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The ability of mathematical literacy on learning treffinger realistic assistance schoology

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Abstract. This research aims to determine the quality of learning through Treffinger realistic model assistance schoology and to know the improvement of students' mathematical literacy skills on Treffinger realistic learning model assistance schoology. This research was a quantitative research with pretest-posttest control group design. The population of this research was the students of class VII of SMP Negeri 6 Semarang academic year 2017/2018. The sample was class VII C as the experimental class and class VII D as the control class. The technique for collecting data used observation and test methods. The results showed that the quality of learning model of Treffinger realistic assistance schoology has good category; the improvement of students' mathematical literacy skills through Treffinger realistic learning model assistance schoology is higher than the improvement of literacy ability of students using PBL.

1. Introduction

The progress and development of a country are determined by human resources (HR) and future generations, if the human resources and the next generation of a nation are qualified, they will be able to bring the country move forward. This is the encourages every country to create human resources and the next generation become superior, one way that can be done is improving the quality of education.

Improving the quality of education is not an easy and instant case, but requires an intensive and continuous process. In addition, raising the assessment standard is one of the efforts to improve the quality of education. Improving assessment standards does not mean only raising the minimum criteria score (KKM) but also by participating in the international assessment to assess the academic achievement of Indonesian students, such as PISA.

The results of PISA in 2012 and 2015 showed that the score of Indonesian students' mathematics literacy is still under the average score of participants. Mathematical literacy is the application of concepts to the mathematical problem related to everyday life [1]. This means understanding everyday problems and applying mathematical concepts to find solutions of everyday problems and the hope is that when students can apply mathematical concepts in real life they will be able to make the right decisions in facing problems [2], but this is rarely done by Indonesian students in the learning process. The main problem is the ability of Indonesian students in solving daily problems still low and less

habituation [3]. That is why the score of Indonesian students' mathematics literacy on PISA assessment is still low.

Based on the reason above, it requires innovation in learning in the classroom that can facilitate students to develop and improve the ability of mathematical literacy. Learning with the Treffinger model can be an alternative to improve students' mathematical literacy skills. This Treffinger model begins with the understanding challenge stage that students identify the problems given and students can practice their ability to understand and communicate the problems and design the strategies that will be used to find solutions. The next stage is generating idea; the students express their ideas about the solution plan to solve the problem, it can train communication ability [4], reasoning ability and giving an argument. The last stage is preparing for action; the students solve the problem by applying the plan that has been prepared earlier, it can also train the ability of mathematization, namely the ability of students to change the real problems into mathematical concepts and vice versa.

One of the characteristics of Treffinger learning is that students are given the freedom to understand and solve problems, this is in line with one of the mathematical literacy processes that is mathematization. Mathematics can simply be interpreted as a process of making a real problem that requires the skills and competencies that students have acquired during school and life experiences [5]. In other words, mathematization and mathematical literacy are very closely related to real problems or everyday life problems, math literature usually begins with a problem or situation in real life [6].

Learning that begins or relates to something tangible is called realistic learning. The realistic approach is the situations of learning serve as a source for initiating the development of mathematical concepts, tools, and procedures and as a context in which students can in a later stage apply their mathematical knowledge, which then gradually has become more formal and general and less context specific [7]. The realistic approach has special characteristics such as the student's contribution, interactivity, and intertwining [8]. This means that in the learning process, students are given more opportunities to develop their knowledge and understanding of the material that is given by the teacher, in other words, learning is based on students centered and students are also required to be able to link the material learned with the material that has been studied or field in other lessons.

The realistic approach can also be interpreted as a learning approach that starts from the real things for students and emphasizes process skills such as discussing and arguing [9]. These activities indirectly train students to find their own material concepts and will make students better to understand the material and will save understanding of material longer (long term memory). Giving the problems which are from surrounding students will make the students feel interested and when they find their own understanding of the material concept, it will have an impact on more meaningful learning. The application of a realistic approach makes the learning process more meaningful and enjoyable for students [10].

There is a similarity between realistic approaches and mathematical literacy which are both using everyday problems. In order to support the creation of the same atmosphere for students when learning anywhere, it is necessary to use learning media that can facilitate the learning process, one of them is schoology. The using of schoology supports learning to be more effective, learning through the web will be more effective because the learning process can be done anywhere and anytime and learning through the web can access teaching material information with a wider scope [11].

