MISCONCEPTION ANALYSIS OF STUDENTS WITH IMPULSIVE-REFLECTIVE COGNITIVE STYLE IN SOLVING PATTERNS OF NUMBERS PROBLEMS

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Abstrak

Dalam proses pembelajaran jarak jauh sejak Maret 2020, banyak siswa yang mengalami miskonsepsi dalam menyelesaian soal yang diberikan oleh guru, tidak terkecuali dalam kegiatan pembelajaran matematika. Pada kegiatan pembelajaran jarak jauh siswa dituntut untuk dapat memahami materi dengan cepat dengan segala keterbatasan yang dimiliki siswa sehingga muncul miskonsepsi pada siswa. Miskonsepsi ini dapat terjadi kesalahan salah satunya dipengaruhi oleh perbedaan gaya kognitif siswa. Penelitian ini memiliki tujuan untuk menganalisis miskonsepsi siswa dalam menyelesaikan soal terkait materi pola bilangan. Analisis dilakukan pada 1 subjek bergaya kognitif impulsif dan 1 subjek bergaya kognitif reflektif dengan kemampuan hasil belajar yang sama. Jenis penelitian ini adalah penelitian deskriptif dengan pendekatan kualitatif. Instrumen-instrumen pendukung meliputi *Matching Familiar Figure Test (MFFT)* dan tes tulis terdiri dari 9 soal pilihan ganda yang mencakup sub materi deret bilangan aritmatika, deret bilangan geometri, deret bilangan huruf, dan soal kontekstual terkait pola bilangan dengan 4 pilihan jawaban. Untuk menganalisis miskonsepsi siswa, digunakan metode *Three Tier test,* yaitu *tier* pertama terdiri dari soal materi pola bilangan berbentuk pilihan ganda dengan 4 pilihan jawaban, *tier* kedua kolom alasan siswa dalam memberikan jawaban, serta *tier* ketiga merupakan kolom tingkat kepercayaan siswa dengan metode CRI, dan dilanjutkan dengan wawancara. Hasil penelitian menunjukkan bahwa pada siswa dengan gaya kognitif impulsif mengalami miskonsepsi klasifikasional, korelasional, serta teoritikal. Sedangkan pada siswa dengan gaya kognitif reflektif adalah miskonsepsi korelasi dan miskonsepsi teoritikal. Untuk mengantisipasi terjadinya miskonsepsi sebaiknya guru memberikan variasi dalam proses pembelajaran, sehingga siswa dapat fokus dalam proses pembelajaran dan guru sering melakukan pemeriksaan pemahaman konsep siswa.
Kata Kunci : Pola bilangan, Miskonsepsi, Gaya Kognitif, *Three Tier*, CRI.

Abstract

In the online learning process since March 2020, many students have experienced misconceptions in solving the questions given by the teacher, including mathematics learning activities. In online learning activities students are required to be able to understand the material quickly with all the limitations that students have so that misconceptions arise in students. This misconception can occur, one of which is influenced by differences in students' cognitive styles. This study aims to analyze students' misconceptions in solving problems related to number pattern material. The analysis was carried out on 1 subject with impulsive cognitive style and 1 subject with reflective cognitive style with the same learning outcomes. This type of research is descriptive research with a qualitative approach. Supporting instruments include the Matching Familiar Figure Test (MFFT) and a written test consisting of 9 multiple choice questions which include sub-materials of arithmetic number series, geometric number series, letter number series, and contextual questions related to Patterns of Numbers with 4 answer choices. To analyze students' misconceptions, the Three Tier test method is used, namely the first tier consists of number pattern material questions in the form of multiple choice with 4 answer choices, the second tier is the column for students' reasons for giving answers, and the third tier is a column of students' confidence levels using the CRI method, and continue with the interview. The results showed that students with impulsive cognitive style experienced classificational, correlational, and theoretical misconceptions. Meanwhile, students with reflective cognitive style are correlation misconceptions and theoretical misconceptions. To anticipate the occurrence of misconceptions, teachers should provide variations in the learning process, so that students can focus on the learning process and teachers often check students' understanding of concepts.
Keywords: Number pattern, Misconception, Cognitive Style, Three Tier, CRI.

