STUDENT CONCEPT UNDERSTANDING ANALYSIS IN NUMBER PATTERN MATERIAL DURING DISTANCE LEARNING (DL)

ANALISIS PEMAHAMAN KONSEP SISWA DALAM MATERI POLA BILANGAN SELAMA PEMBELAJARAN JARAK JAUH (PJJ)

Nita Novita[1], Sumarni[2*], Mohamad Riyadi[3]

[1]Universitas Kuningan, Jl. Cut Nyak Dhien No.36A Kuningan, 20171610017@uniku.ac.id
[2*]Universitas Kuningan, Jl. Cut Nyak Dhien No.36A Kuningan, marnie.1205@gmail.com
[3]Universitas Kuningan, Jl. Cut Nyak Dhien No.36A Kuningan, mohamad.riyadi@uniku.ac.id

ABSTRAK

Penelitian ini dilatarbelakangi bahwa siswa masih kurang memahami konsep dalam menentukan pola bilangan terutuama selama Pembelajaran Jarak Jauh (PJJ). Tujuan penelitian ini adalah untuk mengetahui kemampuan pemahaman konsep siswa dan mengetahui bagaimana cara guru mengajarkan materi pola bilangan selama DL. Penelitian ini adalah penelitian deskriptif kualitatif. penelitian ini dilaksanakan di MTs Pertiwi Kuningan tahun ajaran 2020/2021 pada kelas VIII A sebanyak 16 siswa dan seorang guru mata pelajaran matematika. Sumber data penelitain ini adalah hasil tes tulis dan wawancara. Berdasarkan hasil analisis data, menunjukan bahwa kemampuan pemahaman konsep matematis siswa dengan kategori tinggi adalah sebanyak 45%, kategori sedang sebanyak 40% dan kategori rendah sebanyak 15%. Hasil penelitian ini juga menunjukkan bahwa kemampuan siswa dari masing masing indikator sebagai berikut : 1) siswa dengan kategori tinggi mampu mengerjakan semua soal dengan benar, 2) siswa pada kategori sedang mampu mengerjakan 6 butir soal atau menguasai 6 indikator kemamapuan pemahaman konsep; 3) siswa dengan indikator rendah dapat mengerjakan 4 butir soal atau menguasai 4 indikator kemampuan pemahaman konsep.
Kata kunci: Analisis Pemahaman Konsep, Pembelajaran Jarak Jauh, Pola Bilangan

ABSTRACT

The background of this research is that students still do not understand the concept of determining number patterns, especially during Distance Learning (DL). The purpose of this study was to determine the students' conceptual understanding ability and to find out how teachers teach number pattern material during DL. This research is a qualitative descriptive research. This research was carried out at MTs Pertiwi Kuningan for the academic year 2020/2021 in class VIII A as many as 16 students and a mathematics teacher. The data sources for this research are the results of written tests and interviews. Based on the results of data analysis, it shows that the ability to understand mathematical concepts of students in the high category is 45%, the medium category is 40% and the low category is 15%. The results of this study also showed that the students' abilities from each indicator were as follows: 1) students in the high category were able to do all the questions correctly, 2) students in the medium category were able to work on 6 items or mastered 6 indicators of conceptual understanding ability; 3) students with low indicators can work on 4 questions or master 4 indicators of concept understanding ability.
Keywords: Concept Understanding Analysis, Distance Learning, Number Patterns

PRELIMINARY

Mathematics is a science that has many influences in everyday life and has an important role in the development of technology (Sumarni, 2016). Mathematics is one of the subjects given from elementary to college level. Likewise, according to Zaerani (2017) mathematics is the science of logic related to shapes, arrangements, and the concept of other relationships which are numerous and are divided into three fields, namely analysis, geometry and algebra. One of the goals of learning mathematics in schools is to understand mathematical concepts, explain the interrelationships between concepts and apply concepts or algorithms in a flexible, accurate, efficient and precise way in solving the problems listed in Permendiknas Nomor 22 Tahun 2006.

The outbreak of the Coronavirus Disease of 2019 (COVID-19) which has hit almost the last two years, has had an impact on education in the world, without exception Indonesia. The Kuningan Regency Government based on Surat Edaran Nomor 4 Tahun 2020 concerning the Implementation of Education Policies in the Emergency Period for the Spread of Covid-19 issued by the government issued a recommendation to continue learning from home or Distance Learning (DL) to stop the spread of COVID-19.

According to Arnesti & Hamid (2015) DL is an open and distributed learning system using enabling devices via the internet and network-based technology that forms a meaningful learning and interaction process. This allows for tailoring education and training to other responsibilities and commitments. DL is not easy to implement, how is it possible that the connection limitations of each student are different. This is supported by (Hutami, 2010) stating that the limitations of the media, the lack of mastery of technology, the addition of internet quota costs.

As is the case at MTs Pertiwi Kuningan during DL the teacher uses Whatsapp and Goggle classroom media to support more focused learning activities and students certainly have the WhatsApp application. Student learning outcomes based on preliminary studies, as long as DL mathematics scores are still low, students are only able to work on questions that match the examples with different numbers and students immediately write answers without solving steps. This is in line with Harisuddin (2020) opinion in DL students showed negative results with an average negative percentage of 53.3% and in his research students who were able to understand concepts during DL were still low but there was one student who had a good understanding of the concept of 40 students.

