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Mathematical Literacy Based On Student's Self-Regulated Learning by Flipped Classroom with Whatsapp Module

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Abstrak

Mathematical literacy and self regulated learning are important for students to recognize the role of mathematics in life and effectively manage student's abilities in learning. This study aims to (1) determine the effectiveness of flipped classroom with whatsapp module on student mathematical literacy, (2) describe mathematical literacy based on self regulated learning by flipped classroom with whatsapp module. This research is mixed method type Pre-Experimental Design type One-Group Pretest-Posttest Design. The research subjects were class VII students of Al Azhar Islamic Junior high school 23 Semarang. Based on the results of the study it was obtained that flipped classroom learning with whatsapp module was effective against mathematical literacy. Students with high self regulated learning experience stabilization in mastering the seven aspects of the mathematical literacy process very well. Students with medium self regulated learning, increased in communication, representation, using symbolic, formal and technical language and operation and using mathematic, and can be mastered very well, while other aspects are well mastered. Students with low self regulated learning, increased in mastering three aspects well, namely communication, representation, using symbolic, formal and technical language and operation and using mathematic tools. On the mathematising and devising aspects of strategies for solving problems can be mastered with sufficient categories. While the reasoning and argument aspects of students are still lacking in mastering it.

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INTRODUCTION

Mathematics is a universal science that underlies the development of modern technology, has an important role in various disciplines, and develops human thinking (Mulyono & Lestari, 2016). This is consistent with the statement of Zevenbergen et al., (2004), and Suherman et al., (2003) that mathematics is able to provide opportunities to be utilized in the study and development of other sciences, especially basic science and technology. Students need mathematics because students need to understand practical to solve problems in everyday life (Waluya, 2012). Therefore, mathematics subjects need to be given to all students starting from elementary school to equip students with the ability to think logically, analytically, systematically, critically, creatively and collaboratively.

Mathematical literacy is an individual's capacity to formulate, employ and interpret mathematics in a variety of contexts. It includes reasoning mathematically and using mathematical concepts, procedures, facts and tools to describe, explain and predict phenomena (OECD, 2016). Mathematical literacy helps a person to recognize the role of mathematics in the world and make judgments and decisions needed as citizens (Johar, 2012). Mathematical literacy is the ability to understand and apply basic mathematical knowledge in everyday life Kuswidyanarko et al., (2017). Thus knowledge and understanding of mathematical concepts is very important, but more importantly is the ability to activate mathematical literacy to solve problems encountered in everyday life.

Wardono et al., (2018) states that Indonesia in PISA has not shown results that have not changed much during its participation. The latest results in 2015, Indonesia ranked 63 out of 72 countries with an average score of 386 (OECD, 2016).

A person's success is not determined solely by knowledge and technical abilities (hard skills), but rather by the ability to manage themselves and others (soft skills) (Waluya, 2012; Retnowati & Aqilah, 2017;). One of the important soft skills for students is self-regulated learning (Qohar & Sumarmo, 2013; Alkusaeri, 2013; Hendriana et al., 2017). Zimmerman & Schunk (1989) defines self regulated learning as individuals who are actively involved in the learning environment, organize, train, and use their abilities effectively, and have positive motivational beliefs about their abilities in learning.

Students who have self regulated learning are relatively more able to overcome with all the problems that exist in their lives and do not depend on others (Nanang, 2016). However, people need to control their own learning after they leave formal education (Persico et al., 2015). The lack of independence of learning in students will produce various kinds of behavioral problems, such as shyness, do not have school motivation, and poor study habits. This is in accordance with the results of research by Ainiyah et al., (2017) that students who have high self regulated learning can achieve better results than students who have low self regulated learning.

One of the learning that can involve active students is flipped classroom (Yulierti et al, 2015; Lai et al, 2015; Damayanti & Sutama, 2016; Sun et al, 2017). Ozdamli & Asiksoy (2016) define simply, flipped classroom is "what is done in class is done at home and what is done at home is equipped in class. According to Bishop and Verleger (2013) flipped classroom is a student-centred learning method consisting of two parts with interactive learning activities during lesson and individual teaching bases directly on computer out of lesson. Johnson (2013) revealed that flipped classroom is a learning model that minimizes the number of direct instructions but maximizes one-on-one interactions.

