

## **Analysis of Student's Answer Error in Learning Mathematics Using Newman Analysis**

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**Abstract:** Analysis of students' answers errors during learning mathematics using Scientific Approach at Junior High School is one step in finding learning difficulties that arise when students complete test questions. The purpose of this study was to describe students' answers errors and their causal factors. This research is a descriptive qualitative research conducted in 3 junior high schools in west Aceh with a total of 81 students through scientific activities namely observing, asking, reasoning, trying and forming networks. Data collection techniques used are test questions to see the types of student errors in answering questions through newman's analysis. The results showed that the learning difficulties of students: 1) Reading Error of 4.93% or 4 students, 2) Comprehension Error of 39.51% or 32 students, 3) Transformation error of 20.9% or 17 students, 4) Process Skill Error of 51.85% or 42 students, and 5) Encoding Error of 8.64% or 7 students. In addition, interviews were conducted to find the factors that caused these errors; 1) students are less thorough in working on the questions due to short a time, 2) students are not trained in providing informations that is in the problem and 3) lack of mastery of students' mathematical concepts.

**Keyword :** Scientific Approach, Answer Error, Newman's Analysis

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### **I. Introduction**

The government renewed the Curriculum System in Indonesia from KTSP to 2013 curriculum. These changes included structuring the mindset, deepening and expanding the material, strengthening processes, adjusting burdens, content standards, process standards and assessment standards. As well as emphasizing learning in the modern pedagogical dimension with a scientific approach, also known as the scientific approach (Scientific Approach) which contains the process of observing, asking, reasoning, trying and forming networks(1). However, in 2014 the implementation of 2013 Curriculum was stopped for evaluation because more than 200,000 schools experienced problems, especially the teachers who were not ready to apply the Curriculum.

These problems are a concern for researchers to see the extent to which problems occur in the scientific process based learning process. The aim of the government is to apply this approach so that students are able to formulate their own learning independently, not learning in the form of memorization anymore. Students are introduced to see, pay attention, ask questions, and observe so that the teacher can give students more freedom of opinion and be able to be a companion for their students (2). However, the design of the stages in this approach cannot be realized properly due to constraints on the processes that run in the field. Besides that, the ability of students to learn mathematics is still relatively low, this was revealed in 2015 Trends in International Mathematics and Science Study, Indonesia ranked 36th out of 549 survey countries. According to the Ministry of Education and Culture, the average score of the 2014/2015 National Examination (UN) at the junior high school level was 29.3 percent of the total UN participants who scored between 40 and 50, and the 2015 National Mathematics National Examination decreased amounting to 8.06(3).

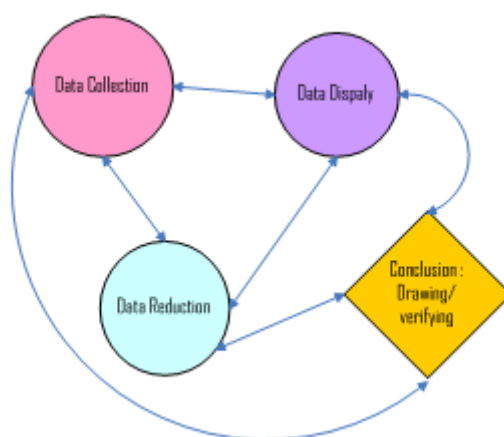
that the problem of students 'low mathematics learning outcomes and students' difficulties in completing mathematical questions indicated an error in the teaching and learning process so that improvements were needed (4). But before making repairs, the teacher must first analyze any mistakes experienced by students in working on the problem by knowing the mistakes experienced by students, it is expected that the teacher can take appropriate steps to improve the teaching-learning process (5)(6). Based on this, the analysis of student errors in working on the problem is very necessary to improve learning in the next material.

One procedure that can be used to analyze student errors in working on a problem is the Newman Error Analysis procedure. there are 5 mistakes that may occur when a child resolves a mathematical story problem, including reading errors, understanding errors, transformation errors, calculation process errors, and errors in coding or writing answers. The selection of the Newman procedure for analyzing student errors in questions is expected to be used to determine variations in student errors and factors that cause students to make mistakes.

