Depicting Epistemological Obstacles in Understanding the Concept of Sequence and Series

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ABSTRACT

This study aimed to discover epistemological obstacle on secondary students to solve sequence and series problems based on three indicators, there are a conceptual obstacle, procedural obstacle, and operational technique obstacle. This study was descriptive with qualitative research approaches. Data were collected with the test and interview method. The subjects in this study are students of SMP Negeri 86 Jakarta class VIII based on the errors seen from the diagnostic tests that had been tested. The analysis was done by giving written tests which are essay and interview formatted. Results on analysis showed that: (1) Conceptual obstacle, obstacle that was experienced by students are: students considered that a pattern was said as a numeral pattern because they own odd numeral pattern and own 2,2,2 of difference; were not able to find exact pattern within the problem; considering that Fibonacci numeral sequence was a pattern that form prime numeral pattern; were not able to differ the concept of arithmetics and geometry sequence; were not able to understand the concept of first quarter on arithmetics sequence; error when interpreted the meaning of problems; were not able to interpret what was given on mathematics model; interpreting sum of the first 20 quarters with sequences which own the 20th quarter; and interpreting sum of the first 20 quarters with the 20th quarter; (2) While on procedural obstacle, obstacle that was experienced are: interpreting numeral pattern if they own their pair; error on determining multiplication or difference; and applying formulas incorrectly; (3) Last on operational technique obstacle, obstacle that was experienced are error on calculation and using sign and symbol mathematics incorrectly.

Keywords: Epistemological obstacle Sequence, and sequence

ABSTRAK

Tujuan dari penelitian ini untuk mengetahui hambatan epistemologis pada siswa sekolah menengah untuk menyelesaikan masalah urutan dan rangkaian berdasarkan tiga indikator yaitu hambatan konseptual, obsesi prosedural, dan hambatan teknik operasional. Penelitian ini bersifat deskriptif dengan pendekatan penelitian kualitatif. Pengumpulan data dilakukan dengan metode tes dan wawancara. Analisis dilakukan dengan memberikan tes tertulis yang berbentuk ularan dan wawancara. Subjek pada penelitian ini adalah siswa SMP Negeri 86 Jakarta kelas VIII sebanyak 6 siswa yang didasarkan atas kesalahan yang dilihat dari tes diagnostik yang sudah diujikan. Hasil analisis menunjukkan bahwa: (1) Kendala konseptual, hambatan yang dialami siswa adalah: siswa menganggap suatu pola bilangan karena...
miliki pola bilangan ganjil dan memiliki selisih 2,2,2; tidak dapat menemukan pola yang tepat dalam masalah; mengingat deret angka Fibonacci merupakan pola yang membentuk pola bilangan prima; tidak dapat membedakan konsep aritmatika dan urutan geometri; tidak dapat memahami konsep kuartal pertama tentang deret aritmatika; kesalahan saat diartikan arti masalah; tidak mampu menjelaskan apa yang diberikan pada model matematika; menafsirkan jumlah suku 20 pertama dengan urutan yang memiliki suku ke-20; dan menafsirkan jumlah suku 20 pertama dengan suku ke-20; (2) Sedangkan pada kendala prosedural, kendala yang dialami adalah: menafsirkan pola angka jika mereka memiliki pasangannya sendiri; kesalahan dalam menentukan perkalian atau perbedaan; dan salah menerapkan rumus; (3) kendala teknik operasional, kendala yang dialami adalah kesalahan dalam perhitungan dan penggunaan matematika tanda dan simbol tidak benar.

Kata Kunci: Hambatan epistemologi Urutan dan Urutan

INTRODUCTION

One of the concepts in mathematics that play an important role in science and technology is the sequence and series (Kharisma, 2016). Students in junior high schools learn the concept in 8th grade (Permendikbud Nomor 24 Tahun 2016). Also, the sequence and series topic is included in the Graduate Competency Standard (SKL) for both National Standard School Examination (USBN) and the Computer-Based National Examination (UNBK). Due to the importance of the concept, many institutions are using it to assess the critical and analytical thinking of their applicants.

