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Exploring Students' Learning Difficulties Using Scientific Approach in Junior High School

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Abstract: This study was conducted at the Junior High School of West Aceh using scientific approach in the process of teaching and learning. This study aims to determine the types of difficulties and factors that cause student learning problem during the use of the scientific approach. The method in this study is the analysis of miles and Huberman, namely data reduction, data display, and conclusion with the technique of triangulation of sources, techniques, and time. The results of the study showed that the learning difficulties of students' mathematics consisted of five components: Reading Error, Comprehension Error, Transformation Error, Process Skill Error, and Encoding Error. Besides, the factors that cause learning difficulties in mathematics come from internal factors and external factors. Internal factors derived from students include student attitudes in learning mathematics, student learning motivation is still low, body health is not optimal, and students' sensory abilities are lacking. While external factors that come from outside the students, among others, the lack of teacher teaching variation, and the use of learning media that has not been maximized. Efforts should be made to reduce the difficulty of learning mathematics by the difficulties experienced and background factors among others teaches math with fun, using instructional media concrete reproduce exercises, and collaborates with parents.

INTRODUCTION

Scientific approach becomes an approach in the modern teaching and learning process that shapes students to be able to organize their mindset, deepening and expanding material, strengthening processes, content, process and assessment standards (Ellizar, Hardeli, Beltris, & Suharni, 2018; Simbolon, Simanjuntak, & Simarmata, 2018). As well as emphasizing learning in the modern pedagogical dimension, the scientific approach has learning steps such as the process of observing, asking, reasoning, trying and forming networks (Al A'raf, Tahmir, & Rahman, 2015). However, the application of the scientific approach has not been fully able to be implemented in schools. This is due to internal and external factors of students and teachers as actors in the teaching and learning process (Farida, 2015).

Optimization of student learning outcomes is an indicator of teacher success in teaching, teaching competition will be tested when the teacher is required to explain in detail the subject matter that is not easy, and the teacher's ability to manage to learn will be questioned when the teacher fails to embed the concept of learning with students (Nurafifah, Budi, & Siahaan, 2017; Putrawan, Suharta, &

Sariyasa, 2014). This failure is a result of the teacher's unpreparedness in teaching, this condition will only turn off students' enthusiasm for learning, and of course, this is a detrimental impact on student learning outcomes (Tawil, Ismaimuza, & Rochaminah, 2014). The difficulties of teachers and students in carrying out the teaching and learning process with the latest curriculum need to be analyzed further, about the form of problems and what factors actually cause difficulties for teachers and students in class (Azizah, Ariwidodo, & Adriana, 2015; Gumilang, Usodo, & Pramudya, 2017; Mutia, 2017; Perbowo & Anjarwati, 2017), this is expected so that the results of this study are considered and important information to improve problems that occur in the field especially in West Aceh.

The researcher collected data using question tests through mini research and interviews with Mathematics teachers in one of grade VII at junior high School in West Aceh. The researcher took ten samples with the sampling technique was a simple random sampling. Test results obtained as follows.

Table 1. Students' Achievement

No	Trial	Lowest score	Highest score	Average
1	Class A	59	80	80,5
2	Class B	63	81	81,2

The low test results of students are influenced by several factors, including students experiencing difficulties when the process of observing mathematical problems is given, students have difficulty reasoning when given problems, students have difficulty trying to solve problems and students have difficulty concluding when asked to conclude the material obtained. In the end, these obstacles arise as a result of the students themselves or from the teacher who is still lacking in the learning process.

Rusindrayanti and Santoso revealed that teachers must be active in activities organized by a group of expert teachers, following workshops or training organized by the government or Ministry of Education and Culture, teachers must be creative and innovative in carrying out learning with a scientific approach, assistance from the curriculum development team (Rusindrayanti, Santoso, & Rusgianto, 2015). This is an effort to familiarize the teacher in applying scientific approaches in the classroom.