PRELIMINARY

Today's online learning is a familiar thing for elementary school students to college students. This happened because of the Covid-19 pandemic with the first confirmed case in Indonesia, namely on March 8, 2020, in Depok, West Java and WHO has declared COVID-19 a pandemic (MENKESRI, 2020). With this change in learning style, students must get used to receiving material initially explained directly into an explanation using specific platforms or media such as YouTube videos, Power Points, Zoom Meetings, Google Meet, and other platforms. Online teaching and learning activities have positive and negative sides. On the positive side, students can carry out the online teaching and learning process. This can help students survive in the era of the industrial revolution 4.0, where all activities use digital technology. Besides that, student learning hours have become more flexible. However, behind this positive side, there is a negative side for students such as reduced student curiosity due to several obstacles, such as uneven internet coverage and poor economic conditions (Fadillah, 2020). In the distance learning process, the teacher uses the lecture method and independent assignments which result in students not being too familiar with the concept, causing misconceptions (Dewi, Martini, & Purnomo, 2021). However, according to Bilda; et al. (2020), distance learning and supported by student learning independence with indicators of confidence, sufficient activity, good discipline, and good responsibility can shape success in student learning. However, with drastic changes in learning activities, indicators of student learning independence have not been achieved, which can result in students' lack of understanding of concepts and cause misconceptions.

Misconceptions are differences in students' understanding of a scientific concept with the concepts adopted by experts in general (Suparno, 2013). In addition, according to Yuliati (2017), misconceptions are concepts that are not by scientific understanding recognized by experts. In addition, according to Timur & Wiryanto (2021), students who are confused about a concept or material are more likely to experience misconceptions. In addition, the cause of the misconception, according to Istiyani; et al. (2018), is the difficulty of students in abstracting the material or concept properly so that the initial concept received remains in the cognitive structure. So it can be concluded that misconceptions are students' incomprehension of concepts in receiving material so that the concepts given are not by existing concepts.

One of the subjects that require high focus is mathematics. In addition to a high focus on studying mathematics, students must understand and understand mathematical concepts. The concept of mathematics itself is one of the four objects of mathematics learning. According to Furrell; et al. (2016), each student has a different interpretation of the concept. The concepts that exist in learning mathematics are related to each other so that if the previous concepts are not mastered by students, in the end students will experience a misconception. In addition, Nurlita; et al. (2016) mention that misconceptions can be generated through experiences in daily activities that are not following the mathematical concepts that will be given. One of the junior high school materials that have conceptual linkages with previous concepts is number pattern material, where the material relates to numbers that have been obtained since students were in elementary school and the concept of saying patterns are often encountered by students in everyday life (Diana & Fauzan, 2018). However, with online learning for 2 years, many elementary school students experienced a decrease in students understanding of mathematical concepts, resulting in misconceptions (Annisah, 2021). So that many misconceptions about numbers are found when studying Patterns of Numbers at the next level.

Misconceptions are errors that often occur to students, especially with online learning not being ready, causing students' focus to be divided. In this study, an analysis of misconceptions will be carried out with the types of misconceptions defined and grouped by Amien (1990) as follows:

1. Classificational misconception is a form of misconception in classifying facts in an organized chart.
2. A correlational misconception is a misconception based on certain interrelated events or errors related to observations made from conjectures, especially in formulating general principles.
3. A theoretical misconception is a form of misconception based on errors when studying facts and events in an organized system.

Berg (1991) said that there are several ways to determine if a student has misconceptions. One way is to use interviews to help us find out what misconceptions occur in students, multiple-choice by giving reasons for students to choose the answer, question and answer, practicum. As well as written tests or essays. In addition, according to Sugiyono (2017), interviews are used in research if researchers find problems carefully and want to know things in depth from respondents.

Hasan; et al. (1999) presented a method to identify students' misconceptions, namely the Response Confidence Index (CRI) method. With the Certainty of Response Index (CRI) method, students are expected to

respond to each question and answer that has been selected in the space provided to identify which students understand the concept, have misconceptions, and do not understand the concept. The CRI method developed by Hasan; et al. (1999) is very effective in diagnosing students who understand concepts, do not understand concepts, do not know concepts, and have misconceptions (Timur & Wiryanto, 2021). In this study, in analyzing students' misconceptions, they used the Three Tier Test where this test combined multiple choice with CRI. The Three Tier Test has 3 tiers, namely the first level of Multiple Choice, the second level of reasons for choosing answers to multiple-choice, and the third level containing a confidence test using CRI. According to Alsagaf (2019), Three Tier Test Multiple Choice has good quality to measure students' misconceptions.

In some experiences, online learning activities have had a significant impact on the world of education, one of which is the phenomenon of students getting high enough scores but not fulfilling the concept in understanding concepts so that students rely more on the internet to complete assignments without trying to work on their abilities (Dewantara & Nurgiansah, 2021). More or less, online learning influences students' absorption of the material, especially in mathematics.

