Analysis Of Murder Learning On Arithmetic Concepts Based On Retrospective Analysis

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ABSTRACT

This research aims to analyze the use of MURDER (mood, understand, recall, digest, expand, and review) learning in arithmetic concepts based on retrospective analysis. The research method used is Didactical Design Research (DDR) using retrospective analysis. The population in this study were all students of class XI at Daarul Amanah High School. The sampling technique in this study used purposive sampling. This research shows that: (1) the use of the MURDER (mood, understand, recall, digest, expand, and review) learning model is able to help students understand arithmetic concepts. (2) Hypothetical Learning Trajectory or creating concepts and learning flows well is able to minimize students' Learning Obstacles, therefore didactic design is able to help students achieve learning goals, especially in mathematical critical thinking skills.

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INTRODUCTION

Education is something that is very important and a necessity for humans, because education can lead us to a more advanced direction and keep pace with the times. The Father of Indonesian National Education, Ki Hajar Dewantara (Pristiwanti, Badariah, et al, 2022) defined the meaning of education, namely; "Education is a demand in the life of growing children, while that means education guides all the strengths and nature that every child has, so that they realize that as human beings they must be able to achieve the highest safety and happiness". So education can direct us in a better direction. Edgar Dalle (Setiani, 2021) states that "Education is a conscious effort made by families, communities and governments through teaching guidance activities that last a lifetime to prepare students to be able to play roles in various living environments appropriately for the future" (Puspitasari, et al, 2021). Therefore education is very important in human life, because every human being needs education, to achieve a better life.

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In education, there is a lot of knowledge that can be studied, one of the sciences that cannot be separated from everyday life, namely mathematics. As stated by Ruseffendi (Putri, 2020) that mathematics is formed from the results of human thought related to ideas, processes and reasoning. Basically, mathematics is born from humans' daily lives which are related to all their activities (Saraswati, Nurizzah, et al. 2020). Mathematics is a universal science and has an important role in all fields of scientific disciplines and develops human thinking power, and underlies the development of modern technology. Therefore, mathematics subjects need to be given to all students with the ability to think logically, analytically, systematically, critically and creatively, and be able to solve the problems they face in everyday life. One of the materials studied in mathematics is the concept of arithmetic sequences and series. where arithmetic sequences and series are often used in everyday life.

The focus of this research is to discuss the concepts of arithmetic sequences and series. The word "sequence" is used to describe a sequence of objects or events that are given in a certain order. Informally, the word sequence in mathematics is used to sort the composition of the members of a set based on a certain rule. The numbers in a sequence are called terms. of the sequence U_1, U_2, U_3, U_4,...Un is called a term. U_1 is called the first term, U_2 is called the second term, and so on. Meanwhile, the sequential addition of the terms of a sequence of numbers is called a series. The sum of the first n terms of a regular sequence is denoted by Sn, so $Sn = U_1 + U_2 + U_3 + U_4 + \ldots + Un$ (soffana, 2023). So an arithmetic sequence is a sequence U_1, U_2, U_3, U_4,...Un where the difference in every two consecutive terms is always the same. And an arithmetic series is the sum of the terms of the number sequence $U_1 + U_2 + U_3 + U_4 + \ldots + Un$. In this research, the indicator of understanding the concept of arithmetic uses the indicator of critical thinking ability.

Students' mathematical abilities must continue to be explored, especially in facing the 21st century students must be able to think critically, because critical thinking is the basis for thinking processes in analyzing arguments and producing products in the form of ideas about meaning that can develop a logical mindset (Hidayati, Fadly , & Ekapti, 2021). There is a difference between thinking and critical thinking, ordinary thinking is normal thinking, and critical thinking is high thinking than standard (Rohmah, & Ulya, 2021). Critical thinking is thinking that has a high value of complexity and consistency, so that the level of thinking ability is much higher than ordinary thinking.

