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Error Analysis of Class VIII with Newman's Procedure on the Material for Building Flat Sides Rooms at SMPN 5 Cilacap

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Abstract

Learning mathematics is required to be able to apply concepts in solving everyday problems. Problem solving in school mathematics is usually realized through story problems. In this study, researchers tried to analyze students' allergies in solving the problem of building a flat side room based on the Newman procedure in grade VIII students of SMPN 5 Cilacap. This research is a descriptive qualitative research. Data collected by test and in-depth interviews. Based on data analysis regarding the location and causes of errors made by class VIII subjects in solving the problem of material building a flat side room are as follows: 1) Errors made by subjects with low spatial ability based on Newman's procedures, namely, (a) reading errors, (b) comprehension errors, (c) transformation error, (d) process skill error, (e) encoding error. 2) Error committed by a subject with moderate spatial ability based on Newman's procedure, namely, a) transformation error, b) process skill error, and c) encoding error. 3) Error committed by subjects with high spatial ability based on Newman's procedure, namely in transformation errors.

Keywords: *Mathematics; Newman's Method*

Introduction

In education, students' abilities are honed through problems, so that students are able to improve their various competencies. This is in accordance with Dahar (2011: 121) which states that the ability to solve problems is essentially the main goal of the educational process. Problem solving is one of the abilities of higher order thinking. The problem is the gap between reality and what is expected. These gaps and gaps need to be minimized, solved and resolved. Problem-solving abilities must be provided to students, not only used to solve mathematical concepts, answering questions about learning that only require cognitive aspects, but used by students as a provision for solving all problems in daily life, which involve various elements and complex problems. Therefore, this ability is very important for students to master.

The steps for solving problems according to Polya (1973) are the ability to understand problems, the ability to plan problem-solving steps, the ability to perform mathematical calculations, and re-examine answers. But in reality, the competence of problem-solving ability has not been mastered by students.

Based on the results of PISA-OECD (Program for International Student Assessment Organization for Economic Cooperation and Development) in 2018 shows that Indonesia's position is ranked 72 out of 77 other countries that are participants (OECD, 2019), the values for reading, mathematics, and science from the test results in 2018 are 371, 379, and 396.

This score has decreased compared to the test in 2015, where successively reading, mathematics, and science we achieved scores of 397, 386, 403. In addition, based on the results of the 2015 Trend in International Mathematics and Science Study (TIMSS) study on measuring mastery of science and mathematics in junior high school grade VIII students , it was found that students' ability in science obtained 4 4th place out of 49 participants, while mathematical ability obtained a score of 45 out of 50 participants (IEA, 2016).

The problems given in the study are analytical in nature that integrates various disciplines, connects material concepts in everyday life, issues involving complex problems (socio scientific issues). However, Indonesian students have not been able to master it. The ability of Indonesian students is only limited to mastering routine things, facts about contexts in everyday life, but have not been able to integrate various information, and draw conclusions in solving problems. Therefore, problem-solving ability is very important for students.

The ability to solve mathematical problems has a very important role in achieving the goals of mathematics education in schools. In addition, problem-solving skills are also necessary for student success in school. Based on some of the research results obtained, the reason why the mathematics achievement is low is the low problem-solving of students. The results of the study showed the fact that mathematical problem-solving ability is also still low. This was revealed from the results of research conducted by Fakhrudin (2010) on Junior High School (SMP) students, in general, the results of mathematical problem solving abilities of junior high school students have not been satisfactory, around 30.67% of the ideal score.

This problem-solving ability needs to be developed because with problem solving, students will be trained to understand a problem well, reason well, analyze, choose the right strategy in solving problems, do calculations to evaluate what has been done. The importance of mathematical problem-solving ability is also expressed by Ruseffendi (1991: 103) stating that the ability to solve problems is very important, not only for those who in the future will explore mathematics but also for those who will apply it, both in other fields of study and in everyday life.