The purpose of this research are (1) to know the quality of learning model through Treffinger realistic assistance schoology have a good category, and (2) to know the improvement of students' mathematical literacy ability through Treffinger realistic model assistance schoology.

2. Methods

This research was a quantitative research with pretest-posttest control group design. This design has a characteristic that contains pretest. Pretest aims to know the initial state of the class that becomes the research sample. There are control class and the sample which are chosen randomly. The design description of this research is given in Figure 1 [12].
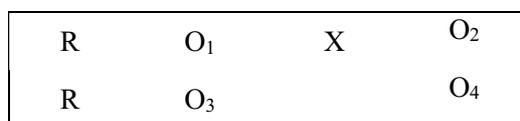
$$
\begin{array}{cccc}
R & O_1 & X & O_2 \\
R & O_3 & & O_4
\end{array}
$$

Figure 1. Pretest-Posttest Control Group Design

The population of this research was the students of class VII of SMP Negeri 6 Semarang, academic year 2017/2018. The sample in this research was the students of class VII C as the experimental class that used realistic Treffinger learning model assistance schoology, and class VII D as the control class that used the PBL model. The dependent variable in this research was the students' math literacy ability.

The technique of collecting data used observation and test method. Observation method was done to obtain the learning quality data of Treffinger realistic model assistance schooology. The test was used to obtain students' mathematical literacy skills. Before the test is given to the students, the test instrument was tested to calculate the validity, the differentiation, the difficulty and the reliability of the questions item. After the data was collected, and then analyzed the hypothesis. The analytical technique used the gain test. This test was used to calculate the increase of students' mathematical literacy ability in the experimental class and control class.

3. Result and Discussion
3.1 Quality of Learning
Learning quality is viewed from three aspects, namely the aspects of preparation, aspects of implementation, and aspects of assessment [13]. In the aspect of preparation is carried out by designing learning tools and seen from the results of the validation of the devices that have been made. In the aspect of implementation, it is carried out by observing the process of student learning and activity during learning. In the aspect of assessment includes student responses.

In the aspect of preparation, after the learning device is made, next it is validated by experts. The results are in Table 1.

Table 1. Recapitulation of Expert Validation Results

Aspect	Validation Score	Category
Silabus	83.9%	Quite Valid
RPP	84.7%	Quite Valid
LKS	90.0%	Very Valid
TKLM	93.3%	Very Valid
Lembar Keterlaksanaan Pembelajaran	85.0%	Very Valid
Respons Siswa	90.0%	Very Valid

Based on the validation results in Table 1, we can get the conclusion that the learning device has a very valid category. it means that the devices made are of high quality. In the implementation aspect, it is seen from two aspects, namely the implementation of learning and the activity during learning. Assessment of the implementation learning used observation sheet. The assessment score for learning implementation can be seen in Figure 2.

Based on the results of the observations assessment of learning implementation, the learning process goes according to the RPP and has an average of good categories.
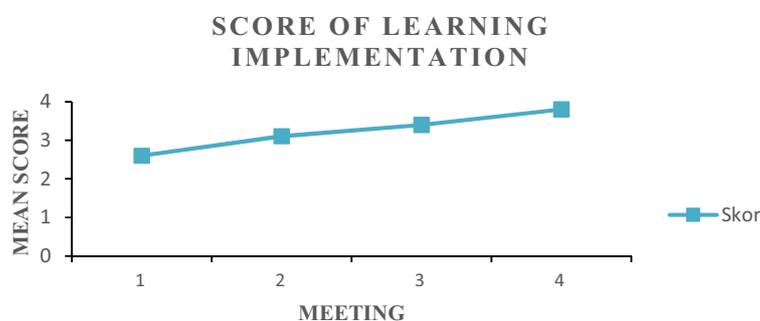
Figure 2. Learning Implementation Score

Student activities during learning include the activities of writing, listening, speaking and acting. The results of the assessment of student activities during learning can be seen in Figure 3.
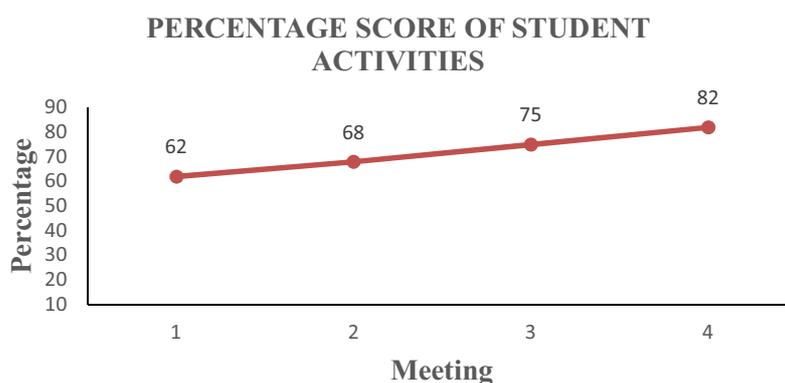