According to Rochika & Cintamulya (2017), students' cognitive styles influence the learning process. By understanding each cognitive style, learning objectives will be easier to achieve and minimize the occurrence of misconceptions. According to Uno (in Meriyati, 2015), the cognitive style includes the characteristics of students in learning conditions, in addition to other characteristics such as interests, attitudes, talents, motivation, thinking skills, etc. In this case, the cognitive style has an essential role in the learning process. Therefore, in designing learning, students' cognitive style is used as a design reference by presenting material by the potential and characteristics of students to create a good teaching and learning process that does not interfere with students' rights. According to Nur & Marcus (2018), cognitive style is an attitude, choice, or strategy that consistently defines an individual's unique style or way of receiving, remembering, thinking, and solving problems. In this study, the cognitive styles chosen were impulsive and reflective cognitive styles where these two cognitive styles were different from each other. Kagan (in Nur, 2018) classifies students' cognitive styles, namely the impulsive cognitive style and the reflective cognitive style. Students who have an impulsive cognitive style have the characteristics of being fast in solving problems but less careful in solving them so that the answers given tend to be wrong. Students with a reflective cognitive

style tend to be slow in solving problems but careful, so the answers given by students tend to be correct.

To measure the cognitive style of students, Kagan 1965 developed a test called the Matching Familiar Figure Test (MFFT), which consists of one reference image and six similar images, but only one of which is precisely the same as the reference. This study uses the MFFT test consisting of 13 reference images and 8 variations of images developed by Warli (2009) to determine students' cognitive styles.

In previous studies by Alsagaf (2019) and Minarni (2018), the analysis of misconceptions with diagnostic tests using Three Tier with quantitative research methods with results in the form of measurements without further elaboration so that this research is expanded by using qualitative methods, which can explain the analytical data in a narrative manner so that the information provided is deeper.

METHOD

This research is a descriptive study with a qualitative approach because, in analyzing student misconceptions, data is needed in the form of a description. The sampling technique used is purposive sampling. The subject is selected based on the results of cognitive style tests and the results of students' completion of the number of pattern questions suspected of having many misconceptions, followed by in-depth interviews. This study aims to determine the types of misconceptions that occur in students and terms of students' cognitive styles so that teachers can more easily overcome misconceptions that occur in students. At the time of taking the subject, students were given the MFFT test. Students were grouped according to their cognitive style and asked questions about patterns of numbers with a Three-Tier diagnostic test, then 1 student was selected for each different cognitive style that experienced misconceptions, and a misconception analysis was performed on students who experienced misconceptions with 2 different cognitive styles. In the preliminary activity, the researcher determines the research subject by selecting the students who experience the most misconceptions about the number pattern material.

Three Tier is a diagnostic test used to analyze students' misconceptions in 3 stages namely the first stage provides multiple-choice questions with patterns of numbers, the second stage provides a column for students to provide reasons for the answers they give, and in the third stage, students providing certainty about whether they believe or not. With the answers, they gave according to Kutluay (in Kamilah & Suwarna 2016). The reference in analyzing students' misconceptions in this

study used a decision table developed by Minarni; et al. (2018) as follows:

Table 1. Results in the Three Tier

Tier 1	Tier 2	Tier 3	Result
Correct	Correct	Convinced	Scientific concept
Correct	Correct	Not convinced	Lucky guess
Wrong	Correct	Convinced	Misconception type 1
Wrong	Correct	Not convinced	Guess type 1
Correct	Wrong	Not convinced	Guess type 2
Wrong	Wrong	Convinced	Misconception type 2
Wrong	Wrong	Not convinced	Lock of knowledge
Correct	Wrong	Convinced	Misconception type 3

From table 1, it is suspected that students have misconceptions and can be continued with interviews to confirm these presumptions. The number of questions at the first level or the first tier is 9 multiple choice questions with material coverage of square number sequence patterns, odd patterns of numbers, arithmetic number sequences, geometric number sequences, arithmetic number series, geometric number series. At the second level or the second tier, a column of students' reasons for the answers is given. At the third level or the third tier, a scale of 0-5 measures student confidence in doing the written test. The scale is used to determine whether students have misconceptions or not. The following table and criteria from CRI.

Table 2. CRI and Criteria

0	Unpredictable answer
1	Almost guessed
2	Not convinced
3	Convinced
4	Almost sure
5	Sure

Source: Hasan; et al. (1999)

From table 2, it is known how much confidence the students have in working on the questions given. From the table, it is explained that a scale of 0 indicates a low level of self-confidence, while a scale of 5 indicates a high level of student self-confidence. An analysis of students' written tests and interviews was conducted to find out students' misconceptions. The analysis used is descriptive analysis with a qualitative approach that describes students' misconceptions and explains how to overcome these misconceptions to learn optimally.