In order to be successful in learning mathematics, teachers play an important role in the teaching and learning process. By the time the teacher gives an explanation of a material, not all students can understand it well. Students who do not yet understand the material are silent and difficult to ask their teachers again. As a result, when the teacher gives exercises, students still make a lot of mistakes. From the mistakes made by students in solving problems, it is very important for a teacher to research and identify what are the types of student mistakes and what are the factors that cause students to make these mistakes. Thus, information about errors in solving these mathematical problems can be given the right solution to improve the quality of teaching and learning activities and finally can improve students' mathematics learning achievement.

Based on preliminary observations made by researchers in class VIII of SMPN 5 Cilacap in the 2020-2021 school year, it is known that students still make many mistakes in solving problems related to determining formulas in solving story problems to build flat side rooms. Based on discussions conducted by researchers with teachers of mathematics subjects at SMPN 5 Cilacap, it was shown that students in the school experienced many errors in solving problems related to the surface area of the building space.

The material of solving problems related to the surface area of the space building is part of the geometry aspect that is closely related to the student's spatial ability. In mastering the material, students

must be supported by high enough visualization and reasoning skills in order to achieve optimal learning outcomes. Schools in general have not given enough stimulus to the development of student intelligence, more focused on the function and role of the left brain, less stimulating the function and role of the right brain. The teacher should give students the opportunity to develop delusions, reflect, think, and realize students' ideas in their own way.

There are several factors that cause this low problem-solving ability, including complicated problem-solving steps and students finding it difficult to understand so that problem solving in mathematics is a very complex skill and there are many ways to find out the problem. One way that can be used to find out the cause of students' low problem-solving ability is by analyzing the mistakes of their learning outcomes to find out what errors often arise, by analyzing the mistakes of these learning outcomes, teachers are expected to be able to find the causes of mistakes and types of mistakes of students in solving mathematical problems, especially related to the material of building a flat side room. Information about students' mistakes in doing math problems can help teachers improve the quality of their learning by emphasizing things that students lack master and are expected to avoid the same mistakes.

There are several methods commonly used in analyzing errors including Newman's procedure, Watson's criteria, and Polya's solution. But in this study, the authors will use Newman's procedure to analyze the mistakes made by students. This Newman procedure makes it easy to analyze errors because it has five stages that students pass through when solving problems. The five stages are (1) reading stages, (2) comprehension stages of the meaning of a problem, (3) transformation stages, (4) process skill stages, and (5) answer writing stages (encoding).

Newman's method of analysis of procedural errors was first introduced in 1977 by Anne Newman, a teacher of the field of mathematics studies in Australia. Based on what anne Newman stated, that when students try to answer problems in the form of story questions, the student has passed a series of obstacles in the form of stages in solving the problem, which include: a) Reading the problem (Reading), when a person reads a question, then by the reader will be represented according to his understanding of what he reads, otherwise known as the result of a representation of the mental abilities of such readers.

Furthermore, the student's reading ability in dealing with problems affects how the student will solve the problem; b) Understanding the problem (Comprehension), at this stage it is said to be able to understand the problem, if the student understands from the meaning of all the words used in the problem so that the student is able to state the problem in his own sentence. At this stage, students must be able to show problem ideas, where the problem ideas in mathematics are represented into known elements, questions and prerequisites.

Furthermore, to check the ability to understand the problem, students are asked to mention what is known and asked in the problem; c) Transformation of the problem (Transformation), this stage the student tries to find the relationship between the fact (the known) and the questioned. Furthermore, to check the ability to transform problems, namely changing the form of problems into mathematical forms, students are asked to determine what methods, procedures or strategies will be used in solving problems; d) Process Skills, at this stage, students are asked to implement a draft problem-solving plan through the stages of problem transformation to produce a desired solution.

At this stage, namely to check processing skills or procedures, students are asked to solve problems in accordance with the mathematical rules that have been planned at the stage of transforming the problem; e) Javaban (Encoding) writing, at this stage, students are said to have reached the stage of writing answers if students can write down the answers asked appropriately. Furthermore, to check the ability to write answers, students are asked to check the answers again and students are asked to interpret the final answer (White, 2010: 129).

