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THE RELATIONSHIP BETWEEN LEARNING MOTIVATION WITH MATHEMATICAL PROBLEM SOLVING ABILITY IN CLASS XI STUDENTS

HUBUNGAN MOTIVASI BELAJAR TERHADAP KEMAMPUAN PEMECAHAN MASALAH MATEMATIS PADA SISWA KELAS XI

Arisman Zebua, Heris Hendriana, Jozua Subandar, Asep Ikin Sugandi

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ANALYSIS OF STUDENTS' ERRORS IN SOLVING CURVED FACE THREE-DIMENSIONAL PROBLEMS BASED ON KASTOLAN'S STAGE REVIEWED FROM FIELD DEPENDENT AND FIELD INDEPENDENT COGNITIVE STYLES

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Abstract:
This study aims to analyze the types of errors made by students in solving curved face three-dimensional problems based on Kastolan's stages reviewed from field-dependent and field-independent cognitive styles. This study uses descriptive research with a qualitative approach. The subjects in this study were 4 students of class IX A SMP Muhammadiyah 1 Jember who had completed the cognitive style test and *soblukan* ethno mathematical story questions, then continued with interviews to obtain more in-depth information. The subject was chosen based on the work of students who made the most mistakes according to the Kastolan error stage indicator. The results obtained in this study are field-dependent students mostly make conceptual, procedural, and technical errors. The form of conceptual error experienced was that students misinterpreted the problem in the form of pictures, students did not conceptualize the height of the cone, and students misinterpreted the shape of the cylinder. The form of procedural error experienced was wrong in determining the formula and students were wrong in determining the surface area of the *soblukan*'s lid. The form of technical error experienced, students were wrong in doing calculations. The field-independent students made more technical errors. The form of technical error is that students are wrong in doing calculations. Through this research, it is expected that teachers can design learning to minimize student errors in solving problems by looking at the types of errors that have the most.

Keywords: Error, Kastolan's Stage, Cognitive Style

ANALISIS KESALAHAN SISWA DALAM MENYELESAIKAN SOAL BANGUN RUANG SISI LENGKUNG BERDASARKAN TAHAPAN KASTOLAN DITINJAU DARI GAYA KOGNITIF FIELD DEPENDENT DAN FIELD INDEPENDENT

Abstrak:
Penelitian ini bertujuan untuk menganalisis jenis-jenis kesalahan yang dilakukan siswa dalam menyelesaikan soal bangun ruang sisi lengkung berdasarkan tahapan Kastolan ditinjau dari gaya kognitif field dependent dan field independent. Penelitian

ini menggunakan penelitian deskriptif dengan pendekatan kualitatif. Subjek dalam penelitian ini adalah 4 siswa kelas IX A SMP Muhammadiyah 1 Jember yang telah menyelesaikan tes gaya kognitif dan soal cerita etnomatematika *soblukan*, kemudian dilanjutkan dengan wawancara untuk memperoleh informasi yang lebih mendalam. Subjek tersebut dipilih berdasarkan hasil pekerjaan siswa yang melakukan kesalahan terbanyak sesuai dengan indikator tahapan kesalahan Kastolan. Hasil yang diperoleh dalam penelitian ini adalah siswa field dependent sebagian besar melakukan kesalahan konseptual, prosedural, dan teknik. Bentuk kesalahan konseptual yang dialami adalah siswa salah dalam menafsirkan soal ke dalam bentuk gambar, siswa tidak mengkonseptualisasikan tinggi kerucut, dan siswa salah mengartikan bangun tabung. Bentuk kesalahan prosedur yang dialami adalah salah dalam menentukan rumus dan siswa salah dalam menentukan luas permukaan penutup *soblukan*. Bentuk kesalahan teknik yang dialami, siswa salah dalam melakukan perhitungan. Pada siswa field independent lebih banyak melakukan kesalahan teknik. Bentuk kesalahan teknik tersebut adalah siswa salah dalam melakukan perhitungan. Melalui penelitian ini diharapkan guru dapat merancang pembelajaran untuk meminimalisir kesalahan siswa dalam menyelesaikan masalah dengan melihat jenis kesalahan yang paling banyak.

Kata Kunci: Kesalahan, Tahapan Kastolan, Gaya Kognitif

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INTRODUCTION

Mathematics is a basic science that influences various disciplines (Noviani, 2019). When viewed from the point of view of education, mathematics is a subject that must be studied from the most elementary to high school levels, even mathematics has been studied starting from childhood education. According to the Ministry of National Education (in Siswandi et al., 2016), one of the goals of learning mathematics in schools is for students to have mathematical abilities that can be used to solve problems in everyday life. To achieve these goals, things need to be developed by providing knowledge and introducing students to story questions related to everyday life. One of the mathematical subjects that can be poured into the form of story problems is curved faces in three dimensions.

