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Analysis of Mathematics Literacy Ability Observed from Metacognition in Learning Realistic Synectics Assisted by Schoology

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Abstract

This research aims to describe the ability of mathematics literacy in terms of students' metacognition in learning realistic synectics assisted by schoology. The subjects chosen by random sampling in this study were 32 students of class VII A of SMP Negeri 4 Adiwerna in the 2018/2019 academic year. Data analysis using Mix Method with Quasi Experimental Design. The results showed that with the learning of realistic synectics assisted by schoology, students' mathematical literacy skills in terms of metacognition is varied. Based on 7 students with high metacognition, obtained 6 students with high mathematical literacy skills and 1 student with moderate mathematical literacy abilities. Of the 21 students with moderate metacognition obtained 5 students with high mathematical literacy skills, 12 students with moderate mathematical literacy abilities and 4 students with low mathematical literacy abilities. Of the 4 students with low metacognition all of them had low mathematical literacy skills as well.

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INTRODUCTION

One effort to improve the quality of education in Indonesia is to improve the quality of mathematics education. An international assessment program that includes a country's mathematical development, PISA, was initiated by the OECD, to evaluate the education system of 72 countries around the world. PISA is carried out every 3 years with the subject of assessment being students who are 15 years old and who are the objects of assessment are reading literacy, mathematics, problem solving and science as well as the latest additions regarding financial (OECD, 2013)

The OECD (2013a) states that in measuring the ability of mathematical literacy, there are also components of mathematical literacy that need attention, namely: communication; mathematising; rrepresentation; reasoning and argument; devising strategies for solving problems, using symbols, using symbolic, formal, and technical language and operations; and using mathematics tools. Indonesia's position is lower in the 2012 PISA survey, which was ranked 64th out of 65 surveyed countries (OECD, 2013b)

According to PISA (Sari, 2015) the stages of the mathematical process include formulating, using, interpreting, and evaluating, in the process of mathematization is influenced by one's view, understanding and experience. A person's understanding of what is owned by himself can be interpreted as metacognition, this means it can be said that metacognition affects one's literacy abilities. This is supported by Diyarko's research (2016) which concluded that the increase in students' metacognition has an impact on changes in mathematical literacy skills for the better.

Metacognition relates to active monitoring and the consequent control and organization of the monitoring and control process in relation to cognitive goals, so that these processes support a number of concrete goals (Yoong, 2013). Shen and Liu (2011) suggested that metacognition is the ability to associate an important role with prior knowledge, draw conclusions and monitor or assess personal performance shown during the learning process.

In the study of Werdiningsih (2015), it was shown that the use of students' metacognition strategies was still low, below 2.45 of the maximum scale of 5.00. The lack of awareness and control of the metacognition process that results in the low ability of Indonesian students' mathematical literacy can be caused by several factors, including the lack of student understanding of the material used in mathematical literacy problems and the lack of student experience in solving problems that require students to do analysis and reasoning deep.

In accordance with the opinion of Suherman (2013) who argued that mathematics is actually a human activity. In line with this, in the learning process a teacher should be able to facilitate students in developing cognitive and affective aspects. This can be done by using a learning model that fosters creative students, namely the synectics model (Novalia, 2017).

The Synectics Model is one of the learning models designed by Gordon which is basically directed to develop student creativity (Annurrohman, 2014: 162). Analogy activities in learning synectics can help students not only learn more concepts but use them as a type of creative thinking. In addition, an approach that is related to aspects of daily life is also needed. The approach that facilitates this is a realistic approach, according to Kusuma (2016) is a learning approach that uses contextual problems as a first step in the learning process.

In learning, students need interactive and communicative media and can be integrated with other learning topics such as e-learning media. In accordance with Aminoto's statement (2014) that e-learning is a use of internet technology in the delivery of learning in a wide range.

Schoology is one of the Learning Management System (LMS) media, where LMS itself is a software application or web-based technology used to plan, implement and assess certain learning processes, Sicat (Rahmawati, 2016: 26). In accordance with the results of research Wardono and Kurniasih (2015) that the application of innovative realistic learning e-learning can improve students' mathematical literacy abilities.

Based on the description above, the main problem formulation in this study are (1) How the quality of learning of realistic Synectics models assisted by schoology towards students 'mathematical literacy abilities (2) How do students' mathematical literacy abilities in learning with schoology-assisted

realistic Synectics models in terms of student metacognition.

The purpose of this study is to (1) Acquire the effectiveness of learning with realistic synectics models with the media of schoology in an effort to improve students' mathematical literacy abilities; (2) Describe the level of metacognition of students after the implementation of learning with realistic synectics models with schoology media; (3) Describe the mathematical literacy abilities of students from each level of metacognition after learning is done with a realistic synectics model with schoology media.

METHOD

This research uses mixed methods research with embedded concurent design which is a research method that combines quantitative and qualitative research methods by mixing the two methods unbalanced (Sugiyono, 2013).