Method

Research Types and Areas

This research is a descriptive qualitative research. This research is said to be a descriptive qualitative research because the purpose of this study is to describe a state or phenomenon as it is. Qualitative research is research that intends to understand the phenomenon of what the subject of the study experiences holistically, and by means of descriptions in the form of words and language, in a special context that is natural and by utilizing various natural methods (Moleong: 2006: 6). Descriptive research is a study aimed at describing a state or phenomenon as it is (Nana Syaodih Sukmadinata, 2010: 18). While the case study research method is a study conducted on a "unified system" (Nana Syaodih Sukmadinata, 2010: 64). This unity can be a program, activity, event or group of individuals bound by a specific place, time or bond.

Research Subject

In this study, researchers tried to analyze students' allergies in solving the problem of building a flat side room based on the Newman procedure in grade VIII students of SMPN 5 Cilacap. Based on these objectives, the strategy in this study is a case study. The case that was studied and described was a special situation, namely the students' allergies in solving the problem of building a flat side room based on Newman's procedure in grade VIII students of SMPN 5 Cilacap.

Data Mining Instruments and Strategies

The data collection technique used to obtain data in this study is in accordance with the form of a qualitative research approach and the data sources to be used, then the data collection technique used uses test and interview methods.

1. Test Methods

The test method according to Budiyono (2003: 54) is a way of collecting data that exposes a number of questions or orders to the research subjects. Furthermore, Budiyono (2003: 54) said that the test method can be carried out individually or in groups. Test methods are excellent for uncovering learning outcomes in both cognitive and psychomotor fields.

A test is a number of questions that have a correct or incorrect answer. The test is interpreted also as a number of questions that require answers, or a number of statements that must be given a response with the aim of measuring the level of one's abilities or uncovering certain aspects of the person being subjected to the test (Djemari Mardapi, 2008:67). The written test aims to find out the results achieved by the data source after going through the teaching and learning process.

The important objectives of the test are to: 1) know the level of student ability, 2) measure student growth and development, 3) diagnose student learning mistakes, 4) know teaching outcomes, 5) know learning outcomes, 6) know curriculum achievement, 7) encourage students to learn, and 8) encourage better teaching educators and learn better students (Djemari Mardapi, 2008:68). The form of the test used in this study is a description form test that requires answers that are discussion or description of words. The description form test was chosen because it can measure students' ability to solve problems that demand high thinking skills which are characteristic of problem solving problems. According to Arikunto (2012: 177), the description form test has goodness, namely:

a. easy to prepare and arrange;
b. does not give much opportunity to speculate or profit;
c. encourage students to have the courage to express opinions and compose in the form of good sentences;

d. gives students the opportunity to express their intentions in their own style and manner;
e. it can be known to what extent students are delving into a problem being tested.

The test method in this study was used to collect data on students' spatial abilities and data on student errors. Tests to determine the spatial abilities of students are carried out with spatial tests. While the error diagnostic test is in the form of a description form test.

The test instruments used are diagnostic in nature which aims to find out the learning mistakes faced by students, including misconceptions of concepts (Djemari Mardapi, 2008: 69). The instrument is used after going through the validation stage carried out by the validator and is declared to meet the requirements for the validity of the contents. The form of the test in this study is a description of 5 questions.

2. In-Depth Interviews

An interview is a conversation between two or more people, whose questions are asked by the researcher to the subject or a group of research subjects to be answered (Sudarman, 2002: 130). According to Moleong (1996:67), in-depth interviews are a process of digging for information in depth, openly, and freely with problems and research focuses and directed at research centers.

One of the ways to obtain direct observation is an interview with the person we are referring to. Interviews are conducted with the aim of knowing and capturing directly the entire information of the subject of the study. Interviews were conducted on the students who were the subjects of the study, namely 2 students from each group who had the most errors or the lowest scores.

Before conducting an interview, a guideline for interview is first drawn up. According to Arikunto (2010: 192), interview guidelines are a tool used to obtain data in the form of questions that will be asked as notes. Broadly speaking, there are two types, namely structured interview guidelines and unstructured interview guidelines. In this study, the interview guidelines that will be used are unstructured interview guidelines because they only contain an outline of the questions to be asked and the interviewer in this case is the researcher who will develop the questions during the interview process.