Data analysis using CRI can distinguish between students who know the concept, experience misconceptions and students who do not understand the concept, according to Hasan; et al. (1999) as follows:

Table 3. Data analysis on CRI

Answer criteria	Low CRI (<2.5)	High CRI (>2.5)
Correct Answer	Answer correct but the CRI level is low which means the subject does not understand the concept (guessing)	Answer correct and a high CRI level which means understanding the concept
Wrong Answer	Answer wrong dan tingkat CRI rendah berarti subjek not memahami kosep	Answer wrong but high CRI level is a misconception

After getting 1-2 students in each cognitive style who are suspected of having misconceptions, further research is carried out to ensure these students experience misconceptions by interviewing each student about the answers they have given. After the interview process is complete, conclusions and suggestions can be drawn. Which can be given to teachers to help unravel the misconceptions experienced by students.

Misconceptions are problems that often occur to students, especially when online learning is not ready, causing students' focus to be divided. In this study, an analysis of misconceptions will be carried out with the types of misconceptions defined and grouped by Amien (1990).

RESULTS

1. Number of Subjects in Each Cognitive Style

Based on the Matching Familiar Figures (MFFT) research conducted in class VIII-F of SMPN 1 Bangsal with a total of 32 students, the results of the cognitive style of each student are shown in table 4.

Table 4. Number of Subjects and Percentage in Each Cognitive Style

No.	Types of Cogniti-ve Style	Number of Research Subjects	Per-centage
1	Impulsif	19	59,375%
2	Reflektif	7	21,875%
3	Slow-not accurate	3	9,357%
4	Accurate fast	1	3,125%
5	Not Taking the Test	2	6,25%
	Total	32	100%

From a review of research results on cognitive styles in table 1. It was found that there were 19 students with impulsive cognitive style, 7 students with reflective cognitive style, 3 slow-note accurate students, 1 fast-accurate student, and 2 students who did not follow the MFFT test.

2. Percentage of Decisions on Each Question

Furthermore, to get the desired subject, further analysis was carried out on the students by giving questions about the number pattern material using the Three Tier method by Minarni; et al. (2018). In the third tier using the CRI method, the results obtained to analyze the misconceptions are as follows:

Table 5. Percentage of decisions on question number question number 1

Results	Score (%)
Scientific concept	66,67%
Lucky Guess	3,34%
Misconception type 1	3,34%
Guess type 1	-
Guess type 2	-
Misconception type 2	23,34%
Lock of Knowledge	10%
Misconception type 3	3,34%

In Table 5, it can be seen that there are 5 students (30.02%) who experience misconceptions on question number 1. When students solve problem number 1, students use the nth term formula without reducing n so that misconceptions arise and the formula used is. The misconceptions that occur are theoretical, namely, misconceptions that occur in students based on mistakes when studying facts and events in an organized system.

Table 6. Percentage of decisions on question number 2

Result	Score (%)
Scientific concept	13,34%
Lucky Guess	-
Misconception type 1	-
Guess type 1	16,67%
Guess type 2	13,34%
Misconception type 2	23,34%
Lock of Knowledge	20%
Misconception type 3	13,34%

In Table 6, it can be seen that there are 11 students (36.68%) who have misconceptions about question number 2. When students solve problem number 2, students do not use the nth term formula in the geometric sequence but use the nth term formula in the arithmetic sequence. . The misconceptions that occur are theoretical, namely misconceptions that occur in students based on mistakes when studying facts and events in an organized system.

Table 7. Percentage of decisions on question number 3

Result	Score (%)
Scientific concept	26,67%
Lucky Guess	-
Misconception type 1	-
Guess type 1	3,34%
Guess type 2	10%
Misconception type 2	20%
Lock of Knowledge	3,34%
Misconception type 3	6,68%

In Table 7, it can be seen that there are 8 students (26.68%) who have misconceptions about number 3. When students solve problem number 3, students are expected to be able to determine or get an arithmetic number pattern formula, but many students only see 2 numbers. Regardless of the third number. This misconception that occurs is a correlational misconception, which is a misconception among students based on certain interrelated events or confusion regarding observations made from assumptions.

Table 8. Percentage of decisions on question number 4

Result	Score (%)
Scientific concept	63,34%
Lucky Guess	6,67%
Misconception type 1	-
Guess type 1	6,67%
Guess type 2	-
Misconception type 2	3,34%
Lock of Knowledge	6,67%
Misconception type 3	13,34%

In Table 8, it can be seen that there are 5 students (16.68%) who have misconceptions about question number 4. When students solve problem number 4, students use the nth term formula without reducing "n," so the formula used is. The misconceptions that occur are theoretical, namely, misconceptions that occur in students based on mistakes when studying facts and events in an organized system.