Mathematics is also inseparable from culture. The combination of mathematics and culture is better known as ethnomathematics. According to Yudianto, Susanto, Sunardi, Sugiarti, and Fajar (2020), ethnomathematics is a tradition or habit used by cultural communities in mathematical activities. Ethnomathematics uses mathematical concepts related to various human activities such as counting, measuring, building houses, determining positions, and so on (Apiati, Heryani, & Muslim 2019). By giving this ethnomathematical problem, students can learn mathematics as well as get to know the culture that gradually began to fade in modern times. Therefore, researchers are interested in incorporating ethnomathematical elements into the story problem of curved faces in three dimensions. The ethnomathematics object used is the *soblukan*. *Soblukan* is a traditional cooking utensil for cooking rice, cassava, sweet potatoes, and other cooking ingredients that are commonly found in rural communities. *Soblukan* consists of three components which are both made of aluminum. The components used in this study are the lid and the *soblukan*'s body because they are related to the curved face in three dimensions as shown in figure 1.

Figure 1. Component *Soblukan* Consists of The Sieve, Lid, and Body

According to Susanto (2015), in solving a problem, each individual has a characteristic that makes the individual different from one another. According to Fatahillah, Wati, and Susanto (2017), the causes of student errors include a lack of thoroughness and a lack of skill in doing calculations. The occurrence of errors in students can be caused by factors that come from outside or from within students. One of the internal factors is the student's cognitive style. According to Woolfolk (in Darmono, 2012), cognitive styles are divided into two types: based on psychological aspects and on the time of understanding the concept. This research is reviewed based on the psychological aspect which consists of field-dependent and field-independent. It was found that research on student errors in solving problems in terms of the cognitive style of FD and FI conducted by Hidayat, Sugiarto, and Pramesti

(2013), that in class X students who have a cognitive style field independent tend to make fewer mistakes compared to students who have a field dependent. In the research results of Andriyani and Ratu (2018), field-dependent students made conceptual, procedural, and technical errors, while field-independent students only made technical errors. In another study conducted by Santoso, Cholily, and Syaifuddin (2021), students field independent experienced errors in manipulating calculations, wrong in concluding, wrong in determining formulas, and wrong in calculating. students field-dependent experienced errors in mathematical operation symbols, wrote wrong formulas, misunderstood the problem, wrongly manipulated calculations, and did not write mathematical formulas.

The students' mistakes are clear evidence of difficulties in solving mathematical problems. To be able to find out the student's errors, it is necessary to analyze using a method. One that researchers use in this study is an analysis based on Kastolan's stages. According to the Kastolan (in Khanifah & Nusantara, 2013), conceptual errors, namely errors in interpreting concepts, understanding, principles, and relationships within the scope of the field of mathematics (numbers, algebra, geometry, and measurement). Procedural errors are errors made by students regarding the sequence of actions or steps in solving mathematical problems. Technical errors are errors made by students in performing calculation operations. Based on the research results of Ulfa and Kartini (2021), many students still make mistakes in completing mathematics. The types of errors made by students were conceptual errors at 33.3%, procedural errors at 38.1%, and technical errors at 23.8%. The same thing also happened to Raharti and Yunianta (2020)'s research. In their research on one class of students, there were three types of errors obtained, namely conceptual, procedural, and technical errors. The two studies show students still do not understand the concept of material and questions, or working procedures, and are not careful in operating numbers.

In field conditions, based on information that has been conveyed by the class IX mathematics teacher at SMP Muhammadiyah 1 Jember, the problem that is often encountered is that class IX students make a lot of mistakes when solving story problems, especially the curved side space material. Based on research conducted by Nuraida (2017), various factors cause students to make mistakes in completing the curved face three dimension material, including students forgetting the formula that must be used, students not understanding the meaning of the questions, students being confused about how to start answering questions, until students don't understand the question. Be careful in writing answers. This is what causes students to lack interest and consider the material to build curved side spaces difficult. Therefore, researchers are interested in researching student errors in solving mathematical problems, especially in story questions about curved side space.

Through this research, it is hoped that the teacher or instructor can design a lesson to minimize student errors in solving problems by looking at the types of errors that have the most. The purpose of this study is to analyze the types of errors made by students in solving curved face three-dimensional problems based on Kastolan's stages reviewed from field-dependent and field-independent cognitive styles.

METHODS

This research is a qualitative descriptive study. The area selected in this study is SMP Muhammadiyah 1 Jember. The subjects in this study were students of class IX A SMP Muhammadiyah 1 Jember. The steps for determining the research subjects in this study were (a) students of class IX A SMP Muhammadiyah 1 Jember were given GEFT (Group Embedded Figure Test) and a test about curved face three dimensions, (b) after obtaining a group with field dependent and field independent, each group was selected 2 students for in-depth interviews. The criteria for 4 subjects were selected based on the most types of errors that had been made by students in solving curved face three-dimensional problems for each type of cognitive style.