Furthermore, research by Ali shows the result that teachers influence students' understanding of concepts (Ali, 2011). Besides, the study also emphasizes the importance of mathematical knowledge and relates it to the understanding of new concepts. Another thing to note is the coordination between teachers, schools, curriculum, and a conducive environment to support students learn math in depth. Based on the results presented, the teacher becomes a factor that influences students' understanding of the concept and influences the difficulty of learning mathematics.

Therefore, the ideal learning process should involve an educator who has the readiness in running a method for students to get involved and experience the learning process without difficulty (Suryana, 2017). Also, the readiness of teachers in the learning process and the limited facilities and infrastructure that support and the low management of teachers in the learning process also become an obstacle in implementing the Scientific Approach, whereas learning of mathematics should be based on scientific context and student activities (Beckman, 2009). Researchers try to do research in several junior high schools in West Aceh as samples that have applied scientific approaches in their teaching and learning processes, with the aim of exploring students' learning difficulties both internally and externally while using scientific approaches, findings in this research will be input, advice, and improvement for educators to develop this

approach to be better and able to regulate learning situations so that the teaching and learning process becomes more effective.

METHOD

This research uses descriptive qualitative research method to understand the phenomenon of what is experienced by the research subject, such as behavior, perception, motivation, action, etc., the holistic description in the form of words and language, in a special context that is natural with utilizing various scientific methods (Moleong, 2010). Researchers carefully investigate a program, event, activity, process, or group of individuals using various data collection procedures based on the time specified (Creswell, 2013). This research was conducted in Grade VII of Junior High School in West Aceh that is School A, School B, and School C which have implemented the 2013 curriculum in teaching and learning process Data analysis in this research using Miles and Huberman technique which is a qualitative data analysis with effort repeated and continuous (Miles & Huberman, 2007). Activities in data analysis, i.e., data reduction, display data, and conclusion drawing or verification as shown in Figure 1.

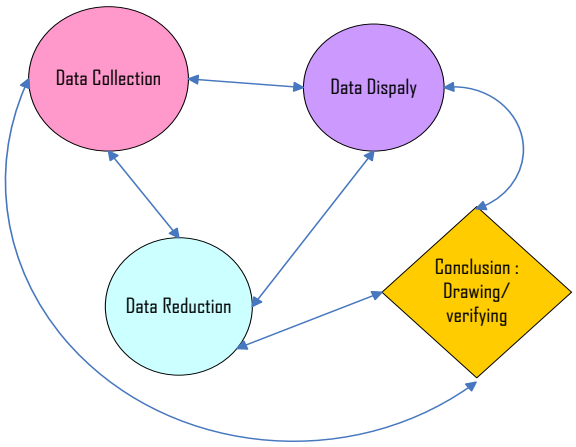

Figure 1. Qualitative Analysis of Data According to Miles and Huberman

This research was conducted with simplification, abstracting and transformation of data that emerges from written notes in the field. In this case, the researcher gives a mathematical test to see the errors in the process of completing the students' answers using Newman analysis, and then students will be interviewed to get more accurate data related to the factors causing student answer errors which will lead to student learning difficulties. The researcher chooses which data to group and which to discard or not used in presenting data. Data obtained through interviews, observation, and the questionnaire will be grouped based on the type of difficulty experienced, the cause difficulties, and efforts to overcome these difficulties. For example from the results of student interviews summarized, then selected answers stating that students do not like math lessons because of difficulties experienced or other answers that refer to problems experienced by students while being taught using the scientific approach. No answer leading to mathematical difficulties will not be used or analyzed further so make it easier for researchers to draw conclusions.

RESULT AND DISCUSSION

The results of this study will be presented in two parts, namely learning outcomes analyzed by using Newman analysis to find the types of learning difficulties and interviews to teachers and students who made the subject of research to see the factors that cause student learning difficulties. Overall, the results of the average analysis of student learning outcomes have been good, because it is able to achieve minimum criteria of mastery learning value ≥ 75, based on the results obtained with the average test that in class VII School A of 31 students, 25 students complete and 6 people unfinished, School B with 28 students, 25 completed and 3 people unfinished, and School C as many as 22 students, 18

completed and 4 people unfinished. The following learning results of students who were taught with the Scientific Approach are presented in the following Table 2.