Quantitative research as supporting data to collect and analyze quantitative data used to determine the effectiveness of realistic synectics learning models for students' mathematical literacy abilities. While qualitative data analysis is used to describe the level of metacognition of students after doing learning with realistic synectics models using schoology media and to describe the mathematical literacy abilities of students from each level of metacognition after learning with the realistic synectics model with schoology media.

The subjects chosen by random sampling in this study were 32 students of class VII A of SMP Negeri 4 Adiwerna in the 2018/2019 academic year. The quantitative stage uses Quasi experimental design type Pretest-Postest Control Group Design. the paradigm in quantitative research can be seen in the following table.

Table 1. Quantitative Research Design

Class	Pretest	Treatment	Posttest
Experiment	T_1	X	T_2
Control	T_1	C	T_2

(Source: Creswell, 2014)

In this research design using two classes chosen randomly. The experimental class uses a realistic synectics learning model aided by schoology while the control class uses the PBL learning model. Then from the experimental class four students were taken based on the results of the mathematical literacy ability to describe the metachogical level.

Research carried out through quantitative stages to be carried out includes several things, namely: providing an initial literacy test, providing a metacognition test, carrying out the learning process with a realistic learning synectics model assisted by schoology, and providing a final literacy test. The final stage is the qualitative stage which includes interviews, conducting data analysis, and drawing research conclusions.

The qualitative stage in this study was conducted in conjunction with the quantitative stage. Retrieval of qualitative research subjects with purposive sampling technique aims to ensure that the subjects chosen are as expected by researchers. In this study, the focus of qualitative assessment is on each student in each metacognition group, namely high, medium and low.

FINDING AND DISCUSSION

The results of the analysis of the effectiveness of schoology-assisted realistic synectics learning on students' mathematical literacy abilities indicate that the average student has reached the minimum criteria. Based on the results of the analysis, the significance value (α) = 0,000 <0.05 was obtained, then H0 was rejected. This means that the average value of the mathematical connection ability of the experimental class students reaches the KKM limit. Many students reached KKM in the experimental class as many as 29 students out of 32 students, this meant that the proportion of completeness of the experimental class had reached 75%

Based on the results of the analysis of different test the average obtained is a significance value of 0.002 <0.05, then stated H0 is rejected. This means that the average mathematical literacy ability of students in the classroom with realistic Synectics learning models assisted by schoology is more than the average mathematical literacy ability of students in PBL classes. And based on the analysis of the influence test, the significance value of the influence test is 0.000 < 0.05, then H0 is rejected. This means

that there is a significant influence of metacognition on students' mathematical literacy abilities. As for knowing the magnitude of the effect of metacognition on mathematical literacy skills, the value of R squared = 0.673 means that the magnitude of the effect of students' metacognition on mathematics literacy ability is 0.673 = 67.3% and the remaining 32.7% is influenced by other factors.

From the three statistical tests that have been carried out shows that mathematics learning with realistic Synectics learning models assisted by schoology is effective on the ability of students' mathematical literacy in terms of their metacology. In accordance with the results of Novalia's research (2017) regarding the ability of mathematics literacy with Synectics learning. The results of his research are obtained that Synectics learning can improve students' mathematical literacy skills through a series of structured and systematic activities. The results of Lestariningsih (2015) and Bintoro (2017) research on the use of a realistic approach can increase student activity, such as when discovering new concepts by linking with existing concepts and when discussing (interacting) with friends. Rendra (2018) states that the use of schoology has an impact on student independence. This means that students will contribute more to learning or can be interpreted as being able to increase student activity

Based on the results of metacognition tests that have been done, researchers grouped students into three groups, namely groups of students with high metacognition of 7 students, groups of students with moderate metacognition of 21 students and students who had low metacognition of 4 students. Data on the division of student groups based on metacognition is presented in Figure 1.

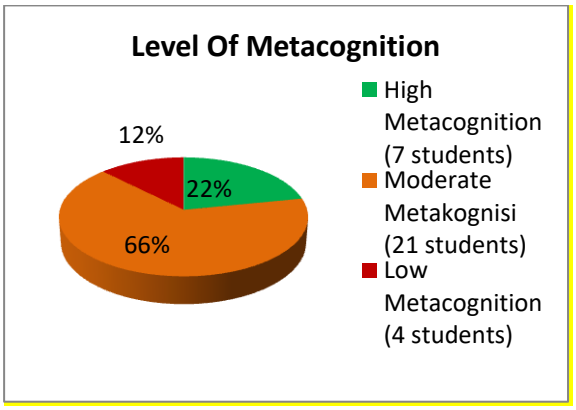

Figure 1. Classifying Student Metacognition

From the high metacognition group, there were 6 students with high mathematical literacy skills and 1 student with moderate mathematical literacy abilities. Of all students in this category, in general the seven components of mathematical literacy are already very capable of being mastered. Students are able to find the information needed to solve problems even though the information is not implicit in the problem, can change everyday problems into mathematical concepts clearly, can make pictures that represent problems and write appropriate formulas, can connect and give logical reasons, can determine the mathematical strategy first before solving the problem and done clearly, logically and precisely, can generally manipulate but sometimes still make mistakes, and can make images using a ruler with an appropriate size and neat results. It's just that in 1 student with moderate catechogy, the component using symbolic formal and technical operations sometimes still makes mistakes that result in the end result being incorrect.