Table 9. Percentage of decisions on question number 5

Result	Score (%)
Scientific concept	13,37%
Lucky Guess	-
Misconception type 1	-
Guess type 1	6,67%
Guess type 2	16,67%
Misconception type 2	23,34%
Lock of Knowledge	26,67%
Misconception type 3	13,34%

In Table 9, it can be seen that there are 11 students (36.68%) who have misconceptions about question number 5. When students solve problem number 5, students, when working on the problem, do not get the

pattern contained in the row of letters that is related to the arithmetic series. This misconception that occurs is a correlational misconception, which is a misconception among students based on certain interrelated events or confusion regarding observations made from assumptions.

Table 10. Percentage of decisions on question number 6

Result	Score (%)
Scientific concept	6,67%
Lucky Guess	3,34%
Misconception type 1	3,34%
Guess type 1	6,67%
Guess type 2	10%
Misconception type 2	20%
Lock of Knowledge	53,34%
Misconception type 3	3,34%

In Table 10, it can be seen that there are 8 students (26.68%) who have misconceptions about question number 6. When students solve problem number 6, students cannot distinguish the given formula from the formula used to solve the given problem. In the solution, students directly enter into the existing formula to get the wrong result. This misconception is a classificational misconception, which is a form of misconception in classifying facts in an organized chart.

Table 11. Percentage of decisions on question number 7

Result	Score (%)
Scientific concept	-
Lucky Guess	-
Misconception type 1	-
Guess type 1	6,67%
Guess type 2	6,67%
Misconception type 2	56,67%
Lock of Knowledge	23,34%
Misconception type 3	6,67%

In Table 11 it can be seen that there are 19 students (63.36%) who experience misconceptions on question number 7. When students solve problem number 7 students are not aware of the relationship between the sentence "total number" many students believe that solving the problem is only by looking for the number the savings to be saved is not the total amount of savings. This misconception that occurs is a correlational misconception, which is a misconception among students based on certain interrelated events or confusion regarding observations made from assumptions.

Table 12. Percentage of decisions on question number 8

Result	Score (%)
Scientific concept	6,67%
Lucky Guess	-
Misconception type 1	-
Guess type 1	-
Guess type 2	10%
Misconception type 2	20%
Lock of Knowledge	53,34%
Misconception type 3	10%

In Table 12, it can be seen that there are 9 students (30%) who have misconceptions about question number 8. When solving problem number 8, students classify it into solutions using the nth term of an arithmetic series. In contrast, question number 8 is a question about geometric series material by solving the formula for the sum of the first n terms of a sequence. In the solution, students directly enter into the existing formula to get the wrong result. This misconception is a classificational misconception, which is a form of misconception in classifying facts in an organized chart.

**Table 13.** Percentage of decisions on question number 9

Result	Score (%)
Scientific concept	3,34%
Lucky Guess	-
Misconception type 1	-
Guess type 1	10%
Guess type 2	20%
Misconception type 2	13,34%
Lock of Knowledge	50%
Misconception type 3	3,34%

In Table 13, it can be seen that there are 5 students (16.68%) who have misconceptions about problem number 9. When students solve problem number 9, students cannot make assumptions that the pattern comes from the power of number 8, where the pattern can be known through the power, and The last number that is repeated is where the power of 1 and 5 will have the same last digit, which is 8. The misconception that occurs is a correlational misconception, which is a misconception among students based on certain interrelated events or confusion regarding observations made from assumptions.

3. **Number of Students experiencing Misconceptions in Each Type**

According to Minarni (2018), students' Misconception profiles for each type can be seen in the figure below:

Figure 1. Number of Misconceptions of the Three Types in Each Question Number
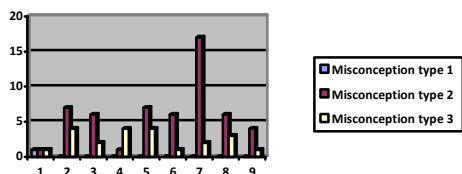
From the data above, it is found that the problems concerning geometric series and the sum of the first n terms in arithmetic and geometric sequences are included in the story problems that have been given. And the percentage of students who do not understand the concept is very high.