On the other hand, students found it challenging to understand the concept of sequence and series (Hardiyanti, 2017; Nopriana et al., 2016). The difficulties mostly due to a lack of understanding of the concepts that are related to daily activities or realistic mathematical problems (Maarif et al., 2019; Ningrum, 2013; Widyatari, 2017). The impact of errors that occur to students is that students cannot understand the intent, direction, and purpose of the questions so that students’ answers feel inconsequential in solving problems (Widodo et al., 2020; Widodo et al., 2019, 2020). An incomplete understanding of the concept can be seen on their performance in solving sequence and series problems. Also, during the learning process, the students only rely on the general formula taught or provided by the teacher and textbook, making the students do not grasp a full understanding of the concept (Nurfadhilah et al., 2016; Setiawan & Widodo, 2019).

Based on Brousseau (2002) and Moru (2010), there are three categories of learning obstacles based on their origin, namely ontogenic Obstacle, Epistemological Obstacle, and Didactical Obstacle. Epistemological barriers arise due to the limited knowledge of students in certain contexts because they do not get the complete information which will result in student difficulties in finding relationships and linkages of concepts (Elfiah et al., 2020). Therefore the researchers chose the epistemological obstacle. Such obstacles have the potential to produce errors that make it difficult for students to construct an understanding of the concepts they learn. Epistemological obstacles relate to the limitations of one’s understanding of something that is only associated with certain contexts based on specific learning experiences (Suryadi, 2019). Furthermore, the three categories came from two factors, namely, internal and external factors (Syah, 2010). About sequence and series subjects, an external factor could appear from the way a teacher teaches. As in Masjudin (2018), he found that during the teaching and learning process of the subject, the teachers tend to
epistemological obstacles in understanding the concept of sequence and series could be coming from the limited context of the concept application that students understand (Moru, 2010; Yusuf et al., 2017).

Epistemological obstacles relate to the limitations of one’s understanding of something that is only associated with certain contexts based on specific learning experiences (Suryadi, 2019). Such obstacles are produced due to the limited conception of the nature of the mathematical concept itself (Brousseau, 2002; Cornu, 1991; Moru, 2007); and reflected in errors that are not made by chance but consistent and persistent (Brousseau, 2002; Modestou & Gagatsis, 2007). Teachers need to take into account obstacles that have been identified previously (Herscovics, 1989) and anticipate other obstacles that may arise as much as possible. Knowledge of typical students’ learning obstacles will help teachers develop more effective instruction to overcome the obstacles (Kadarisma & Amelia, 2018) and make improvements in mathematics learning (Nyikahadzoyi et al., 2013). Thus, teachers need to give extra attention to learning obstacles.

In general, this study aims to depict epistemological obstacles that emerge in understanding the concept of sequence and series. This study could be useful for educators or researchers as a reference to construct appropriate teaching and learning design for sequence and series concept based on the needs to overcome the learning obstacles primarily epistemological obstacles.

**METHOD**

The research was conducted at SMP Negeri 86 Jakarta in the even semester of the 2018/2019 academic year. The research subjects were 6 students of SMP Negeri 86 Jakarta class VIII based on the errors seen from the diagnostic tests that had been tested. The code for the researcher in this study is coded R24 and the code for the research subject can be seen in Table 1.

<table>
<thead>
<tr>
<th>Initial of subject</th>
<th>Code</th>
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<tbody>
<tr>
<td>FR</td>
<td>A1</td>
</tr>
<tr>
<td>MNT</td>
<td>A2</td>
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<tr>
<td>GR</td>
<td>A3</td>
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<td>PAR</td>
<td>A4</td>
</tr>
<tr>
<td>PR</td>
<td>A5</td>
</tr>
<tr>
<td>RAA</td>
<td>A6</td>
</tr>
</tbody>
</table>

Qualitative research methods are used to obtain data in-depth and contain meaning. So in qualitative research, it will emphasize meaning more than generalization (Sugiyono, 2016). The objectives in qualitative research include information about the main phenomena explored in the study, research participants, and research locations (Creswell, 201). The purpose of this research is to describe the phenomenon in uncovering the epistemological obstacle of junior high school students in the material of the sequence and series. The indicators in analyzing the data use the indicators of epistemological barriers, namely conceptual barriers, procedural barriers, and operational technical barriers (Putri et al., 2018). In this study, researchers are human instruments and key instruments because they are observers and interview the informants in a structured manner so that in this study, researchers are the key to the research (Creswell, 201).
In line with the research objectives, this type of research is a qualitative research that seeks to uncover the student's epistemological obstacle. The data collection techniques used are the documentation method, test method, and interview method. Documentation is carried out simultaneously with interviews that are stored in the form of sound recording conducted by the researcher with the research subject, then the test is given to the research subject directly through tests that have been tested for validity then after being tested the researcher distributes the test and is selected according to the test results then carried out Interview. The data analysis technique used in this research is descriptive. Data regarding epistemological barriers were obtained through diagnostic test questions given to students.