The initial step in the research procedure is to develop a research design, determine the research location, make a permit letter, and coordinate with the mathematics teacher to determine the subject and schedule of the research. The next step is to compile three research instruments consisting of a student's cognitive style test, a curved faces three dimensions question sheet, and an interview guide. In the question instrument and interview guide, two lecturers of the mathematics education study program at the Faculty of Education, Jember, were validated. Based on the analysis of the data from the validation results, the average score of all aspects (V_a) of the question instrument is 2.79, while the score on the interview guide is 2.75. Both instruments are feasible to use because they have met the valid category with intervals of $2,5 \leq V_a \leq 3$. Furthermore, collecting research data includes test methods and interview methods. The GEFT test and then the curved face three-dimensional problem test were distributed to 28 students of class IX A SMP Muhammadiyah 1 Jember. At the stage of data analysis using the descriptive analysis method. The process of analyzing the results of the GEFT test is based on the scores obtained from each student. If the score is obtained $0 \leq s \leq 9$, then the students are categorized as having the type of field dependent. If the score is obtained $10 \leq s \leq 18$, then the students are categorized as having the type of field independent. Furthermore, the data analysis of the test results was carried out by observing, analyzing, and classifying the data, then continued the analysis of the data from the interviews with data reduction, triangulation, data presentation, and conclusion. The research procedure is presented in figure 2, below.

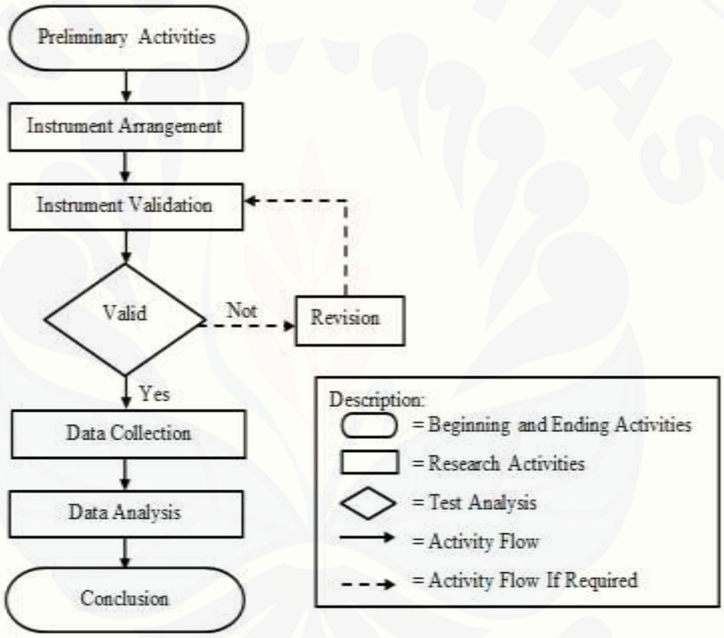

Figure 2. Research Flowchart

RESULTS AND DISCUSSION

Based on the results of the GEFT data analysis, it was found that 22 students had a field-dependent type of cognitive style and 6 other students had a field-independent type of cognitive style. After that, 4 subjects were selected to be interviewed to obtain more in-depth information. The subjects selected were based on the work of students who made the most types of errors from each type of cognitive style according to the Kastolan error stage indicator.

1. Analysis of Student Errors Reviewed from Field Dependent Cognitive Style

Analysis of student errors in solving curved face three-dimensional problems based on Kastolan's stages in terms of the type of field dependent is as follows.

a. Conceptual Errors

Students can be said to have conceptual errors if students misinterpret concepts, understandings, principles, and relationships within the scope of the field of mathematics (numbers, algebra, geometry, and measurement). In this study, students who have a type of field dependent on code FD2 experience conceptual errors at the Kastolan stage. The following are the results of the work of FD2 students.