There are three important aspects in DL, including the separation of teachers from students, independence and learning services (Warsita, 2014). Of the three aspects, the

independence of students in learning is an aspect that is influenced by the way the teacher processes pleasant learning and the form of service provided by the teacher and the educational institution. There are so many gaps that occur during DL including the difficulties found in online learning systems, including: (1) unstable internet network (2) limited internet quota (3) ineffective teaching and learning (Kusumaningrum & Wijayanto, 2020).

This DL requires students to learn independently and understand the concept of a material independently to support student success in learning. But in reality, students are reluctant to study independently because according to him, independent learning is more difficult than studying together in class. The influence in students' independent learning is a sense of laziness to learn (Warsita, 2014). In the implementation of DL students complained about the lack of opportunities to discuss directly and freely, discussions were carried out using the comments column or chatting with text, so that many contexts could not be conveyed clearly because they could not be described clearly through text (Kusumaningrum & Wijayanto, 2020). This certainly has an impact on students' understanding of the material being studied.

Kholidah & Sujadi (2018) stated that in solving problems of understanding students had difficulty applying formulas and performing arithmetic operations in solving problems. Lack of practice questions makes it difficult for students to operate formulas when given tasks that are different from sample questions, but there are also students who can operate problem solving formulas, but in explaining understanding of concepts students are still unsure Kholidah & Sujadi (2018). Likewise, in the schools that the researchers studied, there were some students who had difficulties in solving problems.

Kastberg (2002), states that students' understanding of mathematical concepts is a collection of beliefs held personally about these concepts. Understanding concepts is very important in learning, especially learning mathematics, if students are able to understand the concept of a material then students are able to solve problems in the material and vice versa if students are not able to understand the concept then the student cannot solve problems related to the problems given (Sumarni & Adiastuty, 2015).

Conceptual understanding analysis is the ability of students to re-explain something in depth about the concept and students will build their own knowledge, in this case understanding the concept is not just memorizing but can rediscover the origin of the concept. Copeland (Rojak, 2017) distinguishes conceptual understanding into two, namely 1) understanding of routine concepts, students work based on repeated practice questions

continuously, so students can find out what is solved in working on questions from a more complicated level. 2) understanding the concept of a problem, students work on questions from a low level to a more complicated level, so students can understand the concept of a problem.

Solving problems requires understanding mathematical concepts. According to (Alamsyah, 2017) understanding of mathematical concepts is a number of mastery of learning materials, where students not only recognize and know the concept, but students are able to express it again using their own language that is easy to understand and apply. Therefore, understanding students' mathematical concepts is very important so that in problem solving students are able to work on questions if the student is able to understand the concept (Alamsyah, 2017).

Concept understanding is a situation where students find and prove a concept itself without a rote process. Ghazali & Zakaria (Miatun & Khusna, 2018) stated that understanding concepts allows students to solve mathematical problems with various forms and new rules. Students with high conceptual ability are able to solve problems that they have experienced before. In terms of understanding the concept has usefulness i.e. for mathematics education it should not be limited to, for example, understanding that the concept of function is the mental experience of a person assigning some object to the term 'function' (Godino 2015).

Based on the opinion above, it can be concluded that the understanding of mathematical concepts is the ability of students to explain something in depth about the concept and can implement it in everyday life. Students are able to define their own understanding of concepts using concrete examples because understanding is not just memorizing.

The results of understanding the concept are obtained using measuring instruments (indicators). Indicators are very important and can be used as measurement guidelines. The measuring instrument used in this research is according to Sumarni, (2020), Kartika et al., (2018) indicators of concept understanding as follows: that indicators of understanding mathematical concepts are able to: 1) restate a concept, 2) classify objects according to their properties. certain properties according to the concept, 3) Give examples and not examples of a concept, 4) Present concepts in various forms of mathematical representation, 5) Develop necessary or sufficient conditions of a concept, 6) Use and utilize and choose procedures or operations certain, 7) Apply concepts or algorithms in problem solving.

A number pattern is an arrangement of numbers that form a certain pattern, for example triangles, squares and so on with the formula un=n+1, while the kinds of number patterns are odd, even, triangular, square, rectangular, and pascal number patterns. The concept of number patterns is very applicable in everyday life, ranging from patterns that are deliberately made by humans such as the pattern of giving house numbers to patterns that exist in nature such as the Fibonacci number pattern on various flowers and animals (As'ari, 2017). In addition, the number pattern is one of the benchmarks for a person's academic ability. Because the concept of number patterns is contained in the questions of the Academic Potential Test. Therefore, learning about number patterns in junior high school is the starting point for students to learn and understand pattern mathematics other than numeric mathematics and wake mathematics which are very useful as capital in further education (As'ari, 2017). So it is necessary to have a good understanding of the concept of number pattern material.

Based on the explanation above, this study aims to determine the ability to understand students' mathematical concepts in solving number pattern problems during DL. In addition, this study also aims to find out how teachers teach number pattern material during DL. This research is expected to have a positive impact in order to become a reference for teachers and schools regarding the understanding of students' concepts and become a reference in designing learning so that students are assisted in increasing understanding of number pattern material.

METHOD

This type of research is a qualitative research that aims to understand the phenomena experienced by the research subjects by means of descriptions in the form of words and not numbers. The approach used is a descriptive approach. What is described is the understanding of students' concepts in number pattern material during distance learning and how teachers teach number pattern material during distance learning. In this case, it is based on direct observations in class during the process of working on the student's concept understanding test on the number pattern material carried out by the subject.