RESULT AND DISCUSSION
RESULT

The results of the research in this study included the identification of the obstacles experienced by students in working on the sequence and series questions. Some of the epistemological obstacles experienced by students can be categorized into 3, namely: conceptual barriers, procedural barriers, and operational technical barriers. Conceptual barriers are obstacles to students' understanding of concepts when answering the questions given. Students have not been able to develop a mindset to apply a concept problem. They race on existing problems so they can't develop them. Then the procedural barrier is that students are unable to solve or simplify a question so that further steps are needed to take the problem. Furthermore, the obstacles to operational techniques are students' obstacles to writing errors in the steps and concepts when they answer them. These epistemological obstacles are identified from 10 diagnostic test questions that aim to diagnose suspected errors in working on sequence questions and rows. The results of the diagnostic test were selected by 6 students who will be the research subjects. After selecting the student subject, as many as 6 students, the researcher gave questions in turn at one time. From the diagnostic results, the percentage (%) of errors was obtained based on 3 epistemological indicators. As for more details, it can be seen in Table 2.

<p>| Table 2. Percentage of Errors in the Three Epistemological Indicators |
|--------------------------|-----------------|-----------------|-----------------|</p>
<table>
<thead>
<tr>
<th>Item</th>
<th>Epistemological Obstacle Indicators</th>
<th>Conceptual barriers</th>
<th>Procedural obsessions</th>
<th>Operational technical</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>66.67 0 0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>a 50.00 0 0</td>
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<td></td>
<td>b 33.34 0 0</td>
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<tr>
<td>3</td>
<td>a 66.67 16.67 0</td>
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<td>b 33.34 16.67 0</td>
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<td>4</td>
<td>a 66.67 0 0</td>
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<td></td>
<td>b 0 50.00 0</td>
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<td>5</td>
<td>16.67 33.34 0</td>
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<td>9</td>
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</table>
Based on Table 2, it can be seen that in working on the sequence and series questions, students still make mistakes. These mistakes can be used as the basis that students experience epistemological obstacles. These errors can be identified in 3 epistemological barriers. The characteristics of errors experienced by students can be described as follows.

A. Conceptual barriers

Conceptual barriers can be seen from students' answers when researchers give questions. The obstacle experienced by the students was that the students were wrong in answering the questions to determine the formula for the surface area of the blocks, but the students were looking for the volume of the blocks. The student admitted that he really could not understand the concept because he thought it was difficult and unusual. So that if there is a development of the student's questions, it has difficulty. That is because students cannot understand the concept well so that students are less precise in understanding that the question in this question is looking for surface area (Elfiah et al., 2020)

First, the conceptual barriers can be seen from the students' answers to number 1. As for question number 1 as in Figure 1.

The obstacle experienced by students is that students do not understand what a number pattern is so that to choose a number pattern students still experience errors in answering or giving reasons and students also think that a pattern must have a difference. This can be seen from the answer of subject A1 who chose point B as a number pattern because A1 thinks the number pattern is odd and has a difference from pattern 2,2,2. The more clearly and in detail can be seen in Figure 2.

The authors study the diagnostic results through interviews. The following is the transcript of the interview:

R24 : Oke. hmm... I want to ask questions related to number one, how do you solve question number one?
A1 : I answered them well and thought according to my thinking.
R24 : Okay. You answer this number 1 that it is one of the number patterns It is point B, one, four, nine, sixteen, twenty-five, what is the reason you answered that it is a number pattern?
A1 : Because a sequence pattern is an odd number and the difference of the number is two. Odd numbers.
R24 : Are there any number patterns other than point B?
A1: hmmmmm. No!
R24: nothing?
A1: No.

Based on A1’s answers and the researchers’ interviews with A1, the researcher concludes that A1 does not understand the concept of number patterns well, and A1 also uses an inaccurate concept in understanding number patterns if it is said that the number pattern has a difference.

Second, conceptual barriers can also be seen from students’ answers to question number 2. As for question number 2 as in Figure 3

In general, the mistakes made by students were due to the students being wrong in filling in the dots and incorrectly giving reasons. This can be seen from the A4 answer. The more clearly and in detail can be seen in Figure 4.