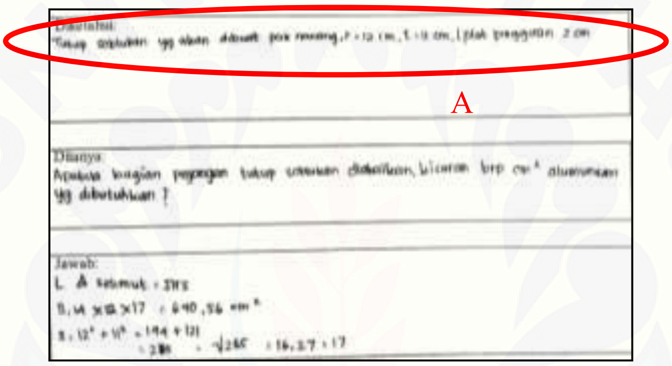

Figure 3. FD2's Conceptual Error in Problem Number 1

Description:

A : does not calculate the height of the cone

Based on Figure 3 above, FD2 students experienced a conceptual error. At A in Figure 3, subject FD2 was unable to conceptualize the height of the cone present on the *soblukan*. As seen in the results of the work, there is no calculation related to the height of the cone which is the result of subtracting the height of the *soblukan* from the width of the edge plate or if it is written $t_{\text{kerucut}} = 11 - 2 = 9 \text{ cm}$. The following excerpts from interviews are related to student work.

P_00:13 Try to tell me the meaning of questions number 1 and 2!

FD2_00:19 For number 1, the *soblukan*'s lid that Mr. Nanang will make has a radius of 12 cm, a height of 11 cm, and a side plate of 2 cm. The question is how many cm^2 of stainless aluminum is needed.
For number 2, Mrs. Maya wants to cook rice using *soblukan* which has a diameter of 24 cm. Then, Mrs. Maya poured as much water

as $\frac{1}{3}$'s height *soblukan*. The question is how many liters of water are poured into the *soblukan* if it is known that the height of the *soblukan* is $\frac{7}{8}$ the diameter?

P_01:09 Now, because there is no illustration of the *soblukan*, try to draw the *soblukan* according to what you know in question number 1!

FD2_01:31 Like this, Sir.

Based on the interview excerpt above, on FD2_00:19, FD2 students did not mention the calculation of the height of the cone. So in the FD2_01:31 footage, FD2 students illustrate that the *soblukan*'s lid is in the form of a cone with a height of 11 cm and a radius of 12 cm. In this case, FD2 students experienced a conceptual error in interpreting the problem in the form of a picture and incorrectly describing the height of the cone. After being dug up again, basic errors emerged that made FD2 students experience conceptual errors. The following is a snippet of interviews with FD2 students.

FD2_06:48 I thought the cylinder was just a barrel, Sir, it turns out there is a flat one like that.

P_06:58 The definition of a cylinder is right, a shape that is bounded by two flat circular planes at the top and bottom of the same size and is bounded by a curved side known as a cylinder blanket.
So, even though the height of the cylinder is only 1 cm, if the base and the lid are the same sizes as a circle, it can be said to be a cylinder.

From the interview snippet FD2_06:48 which is intended to discuss question number 1, it can be seen that FD2 students misinterpret the shape of the cylinder space. Students assume that the shape of the cylinder is only like a *barrel,* nothing is flat like the lid of the *soblukan* number 1. This causes the description on the answer sheet and the illustration of the *soblukan*'s lid that is depicted during the interview process to be wrong.

Based on the results of student work in Figure 3, it was found that FD2 students made a conceptual error. FD2 students did not conceptualize the height of the cone shown in Figure 3 A. It is also supported by the interview snippets of code FD2_00:19 and FD2_00:31 which show students making mistakes in Figure 3 A. So the illustration of the *soblukan*'s lid depicted is wrong. After conducting follow-up interviews, it can be confirmed that students made conceptual errors because students misunderstood the concept of the cylinder. In the interview snippet of code FD2_00:48, students mean that no cylinder is flat like the bottom of the *soblukan*'s lid.

b. Procedural Errors

Students are said to experience procedural errors if students cannot write down the writing steps hierarchically and systematically. In this study, students who have a type of field dependent on codes FD1 and FD2 experience procedural errors at the Kastolan stage. The following are the results of the work of FD1 students.

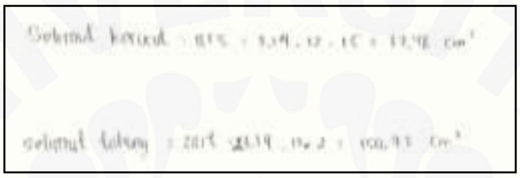

Figure 4. FD1 Procedural Error in Problem Number 1

In figure 4, it can be seen that the subject of FD1 experienced an error in the process of working on the questions. The procedural error experienced by FD1 students is that FD1 students are wrong in determining the area of *stainless aluminum* or the surface area of one *soblukan*'s lid. In this case, FD1 students belong to the Kastolan error indicator "Steps used by students to answer questions are not systematic". After the student does not continue the answer to the questions in the problem. The student only wrote down the completion steps to get a cone lateral and a cylinder lateral, without adding up the results of the two. Procedural errors were also experienced by FD1 and FD2 students in number 2, which is represented in the following FD1 students' work results.