This learning model utilizes technology that supports additional learning material for students that can be accessed online and offline whenever and wherever. While the learning time in class is used by students to discuss with classmates, practical skills, and receive feedback about their progress. According to Zainuddin & Halili (2016) flipped classroom learning allows students to spend more time supporting higher level learning tasks such as group discussions, while lower level assignments such as knowledge and understanding are completed independently outside the classroom. In the flipped

classroom, students are able to take control of their own learning pace, and be responsible for their own learning process (Lai & Hwang, 2016).

In this study the media used in flipped classroom learning is a module. Module is teaching material that have an important role in learning (Arianti et al., 2014; Parmin & Peniati, 2012). The module is a book written with the aim that students can learn independently without or with the guidance of teachers (Depdiknas, 2008). According to Prastowo (Tjiptiany, et al., 2016) learning using aiming module (1) Students are able to study independently or with the help of teachers to a minimum; (2) The role of the teacher does not dominate and is not authoritarian in learning; (3) Train student honesty; (4) Accommodate various levels and speeds of student learning; (5) Students can measure themselves the level of mastery of the material being studied. The module is expected to guide students in understanding learning materials so that they can improve student's mathematical literacy.

The development of science and technology, especially Information and Communication Technology (ICT) is very rapidly influencing the world of education (Ratnaningtyas et al., 2017). The development of applications on smartphone devices can also be used in the world of education. For this reason, in order to support the successful development of student's self regulated learning by flipped classroom with module is needed to use information and communication technology media for learning, one of which is whatsapp. According to Bouhenik & Deshen (2014) Whastsapp is one of the social media as a means of sending messages to and from individuals or groups (groups) which includes various functions such as text messages, documents, images, photos, audio, and video. From some of the advantages and functions of whatsapp, the researcher intends to use it outside of classroom learning as a medium of communication with students regarding learning assistance, discussion forums, and assignment. Feedback when outside the class can be given by the teacher to students through whatsapp.

The following is research related to the use of module and social media such as whatsapp to support mathematics learning. Setiawan et al., (2018) showed that STAD-based module learning with diagnostic assessment was effective against student's problem solving abilities. Bouhenik and Deshen (2014) show that whatsapp provides benefits to education, such as the creation of pleasant environments and in-depth introduction to fellow students, which had a positive influence upon the manner of conversation. The results of the study by Juwita et al., (2015) show that social media has a positive impact on student's lifestyles. The results of the research by Winardi & Wardono (2017) show that students who obtained Missouri Mathematic Project learning with an open-ended approach assisted by whatsapp had good self regulated learning and achievement. The results of the study by Kartikawati & Pratama (2017) show that students who were given integrated Learning Group Investigation social media whatsapp had better critical thinking skills than students who were given direct learning.

The formulation of the problems in this study are (1) How the effectiveness of flipped classroom learning with whatsapp module on student's mathematical literacy, (2) How student's mathematical literacy by flipped classrom with whatsapp module in terms of student's self regulated learning.

METHODS

This research is mixed method by Pre-Experimental Design type One-Group Pretest-Posttest Design. It begins with a preliminary study, then quantitative data collection as well as qualitative data analysis and interpretation.

The research was conducted in Al Azhar Islamic Junior high school 23 Semarang with the population is the students of grade VII of academic year 2018/2019. The subjects are 39 student for class used flipped classroom with whatsapp module and categorized in terms of student's self regulated learning (high, medium and low). Each category of self regulated learning is then taken by 2 students to be the subject of research.

Quantitative data collection techniques are carried out by matematical literacy tests. While qualitative data collection techniques use questionnaire, interviews, and documentation. Quantitative data were tested using normality, homogeneity, proportionality, average mastery, and self regulated learning improvment. While qualitative data analysis follows the concept of Miles & Hubermen (2007) with the following steps, namely data reduction, data display, and conclusions.

RESULT AND DISCUSSION

The results of the validation of learning devices are listed in the following table 1.

Table 1. Results of Learning Device Validation.

Learning Device	Score	Category
Syllabus	4.3	Very Good
Lesson Plan	4.2	Good
Module	4.17	Good

From table 1, it can be concluded that the average score of the learning device is 4.2 with a good category, so that the learning device that has been prepared is feasible to be used in research. The results of the validation of the research instruments are presented in the following table 2.