4. Subject Analysis

After the analysis process is carried out on the answers given by students regarding the questions on the line pattern material, 1 student is selected for each cognitive style that is suspected of having misconceptions with the following criteria:

1) The two subjects with the most misconceptions
2) Give answers to the 2nd tier clearly, give formulas or students' ways of getting answers for the first tier.
3) Diagnosing students' misconceptions according to Table 1 results in Three Tier by Minarni (2018)
4) Willing to be interviewed

Of the 30 students who met the three criteria, 1 student was found in each cognitive style (impulsive-reflective). Thus, two subjects were obtained for in-depth analysis of misconceptions, namely:

Table 14. Initials and cognitive style of the subject of analysis

No.	Nama siswa	Gaya Kognitif
1	DN	*Impulsif*
2	CP	*Reflektif*

5. Analisis Student Answer

- **Analisis misconception siswa berinisial "DN" dengan gaya kognitif impulsif**

a. In question number 6, material is given about finding the 4th term in an arithmetic sequence by knowing the formula for the number of n-terms.

Figure 2. Answer

Jika jumlah n suku pertama suatu deret aritmatika dinyatakan dengan $Sn = 2n^2 + 5n$, maka suku ke-4 deret tersebut adalah .....
a. $U_4 = 18$
b. $U_4 = 19$

The level of confidence in the answer is >2.5

Theoretical misconceptions experienced by "DN"

P: "Do you know the general formula [...] arithmetic sequence?"
DN: "y[...] know"
P: "Ca[...]
DN : "[...]
P: "If y[...] l answers, there are differences. In the questions, the formula Sn is obtained, while the answer is given the answer choice in the form of Un. From these differences, do Sn and Un have different meanings?"
DN: "I think it's the same sis"

Based on the answer "DN" in Figure 2, he had a misconception about the concept of arithmetic series material. From Figure 1, it is explained that the given formula is a formula for determining the number of the first n terms in an arithmetic sequence. Meanwhile, "DN," thinks that the formula for the sum of the first n terms "Sn" is the same as the formula for the nth term "Un" so that the student can be classified as experiencing a theoretical misconception.

b. In question number 7 regarding the contextual problem of the material the sum of the first n terms of an arithmetic sequence.

Figure 3. Students Answer

DN misconception in determining formulas in question solving

The level of students' confidence in solving problems.

P : "From the answer you gave, there is a pattern, can you say what line pattern is this?"
DN : "arithmetic, with a difference of 5000 sis"
P: "From the question there is the sentence "the total amount of money, right? Does your answer fulfill the sentence?"

Question number 7 is a question that most students experience misconceptions in solving. The other wrong is DN. In the solution given by DN in picture 3, he thinks that what he is looking for is the nth term from Kiki's savings regardless of the sentence "the total amount of money," and in the Convinced column and DN gives the number 3 where DN is convinced with the solution. He gave so that there was a correlation misconception where they did not realize that there was a connection between the sentence "the total amount of money" with the final formula used in solving the problem.

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c. Problem number 8, in this problem students are required to find the sum of the first n terms in the geometric sequence.

Figure 4. Student Answer

Berapakah jumlah suku ke 10 pada barisan dibawah ini
1, 3, 9, 27, 81, ...
X 9841
b. 9842
                c. 29524
                d. 29254

Agak lupa tapi mungkin setiap satuannya angka ganjil 9841

Misconception DN, in determining the pattern of numbers.

The level of students' confidence in solving problems.

P: "In this question, does it form a pattern? If so, what pattern?"
DN : "arithmetic series, to get the answer, add odd numbers"
P: this question is almost the same as question number 7, only the difference is that number 7 is a contextual question

From the answer given by DN in figure 4, he said that he added an odd number where in the 2nd and third terms, the difference would be an even number. During the interview, the students said that the sequence formed was an arithmetic series while the question was an arithmetic sequence. Geometric series problem. So that these students experience classificational misconceptions, which are forms of misconceptions based on mistakes in classifying facts into organized charts, DN can not classify the questions given.

- **Analysis of students' misconceptions with the initials "CP" with a reflective cognitive style**

a. In question number 2 students solve the problem using the formula for the nth term in the geometric row.

Figure 5. Student Answer

2, 4, 8, ...
Angka yang tepat untuk mengisi titik -titik diatas adalah ....
a. 11 dan 14
X 14 dan 28 22
                c. 13 dan 19 e.
                d. 16 dan 32

2, 4, 8, -14, 22
+2 +4 +6 +8
ditambah kelipatan 2

Misconceptions that occur in CP, theoretical misconceptions.

The level of students' confidence in solving problems.