Subjects were taken using Clusters Random Sampling. Clusters Random Sampling is a random sample from the nature of grouping individuals in the population which can be in the form of schools, sub-districts, villages and others (Nongkynrih, 2017). Cluster sampling is particularly useful when the population is widely dispersed and it is impractical to register and sample all its elements. Community surveys often use a two-

stage cluster sample: a random sample is drawn from the cluster (village/kelurahan/block or school), and within each selected cluster all eligible subjects are included. The level of sampling can also be carried out in clusters where the individuals are enumerated and part of the sample for the study is randomly selected both processes (Nongkynrih, 2017). Where the research subjects were chosen randomly by the researcher based on random class. The subjects in this study were students of class VIII A of MTs Pertiwi Kuningan as many as 16 students and a mathematics teacher. Furthermore, students were given a concept understanding test related to number pattern material in the form of descriptions which were then selected by six students, two students each representing the high, medium and low categories to be interviewed.

Before conducting tests on students, a validation test was carried out first with three validators. The results of the validation are that the test and interview instruments tested are valid and can be used for research. The instrument used in this study was a written test in the form of conceptual understanding skills and interviews with students regarding the understanding of number pattern concepts based on the results of the students' conceptual understanding ability tests and interviews with teachers regarding the implementation of DL in learning number pattern material. The following is Table 1 which describes the written test instrument and Table 2 the interview instrument.

Table 1. Test Instruments

No.	Question
1.	Explain again what is included with the Pascal number pattern?
2.	Is $2 + 6 + 12 + 20 + 30 + ...$ is an arithmetic series explain! Pay attention to the numbers below! 3,5,10,15,...; 5,7,11,14, ...; 2,6,10,14,.. ;2,8,13,19,..; 5,7,11,14,...; 2,4,6,8,...
3.	Group the sequence of numbers into a. The sequence of numbers that is an arithmetic sequence is b. Arrange a sequence of numbers that is not a sequence of numbers is
4.	A row of rectangular numbers with the first term is 1 and the difference is 2, try to write down the sequence and describe the arrangement of the numbers... If the sum of the first n terms of an arithmetic series is 210 with u3 = 11 and u10 = 39, then the value of n is ...
5.	In an arithmetic sequence, it is known that the 3rd sequence is 11 and the 10th term is 39. a. What's the difference? b. What is the first term? c. What is the sum of the first 10 terms?
6.	In the arithmetic sequence, it is known that the 3rd sequence is 11 and the 10th term is 39. a. What's the difference? b. What is the first term?

No.	Question
	c. What is the sum of the first 10 terms?
7.	Rika saves every Monday. Initially Rika saved Rp. 5000, -. If every week Rika saves Rp. 1000,- more than the previous week, then Rika's total savings in the 10th week is...

Table 2. Interview Instruments

Interview questions with teachers

1. *During Distance Learning, what applications are used to provide number pattern material?*
2. *How do you teach the number pattern material?*
3. *Are there any difficulties in teaching number pattern material using the application?*
4. *What are the obstacles that may occur during the implementation of Distance Learning?*
5. *How do you condition students to take part in learning?*
6. *What factors make students less able to understand concepts, especially in number pattern material during Distance Learning?*

Interview questions with students

Indicator restates a concept
a) Do you understand the concept of number patterns?
b) Can you explain again what is a number pattern?
Indicators classify objects according to certain properties according to the concept
What is in the nature of number patterns?
Indicators provide examples and not examples of a concept
a) Can you write examples and non-examples in the number pattern problem?
b) What is the reason for answering that the example is true or false?
Indicators present concepts in various forms of mathematical representation
Can you describe the shape of a number pattern concept presented?
Indicators develop the necessary and sufficient conditions of a concept
What are the conditions that are known in solving number pattern problems?
Indicators use and utilize and select certain procedures or operations
a) How to solve the problem?
b) Is the method used correct?
Indicator of ability to apply concept or problem solving algorithm
Have you used the right steps in solving problems related to everyday life?

The questions are validated by experts for eligibility on student tests. The following is an explanation of the validation contained in Table 3 below:

Table 3. Exposure To The Validation Of The Concept Understanding Ability Test And Interview Questions

Validator	Validation Result Of Concept Understanding Ability Test	Result Of Interview Question Validation
Validator 1	The test questions are feasible to be tested but there is a revision to question number 3 which does not include indicators providing examples and not examples, and the researcher's error in	Interview questions for students are feasible used. However, interview questions for teachers should add questions about student

Validator	Validation Result Of Concept Understanding Ability Test	Result Of Interview Question Validation
	providing validation sheets, the error is found in different written test questions and validation.	conditioning in participating in DL, in order to get an idea of the DL process carried out by the teacher.
Validator 2	The test questions are feasible to be tested after revision, but the suggestion from the validator is that the questions must be more detailed.	The interview questions are in accordance with the expected interview objectives.
Validator 3	The test questions are feasible to be tested after revision with comments and suggestions, namely the questions given are in accordance with the indicators but there is one question that is not answered correctly but has been corrected.	The interview questions are good and feasible to use, maybe there are still some typos, please repaired.

The number pattern material has been taught, so external validation is seen in the work of students during learning with the teacher, so that the trial of one class can be seen from the work of students during number pattern learning. The following Table 4 is a scoring guideline used during the research at MTs Pertiwi Kuningan.