Data Analysis

Data analysis in a study is the main point in a study because by doing an analysis, results from what is studied will be obtained. To analyze the data that has been collected, an analysis of the results that have been achieved by students is carried out through written tests and in-depth interviews.

1. Written Test

The test data of all students who carried out the written test are presented in the form used to analyze the answers. From the results of this student's work, researchers discussed the answer sheet which is the result of a written test. The purpose of this activity is to obtain data on where the mistakes made by students lie. Thus the results of this discussion are used as a reference in compiling interview materials.

The answers of the students analyzed are the answers that are wrong and those that do not answer. Students who do not answer directly have made a maximum mistake, namely on 5 indicators of the location of the error based on Newman's procedure.

2. In-Depth Interviews

Interview data were obtained from 5 predetermined respondents. Then the data is analyzed to find out in outline the factors that cause students to make mistakes in solving math problems in the sub-material of building a flat side room. The interview data were analyzed in the following way.

a. Data reduction

Reducing data means summarizing, choosing the main things, focusing on the important things, looking for themes and patterns so that the data obtained provides a clearer picture, and makes it easier for researchers to carry out the next data collection, and look for them when needed.

The stages of reduction in this study are.

1) Correcting the results of student work, then ranked to determine which students will be the subject of the study.
2) The results of the work of students who are the subject of research are raw data that must be transformed on the notes as material for the interview.
3) The results of the interview are simplified into a good and neat arrangement of language, and then transformed into notes. This activity is carried out by processing the results of student interviews that are the subject of research so that they become data that is ready to be used.

b. Data Presentation

The presentation of data is a set of information composed that gives the possibility of drawing conclusions and taking actions. With the presentation of data, it will make it easier to understand what is happening, plan the next work based on what has been understood. In this stage, data in the form of student work results are arranged according to the order of the object of study. The stages of presenting data in this study are as follows.

1) Presenting the results of the work of students selected as research subjects to be used as interview material.
2) Present the results of interviews with students.

c. Conclusion

Drawing conclusions or verification is part of one activity from a complete configuration so as to be able to answer research questions and research objectives. A conclusion is considered credible if it is supported by valid and consistent evidence when researchers go to the field collecting data. This is obtained by comparing the analysis of work results and student interviews that are the subject of research so that the causes and types of student errors can be found in solving material problems building flat side rooms.

The test of the validity of the data used by researchers is triangulation. According to Moleong (2011: 330), the triangulation technique is a technique of checking the validity of data that utilizes something other than that data for checking purposes and as a comparison beyond that data. So the researcher compares by looking at the student's work data with the interview data obtained, then looking at the suitability of the documents in this case is the value obtained by the student when doing the given trial questions.

Result and Discussion

The data from each subject were analyzed by looking at the subject's steps in solving the mathematical problem of the revival material, namely by looking at how the subject reads the problem, understands, transforms, solves the problem, and also how to conclude / write down the final answer. From the results of the analysis, it is then grouped based on the types of Newman errors, namely (1) reading error, (2) comprehension error , (3) transformation error, (4) process skills error, and (5) encoding error. Subject there is each step in solving a mathematical problem analyzed based on the results of the work subject on the written answer sheet, oral statements during the interview, as well as the behavior observed in the interview.

Data for each of the spatial ability categories were analyzed based on Newman's error type which included reading, understanding, transformation, process skills and inferring the final answer. Indicators of each error can be seen in table 1.1:

Table1.1 Error Indicators based on Newman's Procedure

Types of Errors	**Error Indicator**
Reading error	1) Wrong in reading the description of the material building a flat side room and did not understand the meaning of the sentence in the question. 2) Unable to read correctly about the material of the flat side room. 3) Can read correctly but cannot take important information in the matter of building a flat side room.
Comprehension error	1) Can't determine what's known and what's being asked about the material of the flat side room. 2) It is wrong to determine what is known and what is asked about the material of building a flat side room. 3) Do not use information or have not captured the information contained from the matter of building a flat side room.
Transformation Error	1) It is wrong in determining the steps of completion and which steps come first in solving the problem related to the material of building a flat side room. 2) It is wrong in determining the formula used in the steps of solving the problem of the material building a flat side space. 3) Wrong in determining the mathematical model of the material problem of building a flat side room.
Process Skills Error	1) It is wrong to operate the calculation in solving the problem of the material building a flat side room regardless of the previous error. 2) Wrong in determining the systematics of solving the problem of building a flat side room. 3) It is wrong in determining the calculation operation in solving the problem of the material building a flat side room.
Encoding error	1) Wrong in determining the final answer or not determining the final answer to the problem related to the material of building a flat side room. 2) Wrong in determining the conclusion or not determining the conclusion of the final answer to the question related to the material of the flat side room building. 3) The student was wrong because of the previous process and did not specify the unit in the final answer to the question related to the flat side room building material.

P1 : Interviewer/Researcher
Sa : Subjects with the High Spatial ability category
Sb : Subjects with the Medium Spatial ability category
Sc : Subjects with Low Spatial ability category

Description and Data Analysis of High Spatial Ability Category (Sa)

From the results of S1a's work, the fact was obtained that S1a did not make a mistake in doing number 1 but had not written the conclusion of the question answer.

(1) Reading Error

To find out what the subject of S1a did in the reading step, given question I. Subject was asked to read the question, it can be known the results of reading, as well as the activities carried out by subject S1a in reading the question. The subject of S1a can read correctly, can interpret the question, and takes important information from the question. Here's an excerpt of an interview that shows just that.

P1 Is it okay for brother to ask about your answer? . Try reading out question number 1!
S1a.1.1 : (read out question number 1)
P1 : Okay, from the questions you have read earlier, what can you know?
S1a.1.1 : Build a cube and a quadrilateral pyramid, the ribs of the cube are equal to 12 cm
P1 : Emm, continue what is asked of this matter?
S1a.1.1 : Surface area of its wake?

Based on the excerpts of such interviews it can be concluded that the subject S1acan read the questions fluently, read correctly, can interpret the questions read, and can also take important information from the questions(S1a.1.1) so that in accordance with the Newman error indicator it can be said that the subject of S1a did not encounter any reading errors *(reading error)*.

(2) Comprehension Error

To find out what the subject of S1a did in the step of understanding the question, after reading the question then the subject was asked to reveal what was known and asked from the question. From what the subject expresses can be known the understanding of the subject regarding the problem. The subject does not experience errors in understanding, because the subject writes in full what is known on the question. Here is an excerpt of the interview.

S1a.1.1 : Build a cube and a quadrilateral pyramid, the ribs of the cube are equal to 12 cm
P1 : Emm, continue what is asked of this matter?
S1a.1.1 : The surface area of the wake*?*
P1 : Any wake surface area?
S1a.1.1 : Surface area build cube and build quadrilateral pyramid mrs

Based on the excerpts of such interviews it can be concluded that the subject S1adid not encounter any errors in determining the known in the matter (S1a.1.1) so that in accordance with the indicator of error Newman can be said that the subject tidak melakukankesalahanpemahaman*(comprehension error)*.

(3) Transformation Error

To find out what the subject of S1a did in the step of transforming, after understanding the problem then the subject was asked to reveal how the steps were in solving the problem. From what the subject expresses, it can be known that the subject did not experience any errors in the transformation step, the subject can explain the steps and formulas used to find the combined surface area of two different space constructs namely the surface area of the cube and the surface area of the quadrilateral pyramid, where the build both have no bulkhead or cube without a lid and a pyramid without a base. Here's an excerpt from an interview that shows this.

P1 : Oh yaa, Then what formula do you use?
S1a.1.1 : The cube formula $5s^2$ *and the Pyramid formula 8 x* $\frac{1}{2}$ *x Base area*
P1 : Please explain why the formula $5s^2$ *?*
S1a.1.1 : That's because the combined part has no partitions, sis

Based on the excerpts of the interview, it can be concluded that the subject of S1a can explain the completion steps and the formulas used, so that according to the indicators of Newman's error it can be said that the subject of S1a did not experience *a transformation error.*

(4) Process Skills Error

To find out what the subject of S1a did t the step of completing the answer, the researcher looked at the subject's answer to how the calculations, the systematics of the completion, and the calculation operation. It is noticed that the subject of S1a did not encounter any errors in the calculation of the first step of looking for the height of the triangle, the surface area of the cube, the surface area of the quadrilateral limas and the combined surface area. Here's an excerpt from an interview that shows this.