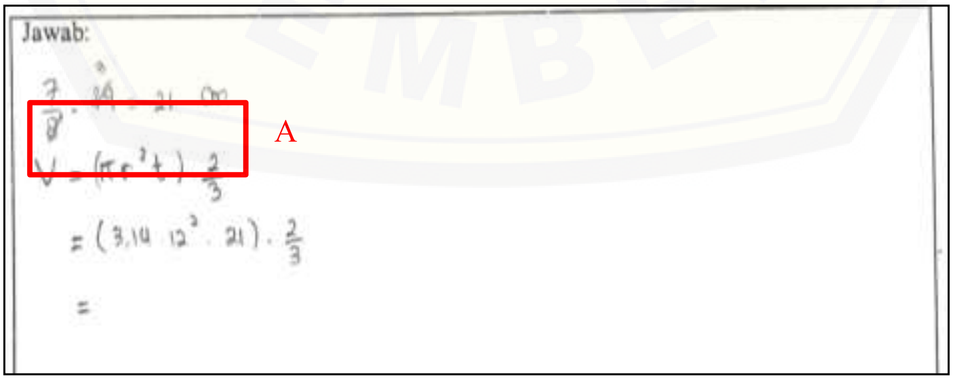

Figure 5. Procedural Errors in FD1 Students Number 2

Description:
A : students are wrong in determining the formula (wrong in manipulating the steps of working on the problem)

In Figure 5, students experience procedural errors shown in A. In A, students experience errors in using formulas. This is included in the category of Kastolan error, wrong in manipulating the steps for solving the problem. In the results of the work, FD1 students used the formula for the $\frac{2}{3}$ volume of a cylinder. This is not by the settlement procedure requested in the problem. The procedural errors made by FD2 are supported in the following interview excerpt.

P_07:59	Then why did you use the formula $V=\left(\pi r^2 t\right)\frac{2}{3}$?
FD1_08:09	Because that's what looking for volume, Sir, I use the formula for the volume of the cylinder. Then I multiply $\frac{2}{3}$, because of $t=\frac{3}{3}-\frac{1}{3}=\frac{2}{3}$ that, sir.
P_10:02	Okay, in the formula for number 2, why do you multiply by $\frac{2}{3}$?
FD1_10:10	Because what will be filled with water $\frac{2}{3}$ is *soblukan*'s body , Sir.

Based on the interview snippet code FD1_08:09, FD1 students use the formula for the $\frac{2}{3}$ volume of the cylinder, which is obtained from the height of the water that is poured as much as $\frac{2}{3}$ the height of the cylinder. The formula error was caused because FD1 students assumed that the height of the water poured came from $t=\frac{3}{3}-\frac{1}{3}=\frac{2}{3}$.

Based on the results of student work in Figure 5 A, the errors made by students were incorrect in manipulating the steps for working on the problem or incorrectly using formulas. The formula written in the student's answer sheet at 5 A is the $\frac{2}{3}$ volume of the cylinder, while the real answer is the $\frac{1}{3}$ volume of the cylinder. This is supported by the interview excerpt with code FD1_08:09, that FD1 students use the formula $\frac{2}{3}$ volume of the cylinder obtained from the height of the water when poured $t=\frac{3}{3}-\frac{1}{3}=\frac{2}{3}$..

2. **Technical Error**

At this stage, the subject who experienced a technical error was the subject with the code FD1. Technical errors are related to student errors in performing calculation operations. Here are the results of FD1's work.

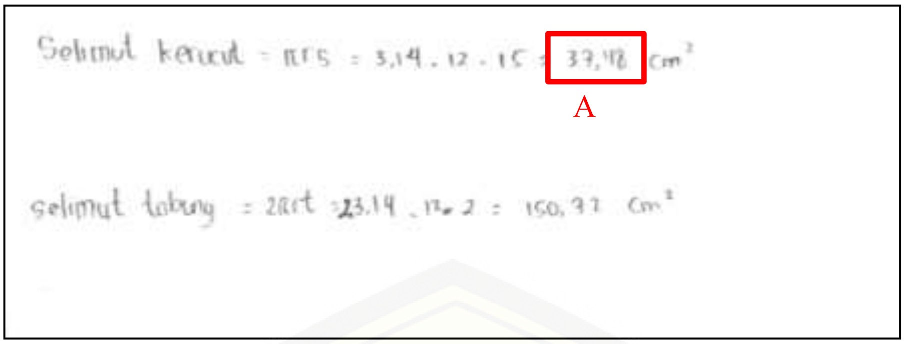

Figure 6. Technical Errors of FD1 Students in Problem Number 1

Description:
A: wrong in calculating the area of the cone lateral

Based on Figure 6 shown by A, students experience errors in operating multiplication. The results of the work of students who wrote down the product of the multiplication of $3{,}14 \times 12 \times 15$ is 37.48, while the actual answer is 565.2 cm^2. Based on this, students are classified as technical error indicators, namely incorrect calculations. The following excerpts from interviews support the results of student work.