The diagnostic results were then explored by researchers through interviews. The following is the transcript of the interview:

Number 2 Point A
R24: Okay, I was with one of the eighth-grade students of SMP Negeri 86 Jakarta. I want to ask question number two-point a. How do you answer question number 2 point a?
A4: I answered it well and according to my thinking.
R24: OK, you answered blank line one seven and empty line two eight point s five. What is the reason you answer like that?
A4: The reason is that if the numbers twenty-eight and thirty-four are divided by four, the result is seven and eight-point five.

Number 2 Point B
R24: Next, I want to ask question number two point B. What is the reason you answered line one which is empty ten and base two which is empty eleven?
A4: Because if the numbers twenty-one are subtracted from thirteen, the results are the numbers eight and eight, if you add two and three, the results are ten and eleven.

In answering 2 points a and b, A4 is wrong in filling in the dots. This is because A4 does not find a pattern that matches the problem. Based on the results of the interview above, A4 also revealed the same thing so that the researcher concluded that A2 experienced conceptual obstacles in answering question number 2.

Third, conceptual barriers can also be seen from students’ answers in answering question number 3. As for question number 3 as in Figure 5.
In general, the conceptual obstacle experienced by students in answering question number 3 is that they cannot eliminate numbers and provide the right reasons for answering them. The error in answering 3 points A was committed by A6. The A6 answer in more detail and detail can be seen in Figure 6.

![Figure 6. Answer Subject A6 Number 3 Point A.](image)

The diagnostic results were then explored by researchers through interviews. The following is the transcript of the interview:

R24: Next, I want to ask question number three-point A. How do you answer question number three-point A?
A6: I answered with my calculations, in my opinion, the answer to number three-point A is four which is removed because if four is omitted it will form a pattern of prime numbers but the number three must not exist.

Based on the results of the answers and interviews that have been conducted, the researcher draws the conclusion that A6 has conceptual obstacles in reading and analyzing the questions. Low ability to read and analyze questions so that hinders him from seeing the patterns that are formed. This is based on the basic knowledge that A6 is still low in understanding the concept of number sequences.

Fourth, conceptual barriers can also be seen from students' answers in answering number 4. As for question number 4 as in Figure 7.

![Figure 7. The problem of number 4](image)

At this number, the conceptual barrier experienced is because students do not understand the basic concepts of mathematics. This can be seen from A2's answer to point A, which assumes that the number 12 must be removed. The A2 answer in more detail and detail can be seen in Figure 8.
The diagnostic results were then verified by the researcher through interviews, along with the transcript.

R24: All right, I was with one of the eighth-grade students of SMP Negeri 86 Jakarta. I want to ask about number 4 point a, how do you solve question number 4 point a, so that point a is an arithmetic number? did you lose?
A2: Twelve.
R24: The number twelve! What is the reason you are missing the number two mercy?
A2: Due to the rules for getting the next number with multiplies the previous term by two.

Based on the sheet in Figure 5 and the interview above A2 argues that the number 12 must be eliminated because in that line the rules for getting the next number are by multiplying the previous term by the number 2. This is a wrong concept if we refer to that reason. Because basically, this reason is a geometric sequence concept, not arithmetic. This indicates that A2 cannot distinguish the basic concept of arithmetic sequences from geometry. Meanwhile, A6 also made mistakes. Based on the A6 answer sheet also states that the number 12 must be removed. The A6 answer can be seen clearly and in detail in Figure 9.

The results of these answers were then explored by the researcher through interviews, along with the transcript:

R24: Next, I would like to ask question number four-point A. How do you answer question number four point A?
A6: I think the answer to the number four point A is twelve because the first number uses a pattern that is changed from the number itself.
R24: Is there any other reason besides that reason?
A6: Nothing.

Based on the answer sheet in Figure 7 and deepened through the interview A6, it is argued that the number 12 should be eliminated. The reason the number 12 must be removed is that the first number uses a pattern that is changed from the number itself. For this reason, A6 cannot understand the concept of the first term and the difference in the arithmetic sequence.