P1 : To answer that question, you have to look for anything?
S1a.1.1 : First look for the height of the pyramid, then find the surface area of the cube and the surface area of its pyramid, after which the surface area of the two is added up

Based on the results of the study , it can be concluded that the subject of S1a did not experience errors in calculations, so according to Newman's error indicators, it can be said that the subject of S1a did not experience errors in the *process skills error*.

(5) Encoding Error

To find out what the subject of S1a did at the step of determining the final answer, the researcher looked at the subject's answer on how the final answer was determined, drawing conclusions, determining units on the final answer. It can be seen that the subject of S1a did not write down the conclusion of the answer, but could answer completely when interviewed. Here's an excerpt from an interview that shows this.

P1 : Oh that's it., so what's the conclusion?
S1a.1.1 : So, the surface area of the cube plus the surface area of the pyramid sis, is equal to 960 cm^2
P1 : Why don't you write it down?
S1a.1.1 : Hehe.. not yet sis

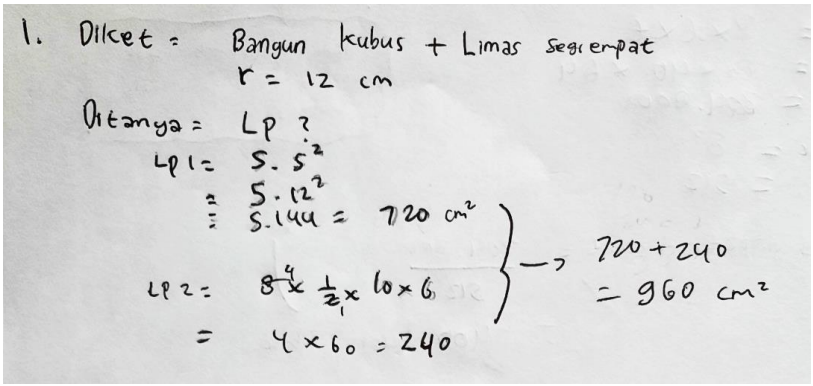

Figure 1. Encoding Error High Spatial Ability Category (Sa)

Based on the results of the study it can be concluded that the subject S1aencountered an error in the writing of the final answer that is not determining the final answer to the question, so that according to the indicator of Newman's error it can be said that the subject S1a encountered an error in determining the final answer *(encoding error).*

From the analysis of the data that has been carried out on the first question number 1, information was obtained that the subject S1a encountered an error in determining the final answer *(encoding error).*

Description and Data Analysis of Moderate Spatial Ability Category (Sb)

From the results of the work of S1b obtained the fact that S1b made mistakes in working on numbers 1.

(1) Reading Error

To find out what the subject of S1b did in the reading step, given question I. Subject was asked to read the question, it can be known the results of reading, as well as the activities carried out by subject S1b in reading the question. Subject S1b can read correctly, can interpret the question, and takes important information from the question. Here's an excerpt of an interview that shows just that.

P1 : Question number 1 please read it out
Sb1.1.1 : (students read out questions)
P1 : What doyou get from this matter?
Sb1.1.1 : the ribs of the cube are 12 cm

Based on the excerpt of the interview, it can be concluded that the subject of S1b can read the questions fluently, read correctly, can interpret the questions read, and can also take important information from the questions (S1b.1.1) so that in accordance with the indicators of Newman's error, it can be said that the subject of S1b did not experience *reading errors*.

(2) Comprehension Error

To find out what the subject of S1b did at the step of understanding the question, after reading the question then the subject was asked to reveal what was known and asked from the question. From what the subject expresses can be known the understanding of the subject regarding the problem. The subject does not experience errors in understanding, because the subject writes in full what is known on the question. Here is an excerpt of the interview.