P : In your opinion, in que
number/sequence pattern is formed?
CP : "arithmetic series, bro"
P: "How do you know if the sequence is an arithmetic sequence?"
CP: "because it is added to a multiple of two"

From the analysis of the answers given by CP in figure 5, as well as the results of interviews, it was found that CP had a theoretical misconception, where the misconception was based on mistakes in studying facts or events in an organized system, in the answer given by CP, he explained that in solving problem number 2 he uses the formula for the nth term of an arithmetic series, after conducting more in-depth interviews, CP says that he does not understand geometric.

Question number 7 is about the contextual problem of the sum of the first n terms in an arithmetic sequence.

Figure 6. Student answer

Pada bulan pertama, Kiki menabung di celengannya sebanyak Rp10.000,00, bulan ke-2 menabung sebanyak Rp15.000,00, bulan ke-3 sebanyak Rp 20.000,00. Berapa jumlah keseluruhan uang Kiki di celengan tersebut pada bulan ke-10?
X Rp55.000,00
b. Rp95.000,00
                c. Rp 325.000,00
                d. Rp 500.000,00

bulan ke 1 = 10.000   bulan ke 7 = 40.000
bulan ke 2 = 15.000   bulan ke 8 = 45.000
bulan ke 3 = 20.000   bulan ke 9 = 50.000
bulan ke 4 = 25.000   bulan ke 10 = 55.000
bulan ke 5 = 30.000
bulan ke 6 = 35.000

Students' misconceptions in determining the solution

The level of students' confidence in solving problems.

P: "In solving this number 7, what formula did you use? Does it form a pattern?
CP: "yes, form a pattern using the arithmetic series formula."
P: "From the question, the sentence is "the total amount of money. Does your answer fulfil the sentence?"
CP: "Yes, Sis, because I was told to look for savings in the 10th month."
P: "Previously, did you know about the formula for the sum of the first n terms in a geometric series?"
CP: "I don't understand and understand the sum of the first n terms in a geometric series so I searched the internet."

In solving the questions in figure 6 and the results of the interviews, it was found that CP had the same misconception as DN, namely the correlation misconception, in which he was not aware of the relationship between the sentence "the total amount of money" and the final formula used in solving the problem. From the interview results, it can be seen that CP was confused when asked about the formula for the sum of the

first n terms and also the formula for the nth term in an arithmetic series.

DISCUSSION

From the results of the study, it was found that the number of students who had a reflective-impulsive cognitive style was more dominant with a percentage of 81.25%, compared to the Slow-note accurate cognitive style of 9.357% and fast accuracy of 3.125%. This is in accordance with Amimah & Fitriyani's research (2017) which states that the percentage of dominant impulsive-reflective cognitive style is 69.69%, and also Rochika & Cintamulya's research (2017) states that students with dominant reflective-impulsive cognitive style with a percentage of 81.82%.

1. **Misconception on Impulsive Cognitive Style**

    Based on the results of the DN analysis using the Three Tier method, there are 5 of 9 wrong questions, and 3 of them are included in the results of misconceptions. Misconceptions are indexed on questions number 6, 7, and 8. At number 6, the answer in the first tier is wrong-wrong-convinced, so in the result table, it is found that students experience type 2 misconceptions. One solution formula is given for the sum of the first n terms of an arithmetic sequence (Sn), while what is being asked is the formula for the nth term of an arithmetic sequence (Sn). So that it can be concluded that the student experiences a type of theoretical misconception where students cannot find the facts or the meaning of the questions given, then in question number 7, contextual questions are given about the number of the first n terms of an arithmetic sequence. Still, in question number 7 there are 63.63% of students experienced the wrong misconception. The only one is DN. In the results of interviews conducted with DN, DN stated that the amount of savings in question is the amount saved, not the total amount of savings so that in the settlement process, he uses the solution of the nth term in the arithmetic sequence so that in the 3rd tier he answers three where he convinced answers that has been given is the correct answer. In this case, the type of misconception experienced by DN is a type of correlation misconception where DN is not aware of the relationship between the sentence "the total amount of money" with the choice of formula in solving the problem. Furthermore, in question number 8, the answer given is in the form of a solution using the formula for the nth term of an arithmetic sequence. In the resolution, DN provides a level of confidence and 4. In contrast, in tier 1 and tier 2, the answer is wrong. It is included in

misconception type 2, while the kind of misconception is DN., classified as a classificational misconception where DN can not distinguish or classify arithmetic sequences with geometric sequences. In this case, this research is in line with Aldianisa's research; et al. (2021), where students' misconceptions arise due to the incompatibility of the student's mind structure with the given problem structure. This research is in line with a study conducted by Alsagaf (2019) and Minarni (2018), which states that diagnostic tests using the Three Tiers Test have good quality in measuring students' misconceptions about the material given by the teacher.