Figure 3. Percentage of Student Activity During Learning

The increasing of this activity is caused by Treffinger realistic learning model assistance schoology. Because in Treffinger realistic learning students are focused on developing ways of thinking, it means students are given the freedom to understand and solve the real problem or in a student environment that affects students feeling happy, unfettered and easy in the process of thinking and understanding mathematical concepts. The research concluded that by applying Treffinger learning, students were more active in asking questions, making opinions, making conclusions or even making examples of cases in daily life [14].

The using of realistic approaches can increase student activity, such as when discovering new concepts by linking with the concepts already owned and when discussing (interacting) with friends [15,16]. The use of schoology has several impacts including more independent learning [17], this means that students will contribute more to learning both at school and outside school hours, and students can explore material independently or can also be interpreted to increase student activity in learning.

In the aspect of assessment, what is assessed is the response of students after learning. The instrument used was a response questionnaire consisting of statements regarding responses after participating in learning. The results of the questionnaire response questionnaire analysis were presented in Table 2.

Table 2. Results of Student Response Questionnaire

No.	Indicator	Positive (%)	Negative(%)
1.	Student's responses to the learning model applied	85.29	14.71
2.	Student's responses to learning devices	90.20	9.80
3.	Student's responses to learning the material	76.47	23.53
4.	Student's responses to learning media (schoology)	55.88	44.12

Students' responses to the learning process as a whole are high in categories because the average positive response of students to learning was 79.12%. This means that most students feel that learning has a positive impact on them. These results can also be concluded that Treffinger realistic learning assistance schoology is practical.

This research concluded that using a realistic approach to the learning process will make variations in students' and teacher positive responses [18], and students who experience Treffinger learning respond positively to learning [19] and supported by the results of [17] research which confirms that students' responses to learning using schoology are positive, because schoology is easily accessible, not boring, students have a target or task collection limit, and more serious in carrying out the task.

3.2 *Increasing the Ability of Mathematical Literacy*
The gain test was used to determine the criteria of students' mathematical literacy abilities. The formula based on normality gain (g), the formula is as follows [20].

$$(g) = \frac{S_{post} - S_{pre}}{S_{ideal} - S_{pre}}$$

Information:
S_{pre} : Initial Score
S_{post} : Final Score
S_{ideal} : Score ideal

Furthermore, the gain values obtained in the experimental class and the control class was analyzed by an independent test using SPSS. The results showed that the improvement of mathematics literacy skills in class-based Treffinger realistic learning models assistance schoology was higher than the improvement of students' mathematical literacy skills in PBL class. This can be seen in the obtained significance value of 0.000 <0.05 so that H_0 was rejected.

The improvement of students' mathematical literacy skills in the experimental class is inseparable from the Treffinger realistic assistance schoology learning factors. Because when students used schoology in outside learning time, the students will be more and often practice the exercises, discuss and understand the questions more clearly so that they will support in improving mathematics literacy and render the efficiency of students' learning time. The application of the Treffinger model also contributes to the role because the characteristics of Treffinger learning are that students are given freedom in determining the steps or ways chosen to solve the problems so that students do not feel restrained.

E-learning can streamline the time and can be used outside of learning time [21]. In addition, many research about Treffinger learning, realistic approaches and the using of schoology can improve students' mathematical literacy skills. The research included research by [22-24] conclude that realistic learning using information technology and computers can improve students' achievement, especially

mathematical literacy and increase students' mathematical abilities that use realistic learning higher than who do not use realistic learning and also there is a positive impact on the use of ICT on students' academic abilities. The Treffinger model can also improve students' mathematical abilities [25, 26]

4. Conclusion
Based on the results and discussion, it can be concluded that the quality of learning through Treffinger realistic method assistance schoology on mathematical literacy abilities has a good category and the Treffinger realistic model assistance schoology can improve mathematical literacy skills in junior high school students.

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