Table 2. Results of Validation of Research Instruments

Research Instrumen	Score	Category
Mathematical literacy test	4.35	Very Good
Interview Manual	4.57	Very Good
Students Response Questionnaire	4.3	Very Good

From table 2, it can be concluded that the average score for all instruments is 4.4 in the very good category, so the instruments that have been prepared are also feasible to be used in research.

From the assessment of learning outcomes, it was obtained that the TLM results were normally distributed with a sig = 0.2 and homogeneous values with a sig value = 0.409. In the calculation of completeness proportion test and the average completeness test, the significant level or α used is 0.05. The obtained completeness proportion is 79%, with z value is 0.647 and $z_{\frac{1}{2}(1-\alpha)}$ is 1.96, so that $z < z_{\frac{1}{2}(1-\alpha)}$, which means the proportion of student's mathematical literacy completeness by flipped classroom with whatsapp module reaches 75%. The average value obtained is 81, with the t value is 3.186, and $t_{(1-\alpha),dk}$ is 1.684, so $t > t_{(1-\alpha),dk}$, which means the average student's mathematical literacy by flipped classroom with whatsapp module more than 75.

On the communication aspect, students with high self regulated learning and medium are able to state the information that is known, the problem being asked, and the idea of solving the problem correctly and completely. Students with low self regulated learning have also stated information that is known and asked, but students almost write down the problem again, not just writing the points. Students with low self regulated also have not been able to express the concept of completion correctly.

In the mathematising aspect, students with high self regulated learning can make mathematical forms of the cases submitted correctly and precisely. Students with medium self regulated learning have also been able to change problems in the case of questions to mathematical forms correctly, but the explanation is incomplete. Students with low self regulated learning are capable of mastering mathematising aspects correctly.

In the aspect of reasoning and argument, students with high self regulated learning can solve problems according to concepts that have been planned correctly and completely, then make final conclusions and explain in detail about the reasons or the basis of the conclusions made. Students with medium self regulated learning can provide the right conclusions and the correct or complete reasons or methods, even if they are not in order. Students with

low self regulated learning are still lacking in mastering aspects of reasoning and argument, because they have not been able to solve problems and provide conclusions correctly.

In the aspect of devising strategies for solving problems, students with high and medium self regulated learning are able to make correct completion steps, and correct calculations. Students with low self regulated learning are quite able to provide the right step of completion. There are questions that students have been able to provide a solution to, but the results of the calculations are not correct.

In the representation aspect, students with high and medium self regulated learning are able to present the problem by drawing and interpreting it well, but students with medium self regulated learning are still lacking in giving information. While students with low self regulated learning are quite capable of restating the problems in the illustration drawing correctly and has not provided information.

In the aspect of using symbolic aspects, formal and technical language and operation, students with high, medium and low self regulated learning are able to use symbols, formal languages and techniques, and operations to formulate, solve or interpret problems very well.

In the using mathematics tools aspect, students with high and medium self regulated learning can use mathematical tools (rulers) well, right scale, and neat. While students with low self regulated learning are able to use mathematical tools (rulers), but have not used scales in number lines.

From the TLM results and interviews with the subject, it can be concluded that students with high self regulated learning have excellent mathematical literacy, students with medium self regulated learning are having good mathematical literacy, and students with low self regulated learning have sufficient mathematical literacy. Students with high self regulated learning tend to be good, able to monitor, evaluate, and direct and control themselves in thinking and acting (Zimmerman & Shunk, 1989; Sumarni & Sumarmo, 2016). Self regulated learning also takes part in determining the success of learning and has a positive impact on student achievement (Kurniawati, et al, 2015; Arifin & Herman, 2017).

Mathematical literacy shown by students with high self regulated learning is based on the motivation of students who are very strong to master mathematics subjects well. This is in accordance with the statement from Sunawan et al., (2013) that someone who has self regulated learning has the ability to monitor, regulate, and control cognition, motivation, behavior in order to achieve his learning goals. This is also in accordance with the results of Ainiyah et al., (2017) and Riza'i et al., (2018) research that students with high self regulated learning can achieve better results than students with low self regulated learning.

Mathematical literacy shown by students with medium self regulated learning is based on students to master mathematics subjects well. They try to communicate with friends to find the best solutions to mathematical problems, even though sometimes they avoid carrying out difficult problems. They were quite enthusiastic in taking mathematics lessons at school and were quite able to motivate themselves to learn mathematics.