Table 2. Student's Learning Result

No	Category	Location of Study		
		School A	School B	School C
1	Complete	25 (80,6%)	25 (89,3%)	18 (81,8%)
2	Uncomplete	6 (19,4%)	3 (10,7%)	4 (18,2%)
	Total	31 (100%)	28 (100%)	22 (100 %)

Analysis of learning difficulties is obtained from the way students complete the answer process. Some student mistakes in solving problems can be viewed from Analysis of Reading Errors, Understanding Errors, Transformation Errors, Process Skill Errors, and Encoding Errors. Based on the result of the analysis of the student answer process then obtained some form of errors and difficulties of students in completing tests caused by internal and external self-discipline students are taught with Scientific Approach. The results of Newman's analysis that researchers found in the study.

Reading Error

The error in the reading phase is 4.93 %, meaning that there are four students from the total of 81 students who are mistaken in reading and understanding the problem well and correctly, the difficulties experienced by students is not able to interpret the sentence that they read well. The error at this stage is that the student understands the context of the sentence but unable to write the meaning correctly. The researcher took 1 sample of student's answer in School C that was wrong in interpreting the sentence about.

Form Question 1.
Sarah will cover the floor of her room with carpets; Sarah's room is a rectangle measuring 5 m x 4 m. If the price is Rp. 200,000.00- per m^2, how much the price will Sarah spent on the carpet?

Sample Answer

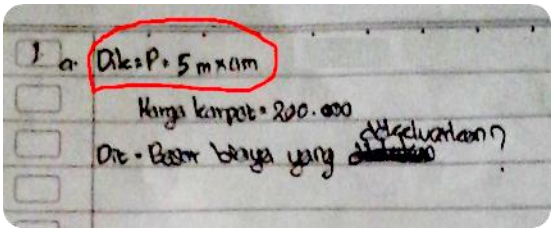

Figure 2. Sample Answer of Reading Error

Sarah's room rectangular with size 5 m x 4 m, it means Sarah room have length 5 m and width 4 m. However, students assume that the length of the room is 5 m x 4 m. This is a condition of reading error or student error in interpreting sentences about, and this happens in because students are less careful in reading the questions given by teachers. The data is obtained through interviews with the students concerned.

Researcher	:	"Do you Know the Purpose of the sentence about the form question 1?"
Student	:	"I know, Sir."
Researcher	:	"So. Why were you wrongly misunderstanding that?"
Student	:	"I'm sorry, Sir. I'm in a hurry to do the problem, so I misinterpret the meaning of the matter after I re-read it, it turns out that I realized I was wrong, Sir."

"The high motivation of the students to solve the problem quickly and want to appear more than his friends cause students to rush into the problem." (Interview with the teacher of School C).

Based on the results of the interview above, it is necessary to be considered by

the educator to give priority to the accuracy in doing the problem from the speed of working on the problem, the positive impact is the emergence of motivation from the student self to get more value, but on the one hand, the students become less concentrated and meticulous because of time hunted because only 5 answerers fastest that gets the best value.

Comprehension Error

At the stage of comprehension the problem, the percentage of students who made a mistake of 39.51 % or 32 students of the total students, the error at this stage is that students can not understand all the meaning of the word, in other words, the students can not mention what is known and what is asked by form question 2. Here is a sample of students' answers indicated by comprehension Error.