2. **Misconception in Reflective Cognitive Style**

    Based on the results of the analysis on CP using the Three Tiers 2 method, out of 5 wrong answers are included in misconceptions, misconceptions occur in questions number 2 and 7. on tiers 1 and 2 false and on the third tier, he gave five which means CP confirmed that the answer given was correct, during the interview he was fooled by subtracting the initial number with the second. So that CP is included in the type of theoretical misconception, namely, students experience misconceptions in studying existing facts (Amien, 1990) so that they assume that all questions to find the next number are arithmetic sequences. He says that he does not understand geometric number series. In this case, this research is in line with research conducted by Aldianisa; et al. (2021), where the occurrence of theoretical misconceptions occurs due to students' ignorance in interpreting the existing material concepts. In question number 7, CP experienced the same misconception as DN, where the misconception that happened was a correlation misconception. CP was not aware of the relationship between the sentence "the total amount of money" with the formula used in solving the problem in the answer analysis. The results obtained in tiers 1 and 2 were wrong, and in the third tier, he gives five, which means CP confirms that the answer is correct. Besides that, CP does not understand the number of the first n terms. This triggers the emergence of misconceptions about CP. In this study, only one student who experienced a misconception on reflective cognitive style met the qualifications. This research is in line with research conducted by Alsagaf (2019) and Minarni, 2018 which states that diagnostic tests using the Three Tiers Test have good quality in measuring students' misconceptions about the material provided by the teacher.

Table 15. Types of Misconception in Each Cognitive Style

Types of Misconception	Impulsive Cognitive Style Students (DN)	Reflective Cognitive Style Students (CP)
Classification Misconception	Qualify	Not Qualify
Correlational Misconception	Qualify	Qualify
Theoretical Misconception	Qualify	Qualify

From the table above, it can be concluded that students with an impulsive cognitive style have three types of misconceptions, according to Amien (1990), namely classificational misconceptions, correlational misconceptions, and theoretical misconceptions. Meanwhile, students with reflective cognitive style have two of the three types of misconceptions, according to Amien (1990), namely correlational misconceptions and theoretical misconceptions.

CLOSING

Conclusions in research on students' misconceptions based on the impulsive-reflective cognitive style are as follows:

1) Students with an impulsive cognitive style in solving problems look quite in a hurry in working on problems seen from the short enough processing time so that an answer wrong appears that leads to misconceptions. Students with an impulsive cognitive style have all three categories of misconceptions, according to Amien (1990), starting from theoretical, classification, and correlational misconceptions.

2) Students with reflective cognitive styles are better able to solve problems in a slightly longer time. Still, they can minimize confusion so that a few misconceptions arise from all students with reflective cognitive styles. Students with reflective cognitive style found correlational misconceptions and theoretical misconceptions grouped by Amien (1990).

3) Students with reflective-impulsive cognitive styles experience the same two types of misconceptions, namely correlational and theoretical misconceptions. Students experience misconceptions on contextual problems, especially geometric series material and the number of the first n terms in a series.

4) From the results of the analysis and interview process that has been carried out, it can be concluded that at the time of giving the number pattern material, the learning process still applies distance learning (PJJ), so one of the factors that students experience misconceptions is distance learning activities (PJJ) or better known as class. Online/online where at the time of the interview, students said they depended more on the internet in answering the daily tasks given by the teacher. This resulted in a lack of conceptual understanding of the material provided by the teacher. In the distance learning process, students are more passive in learning activities. In addition, there are not a few students who at the time of learning do not take notes/listen well so that misconceptions occur in students.

SUGGESTION

In the distance learning process, the risk of students receiving different materials and concepts is relatively high because factors can interfere with the distance learning process. The only problem is that students are less focused on learning activities due to limited quotas, unstable signals, and being around at home, such as helping parents during learning hours. The learning process is less effective. In this case, the teacher's role is significant in this one-way learning activity, one of which is by providing material in various forms of access, such as video, pdf, or PPT, and checking student understanding regularly. The teacher can redefine the appropriate learning strategy or model in the learning process based on the students' cognitive styles, especially the impulsive and reflective cognitive styles, so that students can more easily understand the material and questions given. Learning strategies or learning models that can be used by teachers can be adapted to the characteristics of students with impulsive and reflective cognitive styles. For students with an impulsive cognitive style, the teacher can emphasize so that students can analyze or re-check the answers that have been given so that they can minimize misconceptions. Students with a reflective cognitive style can increase their understanding of material understanding so that misconceptions do not occur.

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