Table 4. Test Scoring Guidelines

Description	Score
No Answer	0
Cannot Restate Concept	1
Can State Concepts But Wrong	2
Can State Concepts But Not Exactly	3
Can State Concepts Correctly	4

This research is a qualitative research so that the data analysis technique used is qualitative data analysis. Analysis of test results is used to determine the level of understanding of students' concepts as well as see the errors in student answers and describe them. Analysis of the ability to understand the concept is carried out in the following way:

a. Calculating the score on each item sal by using the scoring guideline for the ability to understand concept test.

b. After getting the test scores, the scores are categorized based on each indicator of students' conceptual understanding based on high, medium and low. The category of written test of concept understanding ability according to D. A. Sari (2014) in Table 5 is as follows:

Table 5. Percentage of Student Concept Understanding

Percentage of concept ability	Category
$0\% \le P < 40\%$	Very low
$20\% \le P < 40\%$	Low
$40\% \le P < 60\%$	Moderate
$60\% \le P < 80\%$	High
$80\% \le P < 100\%$	Very high

c. Make a description of each category with a mathematical reference and make a description of the student's answer errors.

RESULT AND DISCUSSION

Errors in understanding concepts are things that often occur that must be considered by educators. Before carrying out the research, the researcher developed research instruments in the form of a concept understanding test and interview guidelines based on indicators of understanding mathematical concepts. Concept understanding test consisting of 7 essay questions and interview guidelines which were arranged to determine students' understanding in solving number pattern problems. After the instrument, the next research is arranged to obtain the required data. In this study, the indicators for understanding students' concepts according to Kartika et al., (2018), indicators for understanding concepts are presented in table 6 below:

Table 6. Indicators of Student Concept Understanding

Question Number	Indicator
1	Restate a concept
2	Classifying objects according to the properties of a concept
3	Give examples and not examples
4	Presenting concepts in the form of mathematical representations
5	Develop necessary and sufficient conditions
6	Using and utilizing and selecting certain procedures or operations
7	Applying a problem solving concept or algorithm

The following is Table 7, namely the ability to understand students' concepts which have been calculated as follows:

Table 7. Results of Concept Understanding Ability of Class VIII A Mts Pertiwi Kuningan

Student Concept Understanding Ability			Total
Tall $(80 \geq x \leq 100)$	Medium $(70 \geq x \leq 79)$	Low $(60 \geq x \leq 69)$	16
5 people	4 people	7 people	

Based on Table 7 it can be seen that there are 5 students with high ability, 4 students with moderate ability and 7 students with low ability. So it can be stated that there are 44% of students in the low category in the ability to understand concepts in number pattern material during DL. Based on the average percentage score of concept understanding, which is 72.3%, it can be stated that the students' ability to understand concepts in number pattern material during DL is in the medium category. Table 8 below is the percentage of student answers for each indicator of concept understanding according to table 2.

Table 8. Percentage of Students' Concept Understanding Results Scores for Each Indicator

No	Indicator	Percentage Understanding the concept of Results of Each Indicator	Percentage of Error of Results of Each Indicator
1	Restate a concept	75,0%	25,0%
2	Classifying objects according to the properties of a concept	75,0%	25,0%
3	Give examples and non-examples	74,1%	25,9%
4	Presenting concepts in the form of mathematical representations	73,3%	26,7%
5	Develop necessary and sufficient conditions	71,1%	28,9%
6	Using and utilizing and choosing certain procedures or operations	72,7%	27,3%
7	Applying problem solving concepts or algorithms 65% 36.0%	65%	36,0%
	Average	72,3	**27,7%**

Based on Table 8, it shows that the percentage of understanding of each indicator of concept understanding (1) In online learning, students' understanding of the indicators of rewriting a concept is 75%, this indicator is the easiest of all indicators, to get a higher percentage, students should pay more attention to the learning videos provided. by the teacher in order to get better results (2) understanding in indicator 2, namely errors can

classify objects based on the properties of a concept that is equal to 72.3% with categories, this is because distance learning makes students bored in learning, especially mathematics so that students to get a higher percentage, students must be more active in studying the material, especially the number pattern material (3) understanding in indicator 3, namely errors can provide examples and not examples of 71.1% with high categories and can be understood by students in order to get good results. more maximum s students should pay more attention to learning, especially in number pattern material (4) understanding in indicator 4, namely errors in presenting concepts in various forms of mathematical representations by 73.3% in the high category, the solution given is that students must be more active in order to get maximum results (5) understanding in indicator 5, namely the ability to develop necessary and sufficient conditions of 74.1% with a high category in this indicator there are still many students who do not understand in solving the questions given in order to make it easier to work on this problem students must understand first how to find the first term and its different. (6) understanding the concept in indicator 6, namely utilizing and choosing certain procedures or operations by 75.0% this is because many students are still less able to solve problems that are not known to the first term and the difference so that students have difficulty solving the questions given then by so students must be more observant and pay more attention to the learning given by the teacher (7) understanding in indicator 7, namely the ability to apply problem solving concepts or algorithms by 30.0% this is because students do not understand applying problem solving concepts or algorithms so indicator 7 is indicator that has the lowest percentage because students do not understand number pattern questions in the form of story questions, therefore students should practice more with story questions about number patterns in order to get a higher percentage and increase understanding of concepts, so that the average percentage of understanding concepts in solving number pattern problems for class VIII MTs Pertiwi Kuningan is 73.0% with an error percentage of 27.0%.