Form Question 2.
Aisha had a square-shaped handkerchief with a side of 30 cm, she wanted to put the lace around her handkerchief. How much are you willing to spend to buy lace? If the cost of the lace is Rp.500.00/Cm

Sample Answer

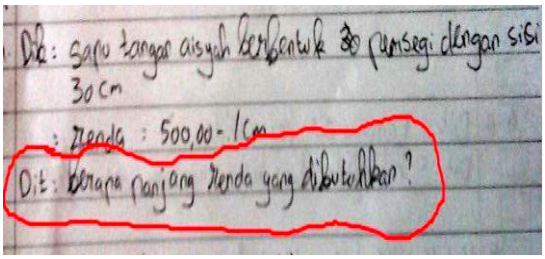

Figure 3. Sample Answer of Comprehension Error

Aisha will put the lace around her handkerchief, while the side size of her handkerchief is 30 cm and what is the money that Aisha must spend on the lace fitting around her handkerchief. However, students assume that what is asked is the required length and how many handkerchiefs are around, the data is very clear, but the students are wrong to provide information about the problem in the section asked. The researcher tried to interview the students' school A who did Comprehension Error in the form of question 2.

Researcher	:	"Why do you provide information that is not in line with question 2?"
Student	:	"Yes, Sir. I think we have to calculate around first."

"... students are always actively working on the given problem, either on the blackboard or as homework, but they are used to not writing what is known and what is being asked." (Interview with school teacher A).

The conclusion that the students know the purpose of the problem but not complete in providing information, this happens because students are not accustomed to being trained to provide information of the given problem, students are more likely to answer directly the questions given by the teacher, so that the creative ideas of students cannot be poured in the form of writing.

Transformation Error

In the Transformation Error stage, the percentage of students who make mistakes is 20.99 % or 17 out of 81 students. The error at this stage is when the student can not write the formula or calculation according to the question form 2. Most students write formulas incorrectly, and some students do not write the formula.

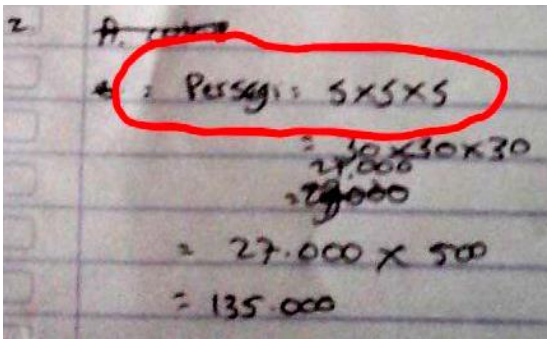

Figure 4. Sample Answer of Transformation Error

Students wrongly use the square circumference formula, and this error causes the students to find the final result of the form question 2 incorrectly. The researcher tries to interview the students of School A who perform the Transformation Error.

Researcher	:	"Did you forget the formula finding around the square?"
Student	:	"Yes, Sir. I forgot."
Researcher	:	"Why forget? not studying at home, huh?"
Student	:	"Yes, Sir. I rarely study at home, when there are tasks from teachers just learning."

Based on the results of the interview above, this happens because students rarely face problem-solving problems, the teacher gives more questions in the form of short, students can not plan solutions to do the problem, the students forget the material and formula, less practice doing the story form problems with different variations, wrong in determining the mathematical operations used, as well as students' difficulties in constructing mathematical connections between mathematical concepts and real problems. The problems that occur above need to be corrected in terms of the strengthened concept of students with exercises with different levels of questions by relating questions related to daily life.

Process Skill Error

Percentage of students who made a mistake of 51.85 % or 42 of 81 students. The error at this stage is when the student cannot perform the calculation operation or calculation steps appropriately. However, errors in process skills can also occur because the error determines the formulas in the transformation phase of the form of questions 1. This can occur because students are rarely given problems in the form of problem-solving, in addition, because students are less thorough in understanding the purpose of the problem and in solving it. Most students make mistakes in solving problems, especially on the writing part of the unit.

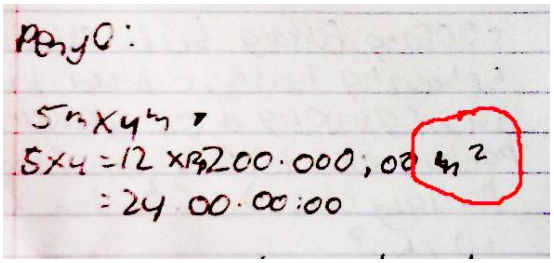

Figure 5. Sample Answer of Process Skill Error

Students make mistakes in putting units and errors in the process of multiplication. Student puts unit m2 in unit Price (Rp) while student makes a mistake in multiplication product and does not make the unit for the price (Rp).