In the moderate metacognition group, there were 4 students with high mathematical literacy abilities, 12 students with moderate mathematical literacy abilities and 5 students with low mathematical literacy abilities. For 4 students with high mathematical literacy skills, able to master the seven components of mathematical literacy. Students are able to master in identifying problems and then present problems in pictures or formulas appropriately and systematically and have no difficulty in using tools and manipulating mathematical symbol operations. This is useful in planning strategies and linking problems to obtain the solutions to be achieved. In 12 students with moderate metacognition, were included in the category of being able to master the seven components of mathematical literacy, although not perfect, but students were able to identify problems and be able to interpret them into models and other forms of mathematical equations in order to facilitate problems. In general, there are still problems when using tools and manipulating mathematical symbol operations that have an impact on the difficulty in connecting problems to get the right solution. Whereas in 5 students in the low category, students were quite able to identify problems but were still constrained in turning problems into mathematical

concepts and manipulating mathematical symbol operations, which prevented students from connecting problems and planning mathematical strategies appropriately to get the solution they wanted to achieve

In the low metacognition group of 4 students, all of them had low mathematical literacy abilities. In this group, the mathematical literacy ability of students in the low metacognition group is included in the quite good category. Students can write the information presented on the problem quite systematically but sometimes still rewrite the problem. Students can model everyday problems into mathematical concepts but often also in modeling the problem is not right, can answer problems by connecting problems but still not right, able to make strategies used in obtaining solutions to problems but sometimes the strategies are made incorrectly, able understand the problem that must be changed the unit of calculation first before solving the problem, but when equating it has not done it right, can make a picture according to the command but still use a size that is less proportional.

The results of the analysis of mathematics literacy abilities (KLM) of students with schoology-assisted realistic synectics learning are better than using conventional learning (PBL) and there is a significant effect of schoology-assisted realistic synectics learning on mathematics literacy skills and student metacognition. This statement is also supported by the results of Novalia's research (2017) regarding the ability of mathematics literacy with Synectics learning. This is supported by Efendi (2017) who concluded that student learning outcomes in classes using schoology are higher than classes that do not use schoology media. The existence of this kind of learning causes students to feel more comfortable in learning and ultimately will get satisfying achievements, this is in line with the results of Diyarko's research (2016) that students who have positive metacognition tend to learn more optimally.

Table 2. Summary of Results of Mathematical Literacy Abilities Based on Metacognition Levels

Component	Group		
	High Metakognition	Moderate Metakognition	Low Metakognition
Communication	Students are very able to identify mathematical information presented in the problem	Students are able to identify mathematical information presented in the problem	Students are quite able to identify mathematical information presented in the problem
Mathematising	Students are very able to model real problems into mathematical concepts	Students are very able to model real problems into mathematical concepts	Students are quite able to model real problems into mathematical concepts
Representation	Student are very able to make drawings or formulas that represent and simplify problems	Students are very able to make drawings or formulas that represent and simplify problems	Students are quite able to create drawings or formulas that represent and simplify problems
Reasoning and argument	Students are able to connect problems and provide logical reasons in finding solutions to problems	Students are quite able to connect problems and provide logical reasons in finding solutions to problems	Students are able to connect problems and provide logical reasons in finding solutions to problems
Devising strategies for solving problems	Students are very able to determine mathematical strategies in solving problems	Students are able to determine mathematical strategies in solving problems	Students are able to determine mathematical strategies in solving problems
Using symbolic, formal, and technical language and operation	Students are able to manipulate mathematical symbolic operations in solving problems	Students are quite capable of manipulating mathematical symbolic operations in solving problems	Students are less able to manipulate mathematical symbolic operations in solving problems
Using mathematics tools	Students are able to use mathematical aids in learning activities	Students are able to use mathematical aids in learning activities	Students are quite capable of using mathematical aids in learning activities

CONCLUSION

The conclusion from this study is that subjects with high metacognition will be very helpful in the seven components of mathematical literacy to play a key role in the application of these seven components to solve mathematical complications with wider

variations. Students with metacognition are able to master the seven components of mathematical literacy but are still limited to the application of the seven components in simple mathematical completion. Students with low metacognition skills will be able to master the seven components of mathematics yet to apply the seven components in solving mathematical difficulties are still very limited.

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