Table 8 also shows that the percentage of errors with a greater level occurs in the seventh indicator, namely applying the concept or problem-solving algorithm with an error rate of 36.0%. With an average error answer of 27.7%. The following is a description of the errors made by students on each indicator and question according to the indicators of understanding the concept.

a. Repeating a concept

Based on the results of the error analysis of the first indicator, namely repeating a concept carried out by students, it is presented in Figure 1 as follows:
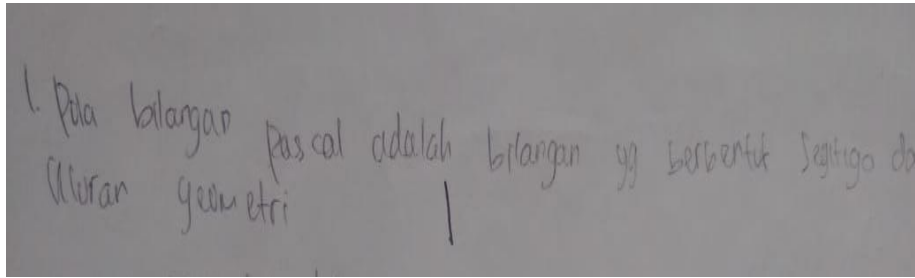
Figure 1. Student Answer Number 1

Based on the results of tests and interviews on the first concept understanding indicator for S2R1 students can restate a concept well but do not know the shape of the Pascal number pattern, and the results of the interviews students are unable to give reasons with the correct answers. Pascal's number pattern is a geometric rule that contains an arrangement of binomial coefficients resembling a triangle, contrary to the research of Dewanti et al. (2018) students are able to restate a concept that has stated the meaning of constants, variables, coefficients and terms. The following is an interview on understanding concepts in S2R1 in solving number pattern questions on the first concept understanding indicator, which is restating a concept.

> *P   : Pay attention to question number 1, is there anything missing from your answer?*
>
> *J   : None*
>
> *p   : Are you sure? Do you know the shape of the Pascal number pattern?*
>
> *J   : No you*

Based on the results of tests and interviews on the first concept understanding indicator for S2R1 students can restate a concept well but do not know the shape of the Pascal number pattern, and the results of the interviews students are unable to give reasons with the correct answers. Contrary to Sari, 2017 research, where students' ability to understand concepts in restating a concept has an average of 57% in the sufficient category.

Based on the results of the second indicator error analysis, namely classifying objects based on the properties of a concept in Figure 2 below:

Figure 2. Student Answer Number 2

The following are the results of the interview on understanding the concept of the subject S2R3 in solving number pattern questions on the indicator of understanding concept 3, namely being able to provide examples and not examples.

P : *Okay, let's move on to number 3, how easy is it to do number 3?*

J : *Not bad,*

P : *But why are those that are not arithmetic sequences not solved?*

J : *Forget.*

P : *But do you know how to distinguish between those that are included and which are not included in an arithmetic sequence? Try to explain!*

J : *Understanding which belongs to an arithmetic sequence that has the same difference, while that which does not belong to an arithmetic sequence that has a difference that is not the same.*

Based on the results of tests and interviews on the first concept understanding indicator for S2R1 students can classify objects based on the properties of a concept well but do not include whether or not the series is included and can answer all questions during the interview. Classifying objects based on certain properties according to the concept is the second indicator of students' conceptual understanding in grouping problems based on the properties possessed by the material (Mutohar, 2016) and in line with research conducted by Dewanti et al, (2018) students are able to classify objects according to certain properties according to the concept, namely students are able to smoothly determine constants, coefficients and terms of an algebraic form.

b. Give examples and not examples

Based on the results of the third indicator error analysis, which is to provide examples and not examples in Figure 3 below:
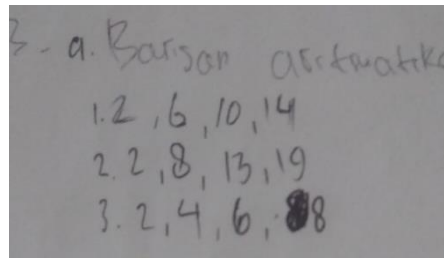
Figure 3. Student Answer Number 3

The following are the results of the interview on understanding the concept of the subject S2R3 in solving number pattern questions on the indicator of understanding concept 3, namely being able to provide examples and not examples.

> P   :   *Okay, let's move on to number 3, how easy is it to do number 3?*
>
> J   :   *Not bad,*
>
> P   :   *But why are not included in the arithmetic sequence not solved ?*
>
> J   :   *Forget.*
>
> P   :   *But do you know how to distinguish between those that are included and which are not included in an arithmetic sequence? Try to explain!*
>
> J   :   *Understanding which belongs to an arithmetic sequence that has the same difference, while that which does not belong to an arithmetic sequence that has a difference that is not the same.*

Based on the results of tests and interviews on indicator 3 for S2R3, students can distinguish between number patterns and non-number patterns, but those that are not arithmetic sequences are not completed, but when interviewed, S2R3 subjects were able to distinguish between number patterns and not. This study contradicts Fajar et al., (2019) students have difficulty in giving examples from SPLDV. Students need help to be able to give examples and not examples.

c.   Presenting concepts in various forms of mathematical representation

Based on the results of the fourth indicator error analysis, namely presenting concepts in various forms of mathematical representations made by students in Figure 4 below:
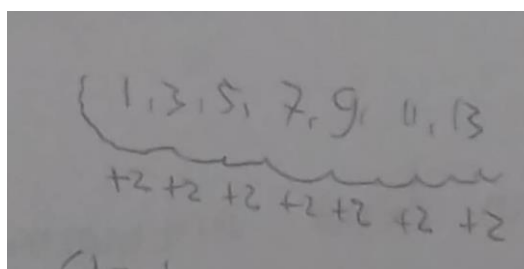

Figure 4. Student Answer Number 4

The following are the results of student interviews in solving concept understanding problems with indicators presenting concepts in various forms of mathematical representation.