Researcher	:	"How can the price Rp. 200.000,00 - you use m^2 as the unit? And you are also wrong in the product multiplication?"
Student	:	"Yes, Sir. I'm wrong, Sir."
Researcher	:	"What exactly do you already know about units and multiplication?"
Student	:	"But sometimes forget, if the results of that time I was wrong, Sir."

This should be noted by the educators to more often train students in the problems that hone the analysis and problem-solving skills, and students must also be familiarized to solve the problem carefully and sequence by paying attention to each sequence with the units by the demand question.

Encoding Error

In the final answer writing stage, the percentage of students making mistakes is 8.64 % or 7 of the total students. This error occurs when the student is wrong or does not write the conclusion as the final answer to the question, this is because the student is not careful and does not evaluate the final answer before it is collected like the following sample answers from students of School B.

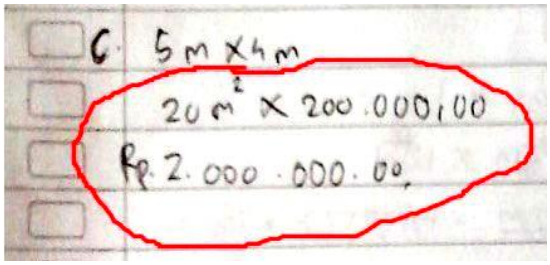

Figure 6. Sample Answer of Encoding Error

Student Error in processing multiplication, students perform the process correctly but wrong in obtaining the results of multiplication. There are so many cases in the field that we consider today as a common but very influential for learning outcomes and student achievement. It is necessary to be considered by educators to pay more attention to the factors that affect the process and learning outcomes, both internally and externally. So that the learning process can run optimally.

Internal Factors

Based on the observation of the students' activity in class VII of School A, School B, and School C, it is found that there are some factors of learning difficulties of mathematics students taught with Scientific Approach. That is:

a. Student attitudes in the learning process

Attitude is a tendency to act in a certain way. A positive attitude toward a subject is a good start for the learning process (Mutodi & Ngirande, 2014). Conversely, negative attitudes toward subjects will potentially lead to learning difficulties or make learning outcomes that are less than the maximum. Researchers found that students' attitudes toward math subjects are diverse, some prefer mathematics, and some do not like mathematics, for them mathematics is a difficult subject, so they do not like math lessons. This was stated in the interview as follows.

Researcher	:	"How do you think the math's are?"
Student	:	"I do not like math. The lesson is difficult because it must count."
Researcher	:	"The teacher explains well, through pictures and real-life examples, are you not interested in math after class?"
Student	:	"I am so glad, Sir. I have a passion for learning because many of our activities, so far only record and solve the problems, but because I often forget the formulas that have been studied, so be afraid to learn math. I not confident, Sir."

Negative attitudes of students in learning mathematics affect students in following the learning process (D. ; M. ; Indarti & Pramudya, 2017). Students who have negative attitudes toward learning mathematics tend not to follow mathematics learning well. Students do not pay attention to the explanation that the teacher submits and perform other activities during the lesson such as silence or chatting with his friend. The statement is justified by the classroom teacher at School C in the following interview.

"If these children are eager to learn math if there are only games with prizes. Some are passive because they are afraid to learn mathematics first, are asked to be afraid that they cannot answer, but not yet tried ".

Excerpts of the results of the above interviews show that attitudes in learning mathematics affect students in following the process of learning mathematics (Ramdhani, Usodo, & Subanti, 2017).

b. Motivation to learn

Strong motivation is needed so that students can achieve success (D. Indarti, Mardiyana, & Pramudya, 2018). Giving motivation from the teacher becomes an important thing so that students are encouraged to learn well (Putra, Widyawati, Asyhari, Wahyu, & Putra,

2018). In addition to motivation by teachers, student motivation is also influenced by the provision of support from parents. Students who get the attention and support from parents will have a strong motivation.

