



The Implementation of Blended Learning Based Realistic Mathematics Education in Mathematics Teaching

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This study aims to understand the result of the implementation of a blended learning based realistic mathematics education (RME). The method used in this research is experiment research that compares the study results of the students using a blended learning based RME with a conventional model. The blended learning based RME affects the cognitive study results of the students in the elementary school mathematic study, evident from the result of the significance test calculation of the Mann Whitney test with a score of Asymp. Sig. is 0.000. The implementation of a blended learning based RME is proven to be more effective in increasing the study results than a conventional model. The N-gain percentage of the experiment class at 60.95 per cent was included in the 'quite effective' category, while control class at only 25.67 per cent was included in the 'not effective' category.

Keywords: Mathematics Study Result, RME, Blended Learning



INTRODUCTION

The era of globalisation is marked by quickly developed technology, including in the education field. Development occurs in almost every aspect of education. The use of technology may increase the will of children to study because of its more interesting display and ability to make the task less boring. In this case, the will to study is affecting the result of studying, similar to what Rusmini (2018) said, that the correlation index number of the will to study with the study achievement is 0.681. Rusmini's research result is also fully supported by other research which states that there is a significant correlation between a student's will to study in terms of joy, attention and will collectively toward the students' study achievement, noting a positive correlation between the students' will to study in terms of joy, attention, and will collectively with a study achievement in a mathematics lesson (Laksono, Ariyanti, & Santoso, 2016). Globalisation also results in humans having to prepare with a variety of skills in order to survive in the future. With the rapid development of science and technology, gaining employment in the future is uncertain, therefore various competencies need to be prepared, including creativity, critical thinking skills, collaborating, and communicating (Mahanani, 2018; Wijaya, Sudjimat, Nyoto, & Malang, 2016). Based on this, it can be suggested that globalisation is very influential in the world of education, in order to prepare students to live in the future.

Appropriate learning in the current era includes the application of innovative models to ensure a positive impact on students. With fun learning, it will help students to accept lessons while also having a high motivation for lifelong learning (Suprihatin, 2015; Trinova, 2012). As mandated by (INDONESIA, 2006), it states that education has the aim to maximise the various potentials of students so that they have a strong faith and good character. The existence of good education also allows the formation of good character for the community (Subianto, 2013; Cahyaningrum, Cholimah, & Christianti, 2014).

Some learning models that are recommended for use in learning activities include inquiry, discovery, project-based learning and problem-based learning. As many other researchers have highlighted, the various learning models are effective in maximising student learning. One of the results of the study states that inquiry and project-based learning can improve student learning outcomes (Mahanani & Muchtar, 2019). The use of discovery models is also effective in increasing understanding and critical thinking skills in the field of mathematics studies (Worthern, 1968; Yuliani & Saragih, 2015). Based on the results above, it can be identified that improving the quality of learning, including mathematics, can be achieved through the application of learning models. However, highlighted from the development of science and technology at this time, learning innovations must also be made, especially in the media or companion learning models, so that later learning which is packaged by teachers becomes more attractive to children.



The role of technology is also to reduce the use of paper, time and energy. UNNES answered the technology challenge by applying a blended learning method in the lecturing process. The study process is not fixed by the classroom, but also can be undertaken outside the class without being attached to time and space. Blended learning is a way in the teaching process to combine the conventional education system with the digitalised system (Graham, 2006).

The learning process needs a two-way interaction. Feedback is required to obtain a better result. Blended learning can use the materials online as self-study materials (Singh, 2003; Osguthorpe & Graham, 2003). A college program that uses blended learning will enable the schedule to be more flexible, so the students can adjust their academic and non-academic activities.

One of the approaches to learn mathematics is RME. RME has many advantages which include that students can construct their own knowledge, the learning process uses reality events, the students feel valued and are more open because their study behaviour is valued, builds teamwork, trains student confidence, students become familiar with thinking and giving opinions, and it teaches the students about character.

The learning process in the mathematics learning subject in PGSD has not used the blended learning model. Therefore, the researcher will try to apply the blended learning model combined with an RME approach in mathematics teaching. It is known that blended learning greatly helps students and lecturers in building learning communication more effectively (Garrison & Kanuka, 2004). With blended learning, students and lecturers have a special space to discuss and complete a variety of assignments and exercises online and can discuss them during face-to-face meetings.

The research questions in this research are: firstly, is there any difference in the student study results in the elementary school mathematics teaching between the one that uses blended learning based RME with a conventional model? Secondly, is the usage of a blended learning based RME in elementary school mathematics teaching effective to increase the student study results in mathematics?

This research aims to understand the result of the implementation of a blended learning based RME in the teaching of a mathematics lesson in the PGSD FIP UNNES.

METHOD

This research was completed in the PGSD FIP UNNES during mathematics teaching lessons. The design of this research was a control group pretest-posttest design. The population that was



used in this research was the students of 2018. There were ten groups that were taken by a random cluster sampling technique as the control class and experiment class. The experiment class consisted of 30 students and is referred to as Group A. The control class also consisted of 30 students and is referred to as Group B. The free variable in this research is the blended learning based RME teaching model. The bound variable is the cognitive study result in the mathematics lesson of the students of PGSD FIP UNNES in 2018. The teaching in the experiment group used a blended learning based RME model, while the control group used a preaching method. The data collection method was a multiple-choice test. The result of the research shows that the mathematics study result that used the blended learning based RME was significantly different from the conventional model.