> *P : Look at the question in question number 4, does it match your answer? or is there something missing?*
>
> *J : Oh, did you not include a picture of the arrangement of the numbers?*
>
> *P : Then why is it not listed?*
>
> *J : Forgot*

Based on the written test and interview test conducted on indicator 4 for S2R4 students are able to write down the correct sequence of numbers according to the questions given and do not describe the sequence of numbers or what is called a nokta. At the time of the interview, the students understood how to describe the number arrangement of the problem. In indicators presenting concepts in various forms of mathematical representation, students are asked to describe an object in a picture and write a sentence from a concept. This is also in line with research by Dewanti et al. (2018) (2018) where students are able to present concepts in various forms of mathematical representations smoothly.

d. Develop necessary and sufficient conditions

Based on the results of the analysis of the five indicators, namely developing the necessary and sufficient conditions in Figure 5 below:

Figure 5. Student's Answer Number 5

The following are the results of the interview on understanding the S2R5 concept in solving number pattern questions on the 5th indicator of understanding the concept, namely the ability to develop necessary and sufficient conditions.

> *P : Continue to number 5, why is it not resolved?*
>
> *J : Forgot how to do it*

Based on the results of tests and interviews on indicator 5, namely the ability to develop the necessary and sufficient conditions for the S2R5 subject unable to work on the questions given. Indicators develop necessary and sufficient conditions, namely to measure the extent to which students work on questions in accordance with procedures based on known necessary conditions. This research is in line with the opinion of Nurul (2019) which states that students have not been able to develop the necessary and sufficient conditions for a material concept.

e. Use and utilize and choose certain procedures or operations

Based on the results of the analysis of the sixth indicator error, namely using and utilizing and choosing certain procedures or operations carried out by students in Figure 6 below:
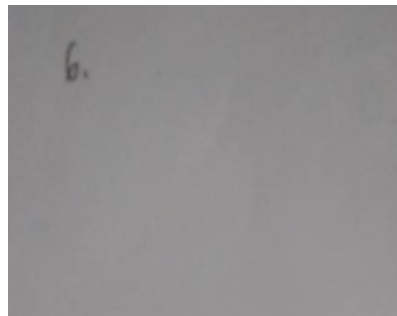

Figure 6. Student Answer Number 6

The following are the results of the interview on understanding the concepts of S2R6 and S2R7 in solving number pattern problems on indicators of understanding concepts 6 and 7, namely utilizing and choosing certain procedures or operations, and the ability to apply concepts or problem solving algorithms.

> *P   :   Continue to number 6 and 7 is not done?*
>
> *J   :   I don't know the formula*

Based on the results of the concept understanding test, it can be concluded that students are still less able to utilize and choose certain procedures on number patterns. In addition, the results of the interview also cannot explain that S2R6 understands question number 6, but it is contrary to Sari (2017) which states that the indicator of understanding the concept of utilizing and choosing certain procedures has a percentage of 85% with a very good category.

f. Apply problem solving concepts or algorithms.

Based on the results of the seventh indicator error analysis, namely applying the concept or problem-solving algorithm carried out by students in Figure 7 below:
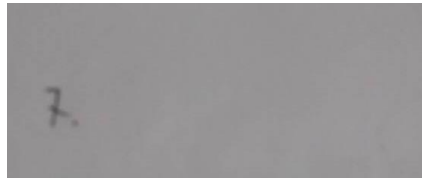
Figure 7. Student Answer Number 7

Based on the results of the concept understanding test and interviews, it can be concluded that S2R7 could not understand the concept correctly and during the interview S2R7 was unable to answer correctly according to the questions. The indicator applies a problem-solving concept or algorithm, in this question students are asked to find the amount of Rika's savings in the 10th week. In indicator 7 different research by Nurul (2019) which states that students are able to apply concepts or problem-solving algorithms to number pattern material.

The following is the average of students' conceptual understanding in the high, medium and low categories with the help of Ms. Office Excel which will be presented in the following table 9:

Table 9. The average understanding of students' concepts in the high, medium and low categories

No	Code	Indicator of concept understanding							Code Average of all categories (%)
		I	II	III	IV	V	VI	VII	
1	S_1T	2	2	1	2	2	2	2	45%
2	S_2T	2	1	2	2	2	2	2	
3	S_1S	1	2	2	1	2	2	2	40%
4	S_2S	2	2	1	1	2	2	1	
5	S_1R	1	0	0	1	2	0	0	15%
6	S_2R	1	0	1	1	1	1	0	

Description:

S1T : First student in high category

S2T : The second student is in high category

S1S: The first student in the medium category

S2S : The second category of students is moderate

S1R: The first student in the low category

S2R: The second student in the low category

Table 9 explains that students with high concept understanding ability are 45%, medium category are 40%, and low are 15%. This is because students have not been able to understand mathematical concepts, especially on the fifth, sixth and seventh questions, students are still confused about solving these problems.