Fifth, conceptual barriers can also be seen from students' answers in working on question number 5. Based on the answer sheet and deepened through interviews, A2 said that the point which is the arithmetic sequence only points B. The reason is that point B if we want to get the next term by multiplying the previous term by two. Meanwhile, according to him, the only point which is the geometric sequence is A, the reason is that point A is an odd number sequence. Based on the explanation above, A2 is wrong in choosing an arithmetic sequence. This is because the basic abilities of the arithmetic sequence A2 are very weak and in providing clear reasons that A2 cannot
distinguish the concept of arithmetic sequence and geometry. Also, in answering the point which is the geometric sequence A2 it is wrong in answering. A2 assumes that a sequence is said to be a geometric sequence if the sequence is odd. From the above opinion, A2 has the wrong concept in understanding the concept of geometrical sequences.

Sixth, the conceptual barrier can also be seen from the students’ answers in working on question number 6. As for question number 6 as shown in figure 10.

![Figure 10. The problem of number 6](image)

The mistakes made in answering question number 6 occurred on A3 and A4. The clear and detailed answers to A3 and A4 can be seen in Figures 11 and 12.

![Figure 11. Answer Subject A3 Number 6](image)

![Figure 12. Jawaban Subjek A4 Nomor 6](image)

Based on the answer sheets and information the researchers got through interviews, both A3 and A4 even though they had answered correctly, but in giving reasons, they both misunderstood the meaning of the question. This indicates that A3 and A4 in understanding the concept of patterns and are applied in everyday life are still lacking. A lack of understanding of the context of the question in question is also the basis for the mistakes that A3 and A4 can make in answering question number 5.

Seventh, conceptual barriers can also be seen from the students’ answers in working on question number 7. As for question number 7 as in Figure 13.
At this number, A5 made a mistake in answering. The clear and detailed answer to A5 can be seen in Figure 14.

The diagnostic results were then deepened through interviews. Here's the transcript:

R24 : OK, I was with one of the eighth-grade students of SMP Negeri 86 Jakarta, I would like to ask questions related to number seven. How did you solve question number seven?
A5 : I will solve it by dividing one hundred thousand into four children equal to twenty-five thousand, the difference is five thousand, it means twenty-five thousand minus five thousand is twenty thousand
R24 : So the child the youngest received was twenty thousand?
A5 : Yes.

Based on the answer sheet in Figure 14 and the results of the interview above, A5 is unable to interpret what it knows into a mathematical model. A5 also cannot understand the meaning of the question so that the written answer sheet has nothing to do with what was asked.

Eight, the conceptual barrier can also be seen from the students’ answers in working on question number 8. The question number 8 is “Jumlah 20 suku pertama dari: 5 + 8 + 11 + … adalah…”. In number 8, the mistake was made by A3. The clear and detailed answer to A3 can be seen in Figure 15.
R24: The total is six. So, if there is S20, if there is a number twenty, then stop there? Yes?
A3: Eee..yes

Based on the diagnostic answer sheet and deepened through interviews, A3 is wrong in interpreting the number of the first 20 terms with a line that has 20 terms. A3 also believes that S20 if there is a number 20 in the sequence it stops eating. Based on the answer sheet, A3 also cannot model the shape of the problem into a mathematical model, cannot determine the first term and the difference in the sequence. Besides, A5 was also wrong in answering question number 8. According to the diagnostic results and deepened through the interview, A5 was wrong in interpreting the number of the first 20 terms with the 20th term. According to him, the number of the first twenty tribes was to find out only the ranks of the twenty-first. The clear and detailed answer to A5 can be seen in Figure 16.

![Figure 16. Answer to Subject A5 Number 8](image)

Ninth, conceptual barriers can also be seen from students’ answers in working on question number 9. As for question number 9 as shown in Figure 17.

![Figure 17. The problem of number 9](image)

Based on the problem of number 9, the mistake is made by A5. The clear and detailed answer to A5 can be seen in Figure 18 below.

![Figure 18. Answer to Subject A5 number 9](image)

Based on the answer sheets and interviews that the researcher concludes, it can be said that in answering item 9 A5 cannot understand the context of the question well. A5 also cannot determine the first term, the difference, and the difficulty in modeling what is known in the problem into a mathematical translation. From the explanation above, A5 does not understand the concept of arithmetic series well. Furthermore, A5 also cannot relate the concept of arithmetic series to everyday life.