P1 : What do you get out of this matter?
Sb1.1.1 : the cube ribs are 12 cm
P1 : Then you know or not? What's the question?
Sb1.1.1 : The surface area of the building made by Budi

Based on the excerpt of the interview, it can be concluded that the subject of S1b did not experience any errors in determining the known in the question (S1b.1.1) so that in accordance with the indicators of Newman's error it can be said that the subject of S1b did not commit a *comprehension error*.

(3) Transformation Error

To find out what the subject of S1b did in the step of transforming, after understanding the problem thenthe subject was asked to k reveal how the steps were in solving the problem. From what the subject reveals, it can be seen that the subject has an error in the transformation step, the subject can explain the steps of solving the problem but is wrong in determining the formula used to find the surface area of the cube and the surface area of the quadrilateral pyramid, where the build both have no bulkhead or a cube without a lid and a pyramid without a base. Here's an excerpt from an interview that shows this.

P1 : Okay, what do you have to look for to answer that question?
Sb1.1.1 : Cube surface area and surface area Pyramidsis
P1 : Okay, you know what the formula is?
Sb1.1.1 : The surface area of the cube is formula $6s^2$ *and the surface area of the pyramid* $\frac{alas \times tinggi}{2}$ *then its combined surface area it's cube surface area + pyramid surface area*

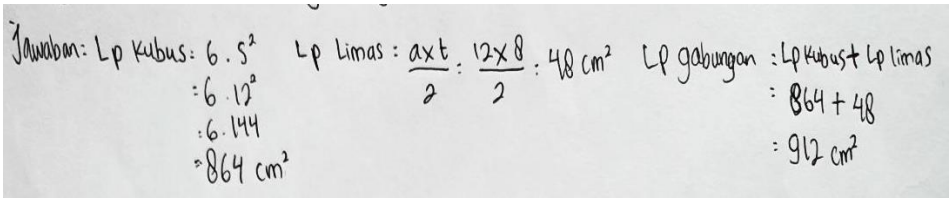

Figure 2. Transformation Error Moderate Spatial Ability Category (Sb)

Based on the results of the study, it can be concluded that the subject of S1b can explain the steps of completion but incorrectly determine the formula used, so that according to the indicator of Newman's error, it can be said that the subject of S1b experienced a *transformation error* .

(4) Process Skill Errors

To find out what the subject of S1b did at the step of completing the answer, the researcher looked at the subject's answer to how systematics of solving, calculating, and calculating operations. It can be seen that subject S1b had an error in the settlement of looking for the surface area of the cube, the surface area of the quadrilateral pyramid and the combined surface area. Here's an excerpt from an interview that shows this.

P1 : Are you sure that's the formula?
Sb1.1.1 : Emm.. this one is sure sis, but the pyramid are not sure sis
P1 : Why aren't you sure?
Sb1.1.1 : Forgot about it sis
P1 : Yes, you miscalculated it, which is true $4 \times \frac{alas \times tinggi}{2}$ *because there are 4 triangles*
Sb1.1.1 : hemmmmm. Okay sis

Based on the excerpt of the interview, it can be concluded that the subject of S1b had an error in the calculation, so in accordance with the indicator of Newman's error, it can be said that the subject of S1b experienced an error in the *process skills error*.

(5) Encoding Error

To find out what the subject of S1b did at the step of determining the final answer, the researcher looked at the subject's answer on how the final answer was determined, drew conclusions, determined the units on the final answer. It is noticed that the subject of S1b incorrectly determines the final answer and does not write down the conclusion of the answer. Here's an excerpt from an interview that shows this.

P1 : Yes, so what is the conclusion of this matter?
Sb1.1.1 : Result 912 cm²
P1 : Is that just the conclusion? Why don't you write it down completely?
Sb1.1.1 : yes sis, just like that
P1 : oh okay, thanks

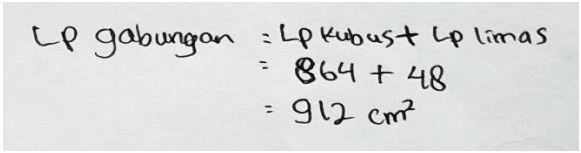

Figure 3. Encoding Error Moderate Spatial Ability Category (Sb)

Based on the excerpt of the interview, it can be concluded that the subject of S1b had an error in the writing of the final answer, so in accordance with the indicator of Newman's error, it can be said that

the subject of S1b had an error in determining the final answer *(encoding error)*.