Harisuddin, (2020) stated that learning mathematics using a distance learning system is not easy. Further Harisuddin, (2020) stated that 53.3% of students showed a negative response to DL, because learning mathematics with DL is very confusing for students when there is material that is difficult to understand. Learning number patterns students still do not understand the concept, therefore interviews with teachers to find out how to teach number pattern material during DL can be seen as follows:

P :   *During distance learning, what applications are used to provide learning to students, especially in number pattern material*

J :   *In teaching using the whatsapp application and google classroom*

P :   *How do you teach number pattern material, especially during DL?*

J :   *By using learning videos uploaded on google classroom and whatsapp*

P :   *What kind of videos do you use? does it only use the lecture method or interactive?*

J :   *In making the video using an interactive method where in the video it asks students to answer questions that are in accordance with the submaterial being taught and then at the end of the video students are asked to work on the questions*

P :   *Are there any difficulties in teaching number pattern material using the application?*

J :   *In teaching number pattern material, students are usually constrained by signals and quota*

P :   *How do students learn during distance learning, ma'am*

J :   *From the video and there are face-to-face meetings that will discuss the essence of the learning*

P :   *What are the obstacles that may occur during the implementation of distance learning?*

J :   *Barriers that often occur are when students do not take lessons on the grounds that they do not have a quota or other reasons.*

P :   *How do you condition students during distance learning?*

J :   *Having 2 absences, namely in google classroom and whatsapp and what is often seen is absent on whatsaap, if students are not absent, they will be called or on video calls.*

Description: P = Question, J = Answer

In interviews with teachers regarding distance learning in teaching number pattern material using applications other than whatsapp to make it easier for students to follow learning, but sometimes there are still many students who are reluctant to take part in learning because learning is carried out at home. From the results of interviews with teachers, the teaching and learning process during distance learning uses the goggle classroom application to support student success in learning the material, especially number patterns. Teachers must have strategies so that students can learn effectively and efficiently in accordance with the expected goals (S. Sumarni et al., 2018). One of the efforts that must be made by the teacher is to choose and use the right learning media and apply the right learning model and in accordance with the material or concept being taught. One of the media that can facilitate the ability to relate mathematical concepts is learning media based on Adobe Flash CS6 through a Contextual approach (Yuniar et al., 2020). In addition, students should be given the opportunity to find knowledge or concepts independently in accordance with previous knowledge (Destiana et. al.,2020).

CONCLUSION

In this study, researchers used qualitative data using data collection techniques in the form of a written test to 16 students which were then interviewed with 6 students including 2 people who had an understanding in the high category, 2 people had an understanding in the medium category, and 2 people had an understanding in the low category. The percentage of understanding the concept of each indicator in students who have a high category is 45%, a medium category is 40% and a low category is 15%. The results of this study also show the ability of students to understand the concept of each indicator as follows: 1) students in the high category are able to do all the questions correctly, 2) students in the medium category are able to work on 6 questions or master 6 indicators of conceptual understanding ability; 3) students with low indicators can work on 4 questions or master 4 indicators of concept understanding ability.

In this DL system, mathematics subject teachers use the Google Classroom and WhatsApp applications to facilitate communication. Learning materials are not piled up with chat, then use google classroom, but to coordinate and discuss the teacher uses the whatsapp application to make it easier for students.

ACKNOWLEDMENT

REFERENCES

Alamsyah, M. (2017). Analisis Kesulitan Pemahaman Konsep Matematika Dasar Pada Siswa Kelas VIII MTsN Balang-Balang. *Skripsi*. Universitas Islam Negeri Alauddin Makassar: Tidak Diterbitkan.

Arnesti, N., & Hamid, A. (2015). Penggunaan Media Pembelajaran Online-Offline dan Komunikasi Interpersonal Terhadap Hasil Belajar Bahasa Inggris. *Jurnal Teknologi Informasi & Komunikasi Dalam Pendidikan*, *2*(1), 85-99. https://doi.org/10.24114/jtikp.v2i1.3284.

As'ari. (2017). *Buku Siswa Matematika Untuk Kelas VIII Edisi Revisi 2017*. Jakarta: Kemendikbud.

Destiana, O., Sumarni, S., & Adiastuti, N. (2020). Pengembangan Perangkat Pembelajaran Bangun Ruang Sisi Datar dengan Pendekatan Kontruktivisme Berbasis Kemampuan Penalaran Matematis. *Mathline : Jurnal Matematika Dan Pendidikan Matematika*, 5(2), 128-145. https://doi.org/10.31943/mathline.v5i2.152.

Dewanti, N. A., Sujatmiko, P., & Pramesti, G. (2018). Analisis Pemahaman Konsep Matematika Siswa Dalam Menyelesaikan Soal Faktorisasi Suku Aljabar Berdasarkan Kesulitan Belajar Faktor Intelektual Siswa Pada Kelas VIII B SMPN 8 Surakarta Tahun Ajaran 2016/2017. *JURNAL PHENOMENON*, *8*(1), 26–35.

Fajar, A. P., Kodirun, K., Suhar, S., & Arapu, L. (2019). Analisis Kemampuan Pemahaman Konsep Matematis Siswa Kelas VIII SMP Negeri 17 Kendari. *Jurnal Pendidikan Matematika*, *9*(2), 229-239. https://doi.org/10.36709/jpm.v9i2.5872.

Godino, J. D. (2015). *Mathematical Concepts, Their Meanings, And Understanding Mathematical Concepts*. Online: https://www.ugr.es/~jgodino/articulos_ingles/meaning_understanding.pdf

Harisuddin, M. I. (2020). Pembelajaran Jarak Jauh Dimasa Pandemi Covid-19 Meningkatkan Pemahaman Konsep Matematis Siswa SMP N 2 Kotabaru. *Didaktik: Jurnal Ilmiah PGSD STKIP Subang*, *6*(2), 205–215.

Hutami, E. R. (2010). Kendala Pembelajaran Jarak Jauh Pada Masa Pandemi Bagi Siswa SD, Guru dan Orang Tua. *Jurnal UNY*, 3(1), 51–61. https://doi.org/10.21831/jwuny.v3i1.40706.

Kartika, Y. (2018). Analisis Kemampuan Pemahaman Konsep Matematis Peserta Didik Kelas VII SMP pada Materi Bentuk Aljabar. *Jurnal Pendidikan Tambusai*, 2(2), 777–785. https://doi.org/10.31004/jptam.v2i4.25.