P_05:09 From the solution that you described earlier, are you sure that the solution is correct?
FD1_05:19 I'm sure, Sir.
P_05:25 Check again, it can be seen from the problem, the calculation, or anything related to the answer, brother.
FD1_05:36 What are 3.14 times 12 should be 37.68, Sir? Here I write 37.48.
P_05:47 Well, that's right. And it's still not multiplied by 15.

Based on the excerpt of the interview code FD1_05:36, FD1 students experienced errors in operating calculations. FD1 students wrote down the results of 37.48 from the results of multiplying 3.14 with 12. When viewed from the excerpts of interviews that have been carried out, the cause of the technical errors experienced by students is that they are not careful in counting. In the interview footage, the students were sure about the results of their work, but when examined and re-examined the answers of FD1 students were still not correct.

The results of student work in Figure 6 A, show that FD1 students made a technical error, namely incorrectly operating multiplication on the area of the cone lateral. This is supported by the interview excerpt in the code FD1_05:36 which indicates an error in the calculation. The calculation error was caused by the students' inaccuracy in doing calculations, and not checking the results of students' answers again.

3. Analysis of Student Errors Reviewed from Field Independent Cognitive Style

Analysis of student errors in solving curved face three-dimensional problems based on Kastolan's stages reviewed from field independent is as follows.

a. Conceptual Errors

Students can be said to have conceptual errors if students misinterpret concepts, understandings, principles, and relationships within the scope of the field of mathematics (numbers, algebra, geometry, and measurement). Students field independent did not experience the error. This is because FI1 students have conceptually understood the meaning of the questions given. The same thing happened to FI2, which has understood the concept of curved face three-dimensional problems.

b. Procedural Errors

If a student cannot write down the writing steps hierarchically and systematically, then the student is said to have experienced a procedural error. Students also experience procedural errors if students do not have a strong enough conceptual understanding. In this study, students with the type of field-independent coded FI1 and FI2 did not experience procedural errors. The procedure written by the two independent fields had fulfilled the procedure for solving questions number 1 and number 2 so that the two subjects did not experience procedural errors.

c. Technical Errors

At the stage of determining technical errors, students who experience technical errors in solving curved face three-dimensional problems are students from FI1 and FI2. Technical errors are related to students' errors in operating numbers. Below are the results of FI1 students' work and excerpts from interviews.

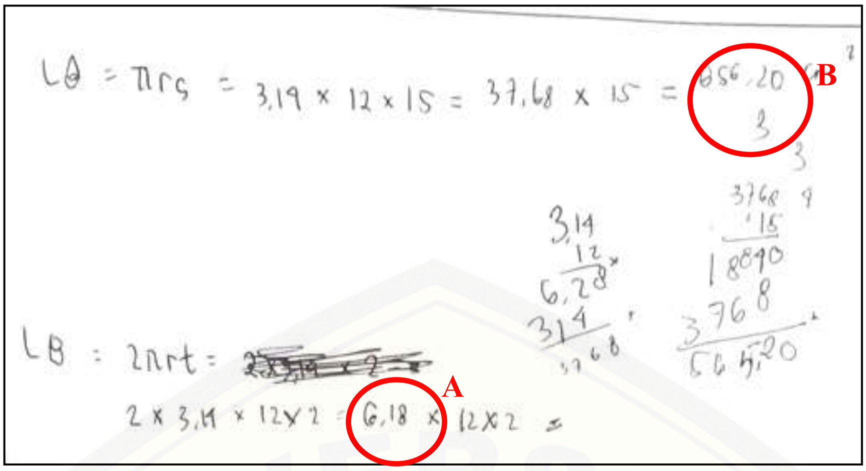

Figure 7. FI1 Student's Technical Error in Problem Number 1

Description:

A : wrong in calculating the area of the cylinder lateral

B : wrong in calculating the area of the cone lateral

Based on Figure 7 A, FI1 students experience technical errors, namely operating $2 \times 3{,}14$. The result obtained by the students in Figure 7 A is 6.18, while the actual answer is 6.28. Another technical error is found in the calculation of the area of the cone lateral, namely B. In circle B the results obtained $37{,}68 \times 15$ are 656.20 cm^2, while the correct result is 565.20 cm^2.

