were 2 classes consisting of experimental class and control class. The samples were taken randomly after going through the random sampling criteria. The data analysis for the students' learning motivation was carried out using

statistical tests, namely the *Wilcoxon* test and t-test by comparing the gain score between the experimental and the control class. The hypothesis in this study were: (1) the students' learning motivation was increased after treatment. (2) the students' learning motivation through HME model based on *among* system was increased compared to the conventional learning models.

RESULT AND DISCUSSION

This study was a part of development research about HME model based on *among* system for low-grade elementary school students (Hayati et al., 2017b, 2018). This study discussed the influence of the model application in learning toward the students' learning motivation in low grade elementary school students.

1. First Hypothesis

Before testing the statistics for the hypothesis, the requirements analysis test of the students' learning motivation questionnaires results was firstly conducted. Based on the analysis, it was obtained that the data were not normally distributed, so the non-parametric test was conducted for testing hypotheses. The test results of the requirements analysis could be seen as follows.

Normality Test

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Experiment class	.131	21	.200*	.940	21	.216
Control class	.337	21	.000	.738	21	.000

*. This is a lower bound of the true significance.
a. Lilliefors Significance Correction

Based on the normality test in the experimental and control class, it can be seen that the control class was not normally distributed because the sig value was < 0.05; in which 0 < 0.05. Thus, the hypothesis testing continued with the non-parametric test that was the *Wilcoxon* test. The output results using SPSS 20 software could be seen as follows.

Ranks

		N	Mean Rank	Sum of Ranks
POST TEST - PRE TEST	Negative Ranks	0[a]	.00	.00
	Positive Ranks	21[b]	11.00	231.00
	Ties	0[c]		
	Total	21		
a. POST TEST < PRE TEST				
b. POST TEST > PRE TEST				
c. POST TEST = PRE TEST				

Statistics Test [a]	
	POST TEST - PRE TEST
Z	-4.019[b]
Asymp. Sig. (2-tailed)	.000
a. Wilcoxon Signed Ranks Test	
b. Based on negative ranks.	

Based on the output, it could be interpreted as follows:

1) First Output "Ranks"
   a) Negative Ranks between the students' motivation in pre-test and post-test were 0 in N value, Mean Rank, and Sum Rank. This value indicated that there was no reduction value from the pre-test to the post-test.
   b) Positive Range between the students' motivation in pre-test and post-test. There were 21 positive data (N) which means that the motivation score of 21 students had increased from the pre-test to post-test. Mean Rank was equal to 11.00 while the number of positive ranking was equal to 231.00.
   c) Ties are the similarity of the pre-test and post-test values. The Ties value was 0, so that it can be said that there was no same value between the pre-test and post-test.
2) Second Output "Statistics Test "

   Based on the output of "Statistics Test ", it was resulted that Asymp.Sig. (2-tailed) 0,000 was less than 0.05. Then, the H0 was rejected. Thus, the students' learning motivation was increased after treatment, so it can be concluded that there was an influence of the model toward the students' learning motivation.

Group Statistics

	Group	N	Mean	Std. Deviation	Std. Error Mean
Gain	Experiment	21	9.14	4.586	1.001
	Control	21	3.67	.577	.126

2. Second Hypothesis

The second hypothesis was done by comparing the gain score between the experimental and control class. The results of normalized gain can be seen as follows.

$$Normlized\ Gain\ (g) = \frac{Posttest\ Score - Pretetst\ Score}{Maximum\ Score - Pretest\ Score}$$

$$Normlized\ Gain\ (g) = \frac{3547 - 3278}{3780 - 3278}$$

$$Normlized\ Gain\ (g) = 0{,}54$$

Furthermore, the normalized gain (g) 0.534 can be categorized as the medium criteria. Thus, the testing hypotheses can be continued by independent t-test. The output results using SPSS 20 can be seen as follows.

Independent Samples Test

Levene's Test for Equality of Variances		t-test for Equality of Means						
F	Sig.	T	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
							Lower	Upper
27.075	.000	5.430	40	.000	5.476	1.009	3.438	7.515
		5.430	20.634	.000	5.476	1.009	3.376	7.576

Based on the hypothesis test results, sig value was = 0.000 < 0.05. Thus, the H0 was rejected. In conclusion, it can be concluded that student learning motivation through the HME model based on *among* system has significant changes compared to conventional models.

CONCLUSION

From the analysis above, it can be concluded that the students' learning motivation through Holistic Mathematics Education (HME) model based on *Among* system is better than conventional model. It is assumed that this model gives the opportunity for the students to discuss, express opinions, present their work both individually and groups, and solve mathematical problems in accordance with their wishes as long as it is in accordance with the concept. Thus, all potential of the students can be developed. In general, the effective learning environment is also one of the factors that influences the students' learning motivation because it has a very positive positive influence on learning (Bringula et al., 2017; Lave, 1988; JP Miller, 2010; Nye , Konstantopoulos, & Hedges, 2004; Resnick, 1987; Rockoff, 2004). In addition, through this model the teacher as the tutor guides and directs the students according to their own nature, so that the students feel to be respected in learning.

In this model, the students are also given freedom and independence to solve problems given in mathematics because the model uses the concept of Ki Hadjar Dewantara's education, namely *ing ngarso sung tulodo, ing madyo mangun karso, tut wuri handayani*. *Ing ngarso sung tulodo* means the teacher is a model for the students. That is, the teacher is an example for his students by giving examples of good habits that will shape the character of students. *Ing madyo mangun karso* means that the teacher builds creativity. Furthermore, *tut wuri handayani* means that the teacher provides support to motivate the students. In order for learning to run in accordance with the desired goals, the teacher must be able to provide motivational support to the students because without motivation the students will be lazy to learn and do not even understand the purpose and meaning of learning. The teacher is an important element in learning because the results of the study also mention that the teacher's performance also influences student learning achievement (Sanberk & Bağiş, 2016).

Moreover, the stages and supporting components of the model increasingly make learning to be more interesting and meaningful for the students. These matters give positive impacts on the students' learning motivation because the teacher does not only develop all the students'

potentials, but also plays an active role in guiding and directing the students in accordance with the concept *among* system. To conclude, this model makes learning to be more meaningful for the students because the concept of the model educates the students by giving independence to learn, avoid them to learn in pressing and coercive manner, and instill the nature of independence which is very important to make the students more courageous in learning (Firdiansah & Suprijono, 2013).

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