The blended learning teaching that has been completed in this research consists of four instructional phases which are: presenting information in the first phase; guiding the learner in the second phase using face to face learning; practicing in the third phase; and assessing learning that used web based learning in the fourth phase (Trollip & Alessi, 1988).

The gathering data method was completed by using a test method. The instruments that have been used are RPS and pre-test and post-test. The cognitive study result data was analysed using parametric statistics which were counted by using the Mann-Whitney, and N-gain tests.

RESULT AND DISCUSSION

The cognitive study result data that was gathered by the pre-test and post-test score was analysed using parametric statistics. The maximum test score in the teaching of mathematics is 100, which would be given to the student if they answered all the questions correctly. While the minimum test score is 0, which would be given to the student if they do not give any correct answers. The general view about the difference of the pre-test and post-test scores between the group that used the blended learning based RME model (experiment class) and the group that used the conventional model (control class) in the elementary school mathematics teaching can be found in the table below.

Table 1. The Students' Descriptive Data of Pre-test and Post-test in Mathematics Teaching

Category	Experiment Class			Control Class		
	Pre-test Score	Post-test Score	Increase	Pre-test Score	Post-test Score	Increase
Minimum	25	50	25	20	30	10
Maximum	70	95	25	70	90	20
Mean	45.46667	80.83333	35.36667	46.83333	61.16667	14.33333

The table shows that the pre-test mean score of the experiment class was almost the same with the mean score of the control class, which are 45, 47, and 46.83 respectively. Meanwhile, the post-test mean score of the experiment class is better than the mean score of the control class, which are 80.83 and 61.67 respectively, which means there is a good increase in the study result of the students in the experiment class (KALI, 2016). The teaching process in the class that used the blended learning based RME is actually enabling the students to be more active and productive, and with more interest in the contextual problems of a blended course variation, resulting in a stronger community feeling between the students rather than traditional or completely online teaching (Rovai & Jordan, 2004). It is also aligned with the result of a research study conducted by Wardono and Mariani (2019), that a realistic teaching model with character education and PISA assessment may increase the quality of teaching into a good category and may increase the students' character and effectively increase the ability to solve mathematics problems. Thus, it cannot be denied that RME is very effective in improving children's skills or abilities in mathematics.

The analysis about the difference of the students' study results in the elementary school mathematics teaching that used a blended learning based RME model and a conventional model, was completed by testing the post-test mean score difference of the experiment and the control class using the Mann-Whitney test. This test was undertaken because the data of the experiment class is not normal. The result of the analysis of the Mann-Whitney test is 0.000 Asymp. Sig. (2-tailed), showing that the mathematics learning result that used a blended learning based RME model is significantly different compared to the conventional model. It also can be identified that the implementation of a blended learning based RME teaching model affects the increase of the student results in the elementary school mathematics lesson. The implementation of a blended learning based RME model is capable of increasing the study motivation and increasing the teaching quality as blended learning in Unnes is done by combining a conventional method and an online method parallelly, while the quality is controlled by the Quality Guarantee Agency, which is better than traditional or completely online teaching (Rovai & Jordan, 2004). Consequently, it can be concluded that the mean score of the students after the teaching activity



using a blended learning based RME model was better than the mean score of the students before the blended learning based RME model teaching. The blended learning based RME model involved the students' activity (mathematics as a human activity) and related it to reality (Fauzan, Slettenhaar, & Plomp, 2002; Andersson, Johansson, Lidestav, & Lindeberg, 2018; Procter, 2003). Students' activity in teaching that is related to reality may increase their interest in learning, which will in turn highly affect the result. It is aligned with the result of a research study that was conducted in a Junior High School in Aceh (Arsaythamby & Zubainur, 2014), showing that the mathematics teaching activity which uses a realistic approach achieved a higher score than the conventional approach.

The study result increasement test for the group that used the blended learning based RME model in the elementary school mathematics lesson, based on the Normalised Gain (g) calculation, shows that there are 12 students that achieved a high gain score, 15 students with a middle score, and three students with a low score (Dianawati, Wardono, & Kartono, 2018). Meanwhile, the Normalised Gain (g) calculation for the group that used a conventional model shows that there were two students that achieved a high gain score, 11 students with a middle score, and 17 students with a low score. The data shows that the students' study results in the mathematics lesson for the group that used a blended learning based RME model achieved a significantly high increase compared to the group that used a conventional model. Blended learning or hybrid courses are teaching models that combine online and face-to-face components (Rennie & Mason, 2010) that may provide a variation in teaching, such as in method, media, source, environment or web (Kintu, Zhu, & Kagambe, 2017; Rohmawati & Sukanti, 2012), so the students will be more interested in following the lesson. It can be a deciding factor to the significantly high increasement in the experiment class' study results.

CONCLUSION

The implementation of mathematics learning using a blended learning based RME model is significantly different when compared to a conventional model. It is proven by the Asymp. Sig. (2-tailed) scores which were 0.000 in the Mann-Whitney test. The implementation of a blended learning based RME learning model increased the mathematics study results more effectively rather than the conventional model, which was proven by the N-gain category score of as big as 60.95 per cent for the experiment class, and 25.67 per cent for the control class. Therefore, the students' study results in the mathematics lesson for the group that used a blended learning based RME model achieved a significantly high increasement compared to the group that used a conventional model.



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International Journal of Innovation, Creativity and Change. www.ijicc.net
Volume 5, Issue 5, Special Edition: ICET Malang City, 2019

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