Students with low self regulated learning have the character tend to be more easily given up in facing difficult problems. In carrying out school work, sometimes students want to do it, sometimes also avoid it, and feel hopeless. Students who don't have self regulated learning will result in low motivation, inability to make decisions and low learning outcomes, and inhibit the learning process (Elfira, 2013). This certainly will hinder learning objectives, so that achievement of learning outcomes is not fulfilled.

Learning carried out in classes VII A and VII B uses flipped classroom learning with whatsapp module. Learning activities last for 2 weeks with details of 2 meetings for TLM (pre-test and post-test) and student's self regulated learning questionnaire, 3 regular meetings in class, and the rest self regulated learning outside the classroom. At meeting 1 after giving pre-test and student self regulated learning questionnaire, the teacher (researcher) gave information to students related to the learning model that would be applied, namely flipped classroom with

whatsapp module. Therefore the teacher gives module and asks for a student's whatsapp number which will later be made a discussion group outside the class.

In this class, researchers carry out learning with the intention to empower students to learn by using various methods / strategies actively. This is in accordance with Meyersand's statement in Effendi (2013) that learning is basically an active search for knowledge and that everyone learns differently. This learning also intends to create important elements that can develop student's self regulated learning. Students must have self regulated learning because learning resources can be obtained from anywhere and anytime. Self regulated learning is responsible for their learning or vice versa, so it has a strong influence on the success and failure of student learning achievements (Arifin & Herman. 2017; Riza'i et al., 2018; Bahri et al., 2018).

The flipped classroom learning process with whatsapp module is divided into two parts, namely learning outside and inside the classroom. Learning outside the classroom starts with students returning from school. Students learn independently outside school hours by studying the material in the module that have been shared or from other relevant sources, such as books, power points, or learning videos. The overall learning carried out is student centered. In learning it is necessary to have an activity that is able to stimulate all students to develop optimally (Hamalik, 2004).

After students go home begin learning outside the classroom. Initially the teacher (researcher) reminded that learning outside the classroom had begun. Students respond well. Students ask about what tasks are learned. To ask about difficulties in learning, students are still shy or afraid. There are some students who ask personally not in the group. Flipped classroom learning is based on revised taxonomic theory from Bloom's cognitive domain. In applying flipped classroom learning, remembering and understanding as the lowest level of cognitive domains are practiced or studied with a longer time outside class hours. This is meant for students before learning in the classroom already have preparation regarding the material being studied. While in the classroom, students in groups can use knowledge that has been learned before and also focus on higher forms of cognitive work, including applying, analyzing, evaluating, and creating with the help of students and teachers (Tainter et al., 2016; Zainuddin & Halili, 2016; Sun et al., 2017).

This learning process initially experienced obstacles because students were not familiar with the learning applied by researchers. There are some students who have not fully followed the teacher's instructions and the class becomes crowded, but at the next meeting students begin to adapt to the learning.

Previously, teachers had formed heterogeneous groups. The teacher instructs that each group can discuss together both outside and classroom learning. When learning in the classroom students can discuss with their respective groups, but when learning outside the classroom students cannot discuss. Most students in that class have private tutoring schedules. So it's difficult to discuss or study together. Students can only discuss the material being studied through whatsapp. With the use of these media, teachers can also monitor and assist students in learning outside the classroom.

The results of student responses regarding the application of flipped classroom with whatsapp module obtained an average score of 3.04 or 76%, so it can be concluded that students assessed the learning to be good and students felt happy to get new experiences in learning.

CONCLUSIONS

Flipped classroom with module assisted by whatsapp on student's mathematics literacy is effective. Mathematical literacy analysis in terms of self regulated learning, it can be concluded that students with high self regulated learning experienced an increase in mastering the seven aspects of the mathematical literacy process very well. Students with medium self regulated learning, experience improvements in communication, representation, using symbolic, formal and technical language and operation and using mathematic, and can be mastered very well, while other aspects are

well mastered. Students with low self regulated learning also experience improvement and are able to master four aspects well namely communication, representation, using symbolic, formal and technical language and operation and using mathematic tools. On the mathematising and devising aspects of strategies for solving problems can be mastered with sufficient categories. While the reasoning and argument aspects of students are still lacking in mastering it.

Based on the results of the study, it is recommended that teachers do more guidance with students who have medium and low self regulated learning so that students are more independent, spirit, and recognize their potential for mathematical literacy.

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