Based on the description, it is necessary to conduct research to identify errors made by students in solving questions in learning with a scientific approach so that similar errors can be minimized so that mathematics learning achievements can be improved.

## II. Methods

According to Miles and Huberman the analysis of qualitative data is an ongoing, repetitive and continuous effort (7). Activities in data analysis are data reduction, data display, and drawing / verification conclusions. As shown in the following picture.



**Picture 1.** Qualitative analysis of according to Miles and Huberman

Data analysis in this study is explained based on Figure 1, where the explanation is as follows.

### 1. Data reduction

Miles and Huberman interpret data reduction as a selection process, focusing on simplifying, abstracting and transforming data that emerges from written records in the field. The reduction process is carried out continuously. In the reduction process the researcher selects which data will be grouped and which will be discarded or not used in data presentation. Data obtained through interviews, observations, and questionnaires will be grouped based on the type of difficulties experienced, the causes of difficulties, and efforts to overcome these difficulties. For example, the results of student interviews are summarized, then answers are chosen stating that students do not like mathematics because of difficulties experienced or other answers that refer to the difficulties experienced by students while being taught by the scientific approach. Answers that do not lead to mathematical difficulties will not be used or analyzed further, making it easier for researchers to draw conclusions.

### 2. Presentation of data

After data reduction, the next step is to present the data. Data presentation is done with the aim of understanding information that occurs in the field. In qualitative research the presentation of data is usually in the form of brief descriptions, charts, relationships between categories, and others. Through the presentation of data, data will be organized, arranged in a relationship pattern, so that it will be easier to understand. In this case, the researcher presents the data in descriptive form and tables so that it makes it easier for the reader to understand it.

### 3. Drawing conclusions

The conclusions in the expected qualitative research are new findings that have never existed before. This finding can be in the form of a description or description of an object that was previously still vague, then examined to make it clearer. This conclusion is used to answer the predetermined problem formulation. The results obtained from the whole process of analysis are then conclusively concluded by looking at the data found such as the type of mathematical difficulties experienced by students, the causes of difficulties experienced, and efforts that can be made to overcome these difficulties.

### III. Result

Overall, the results of the average analysis of student learning outcomes have been good, because it is able to achieve KKM value  $\geq 75$ , 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 as many as 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 Scientific Approach are presented in the following table.

**Table 1.** Students' 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            | Un Complete | 6 (19,4 %)        | 3 (10,7 %)  | 4 (18,2 %)  |
| <b>Total</b> |             | 31 (100%)         | 28 (100 %)  | 22 (100 %)  |

Analysis of learning difficulties gained from the way students complete the answer process. because there are still some student errors in solving the problem according to Newman's Analysis of Reading Error, Comprehension Error, Transformation Error, Process Skill Error, and Encoding Error.

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 a newman's analysis that researchers found in the study

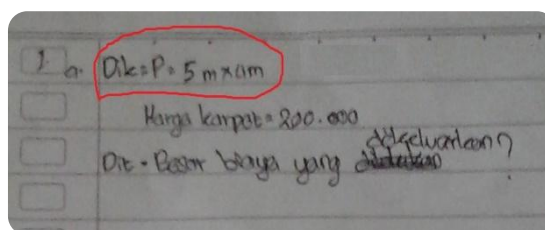
#### a. Reading Error

The error in the reading phase is 4.93%, meaning that there are 4 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 can not 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 of Rp. 200,000.00- per  $m^2$ . determine the cost of Sarah to buy the carpet!

#### Sample Answer



**Picture 2.** Sample Answer of Reading Error

Sarah's room rectangular with size 5 m x 4 m, it means sarah's 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, 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 sentence about the form question 1 ?."
- Student : "I know sir"
- Researcher : "so. Why 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 teacher of School C).

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 (8), 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.