Student motivation during math lessons tends to be low, seen when student observations do not prepare their textbooks. Students do not pay attention properly, whereas at the beginning of learning teachers have motivated to learn. Also, student motivation can be known from the preparation of students in learning mathematics. Students with strong motivation will enjoy learning math even if there is no homework or repetition the next day. However, students who indicated the difficulty of learning mathematics has low motivation. They do not repeat the material that has been submitted or studied in advance the content to be delivered. The lack of learning motivation is justified by students in School C in the following interview quotes.

Researcher	:	".... until home, are you reading back a record of what you learned in school?"
Student	:	"(Shook his head)."
Researcher	:	"Usually if there is no repetition, do you learn math?"
Student	:	"No."

In general, teachers motivate students orally through words and real examples of students who succeed in the lesson so that students who are still challenging to imitate his friend. In addition to providing oral motivation, teachers also motivate by giving rewards or awards to students who can not be encouraged to be in learning. But the motivation of teachers without parental support will not have a meaningful impact on students.

"These kids have the will to study at school, but all still have to be balanced from the family. Although schools are motivated to let the spirit of learning at home there is no attention from parents is the same, so children do not learn at home pack." (Interview with teacher's School C).

Family plays an essential role in motivating students. Parents who do not give the maximum attention will have an impact on the low motivation of student learning in school. Little motivation to learn to make students not pay attention to the lesson and tend to be noisy in the class.

c. Body health

Health is one of the important factors to run the learning activities of mathematics. Students who are less healthy will have difficulty learning. Students who are sleepy and not concentrated during the lesson can be a sign that the students' physical condition is not in an optimal state. The circumstances resulted in students not able to absorb well the material delivered during the lesson. Some students who are experiencing difficulty learning confess to feeling dizzy during the lesson, as stated by students in School A in the following interview passage.

Researcher	:	"During math class, have you ever felt the pain that interferes with math?"
Student	:	"Yes, I have. Dizzy."
Researcher	:	"Are you feverish or sick?"
Student	:	"Yes, Sir. I have a fever, but I want to go to school to study, but to school so I do not concentrate because of dizziness."

Unhealthy student body condition can disrupt the student's learning concentration. Also, poor health to make students often do not go to school resulting in students lag behind the subject matter. The condition is also a cause of students having difficulty in math lessons, as yes is told by teachers of School A.

”There is because it does not come in, so it is automatically left behind the lesson. Students who have health problems need special attention and get appropriate treatment from an expert or doctor”.

“There are if children often do not enter the reason sick, dizzy, hot, and his son seems weak usually I call his parents.” (Interview with Teacher’s School B).

Based on the results of these interviews teachers have given attention to the health of their students. Furthermore, it is necessary to coordinate between teachers and parents to maintain student health.

d. Sensing ability

Eye disorders will disrupt the students in receiving information, especially in learning mathematics. From the results of data collection, not many students who have eye disorders. Researchers found two students who have eye disorders. They can not see far or eye minus. Students who are less in the view need to get special handling, it is of particular concern to teachers of School B. Knowing his students there are eye disorders that is the eye minus, he puts the student on the front bench in the middle to still be able to see the board clearly, as delivered in the following interview quotes.

”There, the students whose eyes minus I sit in front of the middle let me focus on the blackboard.”

Ear disorders can also affect students in absorbing the information conveyed by the teacher. There are some students who do not listen to the teacher's explanation well when sitting behind. The researchers found the questionnaire with the statement.

”I can not hear the teacher's explanation well when explaining the lessons of mathematics.”

But the researchers found no more in-depth explanation because the students' interviews were less able to provide detailed information about their lack of listening.

External Factors

a. Teaching variation

The use of varied learning methods and models is needed to attract students 'attention and reduce the students' boredom in learning mathematics (Apriandi & Krisdiana, 2016; Rusnilawati, 2016). Based on the observations and interviews of researchers in School A found that teachers use Scientific Approach in learning based on the curriculum of 2013. At the beginning of learning teachers use lecture model to open the lesson and then combined with Scientific Approach so that students are more active and more critical in understanding the material provided.