P_02:50	Are these cone lateral and cylinder laterals sure that the results are correct?
FI1_02:58	I think so, Sir.
P_03:00	Let's look at the calculations again!
FI1_03:02	Oh, it's wrong, Sir.
P_03:04	Yes, It should be 6.28. What else is there?
FI1_03:11	Looks like there's none, Sir.
P_03:13	Try researching again, okay?
FI1_03:19	None, Sir.
P_03:21	For the calculation of 37.68 times 15, is it correct?
FI1_03:40	Oh yes, Sir, I wrote it wrong.

Based on the interview excerpts in codes FI1_03:02 and FI1_03:40, FI1 students experienced technical errors because they were not careful in operating numbers. FI1 students admitted that they had an error when operating numbers on the area of the cylinder and cone lateral.

Based on Figures 7 A and B, students experienced technical errors, namely incorrectly operating numbers on the area of the cone lateral and the area of the cylinder lateral. In the area of the cylinder lateral shown in Figure 7 B, the student was wrong in operating the $2 \times 3,14$. In the area of the cone lateral shown in Figure 7 A, the student made a mistake in operating $37,68 \times 15$. This is supported by the interview snippets of codes FI1_03:02 and FI1_03:40, where students experienced errors in calculation operations.

Students with code FI2, experience technical errors as evidenced in the results of the following work.

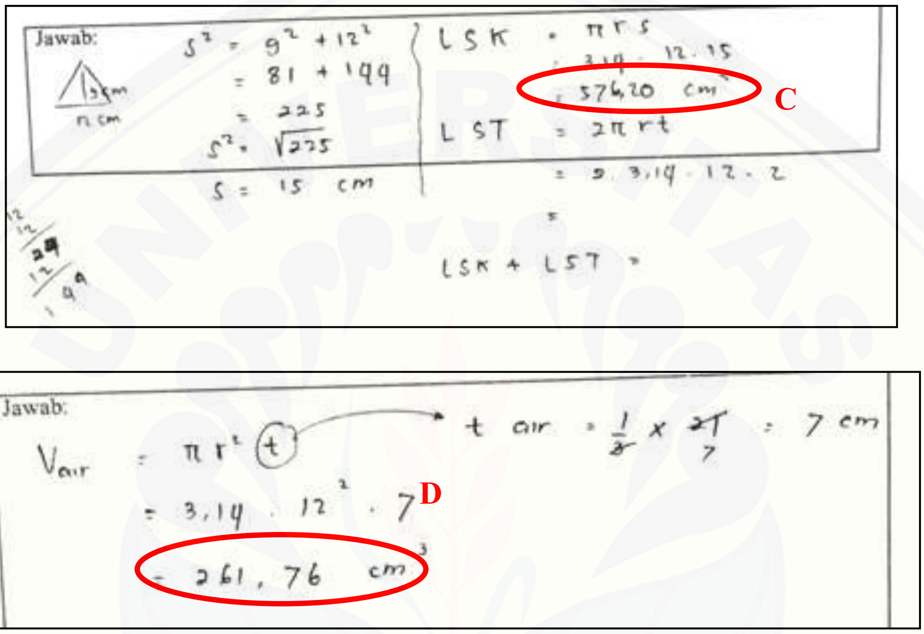

Figure 8. FI2 Students' Technical Errors in Problems Numbers 1 and 2

Description:

C : wrong in calculating the area of the cone lateral number 1

D : wrong in calculating the volume of cylinder number 2

Based on Figure 8, FI2 students experienced errors in questions number 1 and 2 which are indicated by circles C and D. In student work number 1 which is indicated by circle C, students are wrong in operating the numbers in the formula for the area of a cone lateral. Students write down the result as 576.20 cm², while the actual result is 565.20 cm^2. In number 2 which is indicated by circle D, students are wrong in operating multiplication $3,14 \cdot 12^2 \cdot 7$. From the results of the multiplication, the students wrote the result 261.76 cm^3, while the actual result was 3165.12 cm^3 or 3.2 liters.

P_04:10 Okay, for question number 1, the area of the cone lateral, are you sure the result is 576.20 cm^2 ?

FI2_04:21	I'm sure, Sir.
P_04:24	Try counting again.
FI2_04:35	I'm sorry, it's wrong Sir. The result is 565.20 cm^2
P_07:11	From the answer to number 2, are you sure that the answer is correct?
FI2_07:17	Of course, Sir.
P_07:19	Please check again, it can be from formulas, calculations, or something else
FI2_07:29	I think this answer is not 261.76 sir.
P_07:33	Yes, the result is that you haven't multiplied by 12, so the result is still not quite right.
FI2_07:40	Oh yes, Sir, I understand, after that the commas made me a bit confused.

Based on the interview snippet code FI2_04:35, students experienced an error in calculating the area of the cone lateral number 1. Students wrote down the result of 576.20 cm^2, while the actual result was 565.20 cm^2. The code FI2_07:29 shows a technical error experienced by FI2 students in calculating the volume of water that is poured into the *soblukan.* The final result written FI2 is 261.76 cm^3, while the actual result is 3165.12 cm^3 or 3.2 liters. In the code FI2_07:40, students experience this technique error because students feel confused when operating decimal fractions. So it takes accuracy to obtain maximum results.