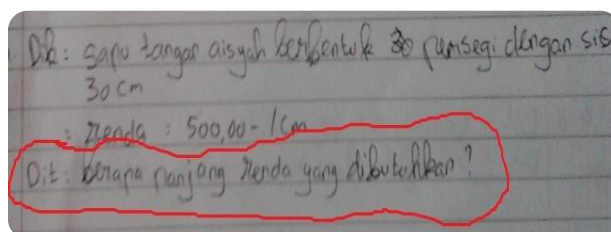
### b. Comprehension Error

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



Picture 3. Sampel Answer of Comprehension Error

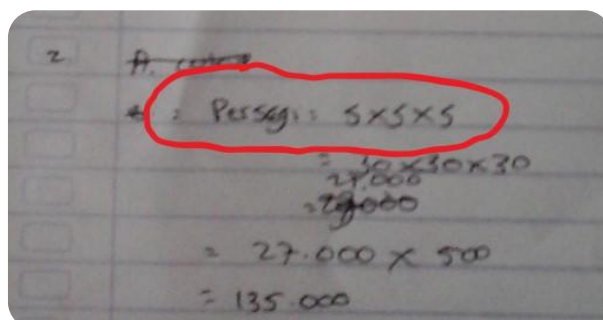
Aisha will put the lace around her handkerchief, while the side size of her handkerchief is 30 cm and what is the money that Aisha must spend on the lace fitting around her handkerchief. However, students assume that what is asked is the required length and how many handkerchiefs are around, the data 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 that asked the circumference pack. Only later after can be around, just calculated the cost"

the conclusion that the students actually know the purpose of the problem but not complete in providing information, this happens because students are not accustomed to be 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 can not be poured in the form of writing.

### c. 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 inappropriately the formula and some students do not write the formula used.



Picture 4. Sample Answer of Transformation Error

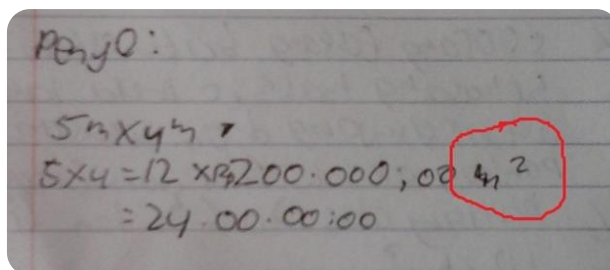
students wrongly use the square circumference formula, this error causes the students to incorrectly find the final result of the form question 2. The researcher tries to interview the students of School A who perform the Transformation Error.

|            |   |   |
|------------|---|---|
| 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" |

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 determine the mathematical operations used, as well as students' difficulties in constructing mathematical connections between mathematical concepts and real problems

**d. Process Skill Error**

Percentage of students who made a mistake of 51.85% or 42 of 81 studentsThe error at this stage is when the student can not 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.



**Picture 5.** Sample Answer of Process Skill Error

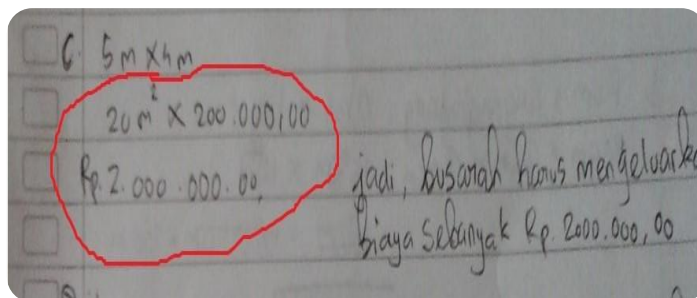
Students Make mistakes in putting units and errors in the process of multiplication. Student puts unit m<sup>2</sup> in unit Price (Rp) while student make mistake in multiplication product and does not make unit for price (Rp).

|            |   |  |
|------------|---|--|
| Researcher | : | How can the price Rp 200.000,00 - you use m <sup>2</sup> 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 really 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 in accordance with the demand question.

**e. 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.



**Picture 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.

#### **IV. Conclusion**

The results showed that the learning difficulties of students: 1) Reading Error of 4.93% or 4 students, 2) Comprehension Error of 39.51% or 32 students, 3) Transformation error of 20.9% or 17 students, 4) Process Skill Error of 51.85% or 42 students, and 5) Encoding Error of 8.64% or 7 students. In addition, interviews were conducted to find the factors that caused these errors; 1) students are less thorough in working on the questions due to short a time, 2) students are not trained in providing informations that is in the problem and 3) lack of mastery of students' mathematical concepts.

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