Appropriate learning methods and models will make it easier for students to understand the material and reduce students' saturation. But in School C, researchers have not found the use of Scientific Approach that has not been maximized due to inadequate school facilities and understanding of Scientific Approach is also lacking. In observations made during math lessons, teachers use more lecture methods. The teacher explains the material in front of the class, and the students are not enthusiastic about listening to the material presented, the students tend to talk to their onboard friends. After explaining the material, the teacher gives the students to ask questions, but no students ask questions. Students are then asked to work on the exercises that are in the packaged book with the specified time and then collected.

The proper use of the Scientific Approach and support of students to be active will make learning meaningful. Meaningful learning will make the subject matter interesting and well understood by

the students. Conversely, conventional learning does not attract students' attention and affects the lack of understanding of the material presented. This is justified by an interview quote with students in School C below.

Researcher	:	"Do you understand the teacher's explanation?"
Student	:	"Do not understand, Sir."
Researcher	:	"Keep if you do not understand, why not ask?"
Student	:	"I do not know what I want to ask, Sir."

This indicates that the teacher has tried to use a varied Scientific Approach. But there are also teachers who still do not understand the application of Scientific Approach so that students are less interested in learning mathematics (Nursalam & Rasyid, 2016).

b. Using media

Students can not think abstractly, the use of instructional media becomes an important factor that needs to be considered in mathematics learning so that students can understand the concept of mathematics well (Maharani, Supriadi, & Widyastuti, 2018; Rahman, 2017). The importance of using media to help students' understanding has been realized by teachers (Irawan & Suryo, 2017). Therefore teachers try to use the media in learning mathematics. This is stated in the interview quotes with teachers as follows.

"... children should not be verbal. Sometimes children make their props." (Interview with teacher's School A).

"Yes, that's sure, but the media does not have to be beautiful, but the media that I use is simple, suppose that if the math is the medium, as multiplication can use more than five fingers ...." (Interview with teacher's School C).

The teacher realizes the importance of using media in mathematics learning, but sometimes teachers experience difficulties in choosing the right media according to the material presented. As with the delivery of integer material, teachers do not understand the right media to teach the material. Submission of integer matter is conveyed by giving an analogy to the student such as a negative integer of debt, and a positive integer is given the liability of paying the debt. This is justified by the statement of teacher C School in the following interview quotes.

"It should be used by the media because it teaches mathematics there is a concrete way, semi-concrete, semi-abstract, and abstract like that right. But not all materials can use the media, as the material says round there is a negative and positive, the child was confused when it entered the integer operation. Negative minus negative again why the result so much more, that kind of child is still confused."

Teachers also choose to use the environment around the school as a medium rather than to create learning media that can attract students' attention and interest, as presented in an interview quote with teacher School A as follows.

"Sometimes I use things around the school as a medium, like a sum or subtraction can use gravel in school."

"The media used in the neighborhood, media around the environment used for learning." (Interview with teacher's School B).

The use of media following the material can help students understand the concept well. Students who are active in using learning media are proven to make students better understand the material well.

CONCLUSION

Difficulties of learning mathematics experienced by students consist of five components namely Reading Error is 4.93 % or 4 students, comprehension error is 39.51 % or 32 students, Transformation Error is 20.99 % or 17 students, Process Skill Error is 51.85 % or 42 students, and Encoding Error is 8, 64 % or 7 students. Factors that cause learning difficulties

come from internal factors and external factors. Internal factors derived from students include students' attitudes in learning mathematics, student learning motivation is still low, the health of the body is not optimal, and the ability of students' senseless. While external factors that come from outside the students, among others, the lack of teaching variation, and the use of learning media that have not been maximized Efforts that can be done to reduce the difficulty of learning mathematics based on the difficulties experienced and factors that background, among others, teachers should be able to teach math with fun, using congruent learning media and multiplying exercise questions.

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