Kastberg, S. E. (2002). *Understanding Mathematical Concepts: The Case Of The Logarithmic Function*, Disertation University of Georgia. Online : http://jwilson.coe.uga.edu/Pers/Dissertations/kastberg_signe_e_200205_phd.pdf

Kholidah, I. R., & Sujadi, A. A. (2018). Analisis Pemahaman Konsep Matematika Siswa Kelas V Dalam Menyelesaikan Soal di SD Negeri Gunturan Pandak Bantul Tahun Ajaran 2016/2017. *Trihayu*, *4*(3), 1-4. https://doi.org/10.30738/trihayu.v4i3.2607.

Kusumaningrum, B., & Wijayanto, Z. (2020). Apakah Pembelajaran Matematika Secara Daring Efektif? (Studi Kasus pada Pembelajaran Selama Masa Pandemi Covid-19).

Kreano Jurnal Matematika Kreatif-Inovatif, *11*(2), 136–142.

Nurafni, N., Miatun, A., & Khusna, H. (2018). Profil Pemahaman Konsep Teorema Pythagoras Siswa Berdasarkan Perbedaan Gaya Kognitif Field Independent dan Field Dependent. Kalamatika: *Jurnal Pendidikan Matematika*, 3(2), 175-192. https://doi.org/10.22236/KALAMATIKA.vol3no2.2018.

Mutohar, A. (2016). Analisis Kemampuan Pemahaman Konsep Matematis Siswa Kelas IX SMP Negeri 1 Pandanarum Pada Materi Kesebangunan dan Kekongruenan. *Skripsi.* Universitas Muhammadiyah Purwokerto: Tidak diterbitkan. Online http://repository.ump.ac.id/90/1/ALI%20MUTOHAR%20COVER.pdf.

Nongkynrih, B. (2017). Sampling, Sample Size Estimation and Randomisation. *Indian Journal Of Medical Specialities*, *3*(2), 195-197. https://doi.org/10.7713/ijms.2012.0056.

Nurul. (2019). Analisis Pemahaman Konsep Dalam Menyelesaikan Soal Pola Bilangan Pada Siswa Kelas VIII SMP Pesantren Guppi Samata Kabupaten Gowa. *SIGMA (Suara Intelektual Gaya Matematika, 11*(2), 114-121. https://doi.org/10.26618/sigma.v11i2.3512.

Rojak, A. (2017). Analisis Pemahaman Konsep pada Materi Perbandingan Siswa SMP. *Skripsi.* UIN Syarif Hidayatullah Jakarta: Tidak diterbitkan. Online https://repository.uinjkt.ac.id/dspace/bitstream/123456789/36540/1/ABDUL%20ROJ AK%20-%20FITK.pdf

Sari, D. A. (2014). Analisis pemahaman konsep matematika siswa setelah diterapkan kurikulum 2013. *Skripsi.* Universitas Muhammadiyah Surakarta: Tidak diterbitkan. Online http://eprints.ums.ac.id/32904/9/NASKAH%20PUBLIKASI.pdf *Jurnal*.

Sari, P. (2017). Pemahaman Konsep Matematika Siswa pada Materi Besar Sudut Melalui Pendekatan PMRI. *Jurnal Gantang*, 2(1), 41-50. https://doi.org/10.31629/jg.v2i1.60

Sumarni. (2020). *Kemampuan Matematis Tujuan dalam Pembelajaran Matematika* (1st ed.). Cirebon: CV Eulim Publisher.

Sumarni, S & Adiastuty, N. (2015). Perbandingan Pemahaman Matematis Antara Siswa Yang Memperoleh Pembelajaran Metode Discovery dan Metode Advance organizer. *Euclid*, *2*(1), 226-237.

Sumarni, S., Darhim, D., Fatimah, S., Priatna, N., Anjelita, A., & Taufik, A. (2018). The Students' Mathematical Concept Understanding Ability Through Cooperative Learning Type Jigsaw Assisted Visual Media. *J. Phys. Conf. Ser.* 1132 012051. https://doi.org/10.1088/1742-6596/1132/1/012051.

Sumarni, S. (2016). Tinjauan Korelasi Antara Kemampuan Koneksi Matematis dan Self-Regulated Learning Matematika Siswa yang Pembelajarannya Melalui Learning Cycle 5E. *JES-MAT (Jurnal Edukasi Dan Sains Matematika)*, *2*(1), 83–98. https://doi.org/10.25134/jes-mat.v2i1.283.

Warsita, B. (2014). Landasan Teori dan Teknologi Informasi dalam Pengembangan Teknologi Pembelajaran. *Jurnal Teknodik*, *15*(1) 84–96.

Yuniar, F., Sumarni, Adiastuty, N. (2020). Pengembangan Media Pembelajaran Segiempat Berbasis Adobe Flash CS6 Melalui Pendekatan Contectual Teaching And Learning Untuk Memfasilitasi Kemampuan Koneksi Matematis. *Jurnal Edukasi dan Sains Matematika (JES-MAT), 6*(2), 101-112. https://doi.org/10.25134/jes-mat.v6i2.3413.

Zaerani, S. (2017). Pengaruh Penguasaan Konsep Teorema Pythagoras Terhadap Kemampuan Menyelesaikan Soal-Soal Bangun Ruang Sisi Datar pada Siswa Kelas VIII MTs. Negeri Balang-Balang. *MaPan: Jurnal Matematika & Pembelajaran, 5*(2), 279-292.