From the data analysis that has been carried out on the first question number 1, information was obtained that the subject of S1b experienced *transformation errors*, errors in the process skills *error*, and errors in determining the final answer *(encoding error)*.

Description and Data Analysis of Low Spatial Ability Category (Sc)

From the results of the work of S1c obtained the fact that S1c made mistakes in working on numbers 1.

(1) Reading Error

To find out what the subject of S1c did in the reading step, given question I. Subject was asked to read the question, it can be known the results of reading, as well as the activities carried out by subject S1c in reading the question. The subject of S1c can read correctly, can interpret the question, and takes important information from the question.

Based on the results of the nterviews that have been conducted, it can be concluded that the subject of S1c can read the questions fluently, read correctly, can interpret the questions read, and can also take important information from the questions (S1c.1.1) so that in accordance with the Newman error indicators, it can be said that the subject of S1c did not experience *reading errors*.

(2) Comprehension Error

To find out what the subject of S1c did in the step of understanding the question, after reading the question then the subject was asked to reveal what was known and asked from the question. From what the subject expresses can be known the understanding of the subject regarding the problem. The subject does not experience errors in understanding, because the subject writes in full what is known on the question.

Based on the results of the interviews that have been conducted, it can be concluded that the subject of S1c did not experience any errors in determining the known ones in the problem (S1c.1.1) so that in accordance with the indicators of Newman's error, it can be said that the subject of S1c did not make a comprehension *error*.

(3) Transformation Error

To find out what the subject of S1c did in the step of transforming, after understanding the problem then the subject was asked to reveal how the steps were in solving the problem. From what the subject expresses, it can be known that the subject did not experience any errors in the transformation step, the subject can explain the steps and formulas used to find the combined surface area of two different space constructs namely the surface area of the cube and the surface area of the quadrilateral pyramid, where the build both have no bulkhead or cube without a lid and a pyramid without a base.

Based on the results of the interviews that have been conducted, it can be concluded that the subject of S1c can explain the steps of completion and the formulas used, so that according to the indicators of Newman's error, it can be said that the subject of S1c did not experience *transformation errors* .

(4) Process Skill Errors

To find out what the subject of S1c did at the step of completing the answer, the researcher looked at the subject's answer to how the calculations, the systematics of solving, and the calculation operation. It is noticed that the subject of S1c did not encounter any errors in the calculation of the first step of looking for the height of the triangle, the surface area of the cube, the surface area of the quadrilateral pyramid and the combined surface area.

Based on the results of the interviews that have been conducted, it can be concluded that the subject of S1c did not experience errors in calculations, so in accordance with newman's error indicators, it can be said that the subject of S1c did not experience errors in the *process skills error*.

(5) Encoding Error

To find out what the subject of S1c did at the step of determining the final answer, the researcher looked at the subject's answer on how the final answer was determined, drew conclusions, determined the units on the final answer. It can be seen that the subject of S1c did not write down the conclusion of the answer, but could answer completely when interviewed.

Based on the results of the interviews that have been conducted, it can be concluded that the subject of S1c had an error in writing the final answer, so that according to the indicator of Newman's error, it can be said that the subject of S1c had an error in determining the final answer *(encoding error)*.

From the data analysis that has been carried out on the first question number 1, information was obtained that the subject of S1c had an error in determining the final answer *(encoding error)*.

Conclusion

Based on the results of data analysis regarding the location and causes of errors made by class VIII subjects in solving the problem of material building a flat side room are as follows: 1) Errors made by subjects with low spatial ability based on Newman's procedures, namely, (a) reading errors, (b) comprehension errors, (c) transformation error, (d) process skill error, (e) encoding error. 2) Error committed by a subject with moderate spatial ability based on Newman's procedure, namely, a) transformation error, b) process skill error, and c) encoding error. 3) Error committed by subjects with high spatial ability based on Newman's procedure, namely in transformation errors.

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