From the results of the FI1 students' tests shown in Figure 7 AB and the FI2 students' test results shown in Figure 8 C D, it was found that one technical error was experienced, namely incorrectly operating numbers. This is supported by the interview snippets of codes FI1_03:02, FI1_03:40, FI2_04:35, and FI2_07:29 which show that the results of the work of FI1 and FI2 students have technical errors, namely incorrectly operating numbers.

From the results of the analysis of students in class IX A of SMP Muhammadiyah 1 Jember as a whole in solving story problems, the errors experienced by students were conceptual, procedural, and technical errors. This is the research of Ulfa and Kartini (2021) and Raharti and Yunianta (2020), that in one class students experience 3 types of errors according to Kastolan's stages, namely conceptual, procedural, and technical errors.

The analysis of student errors in solving face three-dimensional problems based on Kastolan's stages reviewed from field dependent and field independent presented in Table 1 below.

Table 1. Types and Forms of Student Errors Based on Kastolan Stages

Types of Cognitive Style Types of	Errors	Errors
Field Dependent	Conceptual	a. Wrong in interpreting the problem into image form b. Not conceptualizing the height of cones c. Wrong in interpreting the shape of the cylinder
	Procedural	a. Wrong in determining the surface area of the *soblukan*'s lid b. Wrong in determining formulas
	Technical	Wrong in doing calculations
Field Independent	Conceptual	-
	Procedural	-
	Techniques	Wrong in doing calculations

From the analysis of student work on each type of cognitive style, students with field dependence tend to make the most types of errors. This is in line with the research of Hidayat, Sugiarto, and Pramesti (2013), which revealed that field independence experienced the least amount of errors. In particular, errors in writing formulas, counting, and understanding the questions that have been said by Santoso Cholily, and Syaifuddin (2021) in his research.

From the results of the analysis of the types of errors, there is a difference between field-dependent students and field independent. Students field dependent made conceptual and procedural errors, while the field independent did not experience these errors. In learning, conceptual knowledge is an important thing to support students' procedural knowledge sources. If students want to improve a problem-solving procedure, students must understand the concept of the material in the problem. If the student's understanding of the concept is good, then procedural errors can be resolved and can be minimized. From this study, field dependents need to focus on understanding the material about curved faces in three dimensions to build a strong concept, and practice story questions about question faces in three dimensions to correct procedural errors.

In this study, errors were found outside of the error analysis indicators based on the Kastolan stages. The indicators that appear include students misunderstanding the questions that have been presented which is one indicator of comprehension errors according to Newman (in Suryani, Nengsih, Sianturi, Nur 'Aini, and Meirista, 2018) and students do not complete the questions to the end. In this study, there are also several other characteristics of students in solving curved side space problems in terms of each type of cognitive style. Characteristics of field dependent on solving curvilinear spatial problems, namely they tend not to first illustrate the shape of the space in the problem, and the written solutions are not systematic. Students' Field independence has the characteristics of tending to illustrate first the shape of the space in the problem by providing information about the radius, height, and so on. Students' field independence tends to be in order according to the required completion steps of the questions.

CONCLUSION

Based on the results of the analysis and discussion that has been described, the types of students' errors in solving curved face three-dimensional problems based on Kastolan stages reviewed from field dependent tend to make conceptual errors, procedural errors, and technical errors. The conceptual errors experienced were errors in interpreting the problem in the form of pictures, not conceptualizing the height of the cone, and misinterpreting the concept of the cylinder shape. In procedural errors, there were inappropriate steps, namely, the students were wrong in determining the formula for the volume of the cylinder and the surface area of the *soblukan*'s lid. In technical errors, the form of errors made by students is wrong in doing calculations. The error was caused because students were not careful in working on the questions, and did not re-check the results of the answers. The type of error that students tend to make in solving curved face three-dimensional problems based on the Kastolan's stages reviewed from field independent is a technical error. The form of technical error experienced is wrong in doing calculations.

Based on the research results that have been obtained, several suggestions are shared. Suggestion For field dependent, it is better to focus on understanding the material of curved face three dimensions conceptually and need to get used to practicing in working on problems to reduce procedural and technical errors. Students field independently, and you should get used to often practicing math story problems and re-correcting the final results. For teachers, it is better in teaching activities to pay attention to each type of student's cognitive style and not to favor one type of cognitive style, so that all students can receive the material well and minimize the form of errors. Suggestions for other researchers might be to combine Kastolan’s stages with other theories.

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