B. Procedural obsessions

Procedural barriers are also an indicator in analyzing the epistemological obstacle. After the researcher researched with the result that the students were able to answer the questions correctly
but were wrong in giving reasons. They managed to answer the questions correctly but they didn't know the real reason. There are cases in previous research, students experienced errors in the SPLDV modeling procedure, errors in carrying out the procedure of elimination and substitution methods, and did not carry out the re-checking procedure in answering the questions that had been done. Students do not understand the meaning of variables and the use of the meaning of the symbol “=” (Maarif et al., 2020).

Procedural barriers are one indicator in analyzing epistemological barriers. After being analyzed based on a diagnostic test that had been conducted by the researcher, the researcher found the wrong subject in answering based on indicators of procedural obstacles. Procedural obstacles experienced by A4 in answering number 3 point a, namely eliminating number 9. The clear and detailed can be seen in Figure 18.

![Figure 18. Answer to Subject A4 Number 3 Point A.](image)

Even though the answer that was answered by A4 was correct, in giving reasons A4 was wrong. A4 argues that the number 9 is omitted because it does not have a partner. Even though the sequence pattern has nothing to do with the pair, this indicates that A4 has procedural obstacles in providing the reason for the number 9 is omitted.

On item 3 point b, A6 also has procedural obstacles. As clearly and in detail, it can be seen in Figure 19.

![Figure 19. Answer Subject A6 Number 3 Point B](image)

Based on Figure 19, Figure 13 shows the A6 argument which argues that the number 4 is omitted because it uses a pattern in which every number in the number is added by two and continues like that. From the above explanation, the researcher concludes that A6 has procedural obstacles because it does not provide precise reasons.

A2, A3, and A4 also experienced procedural obstacles in answering item 4 point b. Even though they have been able to answer correctly, they give the wrong reasons. The reasons, among others, are wrong in determining the difference or multiples, and considering the number -50 because it does not have a multiple.

Meanwhile, students A4 and A6 also experienced procedural obstacles in answering question number 5. The procedural obstacles included choosing point an as an arithmetic sequence because it assumed the arithmetic sequence was a sequence that had an odd number pattern and because it had multiples. The answer is correct but based on the procedure or making a wrong guess.

A3 also experienced procedural obstacles in answering item 9. The A3 answers can be seen in detail and clearly in Figure 20.
Based on Figure 20, students A3 cannot translate what they know into a mathematical model, and if we look at Figure 4.28 A3 is wrong in using the formula even though the question being asked is asking for an arithmetic sequence, not an arithmetic sequence. From the explanation above, it can be concluded that A3 was wrong in making the allegations/procedures.

C. Operational technical

The barrier to this operational technique is in the epistemological obstacle indicator. In this operational technique, an obstacle is in answering students' questions in operating calculations, even though they are correct in doing it, they are wrong in using symbols. There are obstacles students in operational techniques have cases in previous research, students have not been able to substitute, square, and add correctly. Students are still not consistently doing calculations well (Rasmania et al., 2018).

The operational technique barrier is one indicator in analyzing epistemological barriers. On this operational technical obstacle, A1 experienced in answering item number 8. The following is the result of A1's work as shown in Figure 21.

Figure 21 shows that A1 experiences problems in operating calculations, even though working on the A1 answer, he can model what is known into a mathematical model and can make correct guesses. However, A1 experienced operational technical difficulties because A1 was wrong in operating the calculations, incorrectly using signs/symbols in mathematics so that A1’s final answer was wrong.

CONCLUSIONS

Based on the results of the discussion and data analysis that has been described, it can be concluded:

1. Conceptual barriers were experienced by some students in answering the sequence and series questions, while the students had a tendency, namely: students assumed a pattern was said to be a number pattern because it had an odd number pattern and had a difference of 2,2,2; can't find a pattern according to the problem; assume the Fibonacci number pattern is a pattern that forms prime number patterns; unable to distinguish between arithmetic and geometric concepts;
unable to understand the concept of the first term of arithmetic sequence and difference; interprets geometric sequences if they have odd sequences; wrong in interpreting the questions entered; unable to interpret what is known into a mathematical model; interprets the sum of the first 20 terms with a sequence having 20 terms; and interprets the sum of the first 20 terms with the 20th term.

2. Some students experienced procedural obstacles in answering the questions of sequences and series, while students tended to: interpret number patterns if they had a pair; wrong in determining the multiple / difference; and wrong in using the formula.

3. Some students experienced operational engineering barriers in answering sequence and series questions, while students had a tendency, namely: wrong in operating calculations and wrong in using mathematical signs or symbols.

REFERENCES