Critical thinking is able to develop students into individuals who are more confident and have high curiosity, so that in dealing with problems in mathematics and other fields students are able to solve them. However, in reality what is happening is that students' mathematical critical thinking skills are still very low and need to be developed (Samosir, 2020). This is caused by several factors, one of which is the learning process implemented. So far, the learning process in class still uses the teacher center (Pertiwi, Nurfatimah, & Hasna, 2022), so students cannot be independent in thinking and solving problems, students only memorize definitions and formulas, without understanding the concepts of the material being studied, because students cannot critical thinking.

On the other hand, it is known that students' critical thinking skills are still lacking, based on the results of interviews with Daarul Amanah High School mathematics teachers, that the level of students' critical thinking is still lacking, because these students are very monotonous and tend to memorize more, because seen from their school background it is a boarding school. boarding school. This is in line with research (Kempirmase, 2019) that students lack critical thinking mathematically because students usually have the ability to memorize a certain mathematical formula, but will experience difficulties when they have to use this formula in solving questions in the form of stories

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or solving problems related to contextual problem. Therefore a strategy is needed to improve students' mathematical critical thinking skills.

In overcoming the problem of low critical thinking in mathematics learning, it is necessary to apply a learning model that can improve students' mathematical critical thinking abilities and active learning. One learning model that suits the problems above is the MURDER learning model (Mood, Understand, Recall, Digest, Expand, and Review). The MURDER learning model is a form of cooperative learning, so that it gives rise to the ability to think creatively mathematically.

The MURDER learning model is a combination of the words Mood (mood), Understand (understanding), Recall (repetition), Digest (discovery), Expand (development), and Review (study again). According to Darmika (Intan, 2021), the MURDER type learning model is a learning model that can create encouragement for students and increase the depth and breadth of views towards students. In this MURDER learning model there is a digest step, where students examine and dig up information from various sources, then continue with the expand step. In this stage students are required to be able to express their opinions in developing the results found, and can exchange information with other friends. , in the review step students review the material they have studied, this learning model can also be used to develop an effective and efficient learning system so that it can activate students' critical thinking. Based on the description above, the author is interested in conducting research entitled "ANALYSIS OF MURDER LEARNING ON ARITHMETIC CONCEPTS BASED ON RETROSPECTIVE ANALYSIS"

METHODS

The research method used is Didactical Design Research (DDR) using retrospective analysis. Retrospective analysis, namely conducting data analysis, analyzing the factors that cause success or failure, carrying out a synthesis to revise the didactical design, then preparing the empirical. The population in this study were all class XI students at SMA Daarul Amanah. The sampling technique in this research used purposive sampling.

FINDINGS AND DISCUSSION

In the following, a discussion of each question regarding the results of the posttest after implementing the didactic design concept of arithmetic sequences and series will be presented.

Question number 1

The production of white and gray school uniforms made by Vocational School students of the Fashion Design Department produced 80 sets in the first month. Every following month, the output increases by 10 sets to form an arithmetic series. Much of the output during the first 6 months is • • • sets.

Figure 1 Posttest Question Number 1

In Figure 1, Question number 1 is a question that was developed to determine the extent to which respondents can interpret the basic concepts of arithmetic series. Indicators and distribution of respondents' abilities in solving this question, it was found that more than 50% of respondents were able to interpret the basic concepts of arithmetic series. After conducting interviews with several respondents, they understood that before students answered a question, students interpreted it first and identified what was "known", what was "asked" and the "solution" correctly.

These results illustrate that respondents have been able to interpret the concept of arithmetic series questions. The ability of the respondents occurred because in the didactical design of the concepts of arithmetic sequences and series, the respondents experienced action steps. The action step in didactic situation theory according to (Brousseau, 2002) is a process where students interact with

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learning situations and teaching materials to obtain information (Fauzi, & Suryadi, 2020). At the first meeting, students are asked to identify the sequence questions available in the LKPD. In the LKPD students are given a stimulus, problem statement and verification, so that students can interpret the questions in mathematical form in addition to the action steps contained in the didactic design of the sequence concept. and the arithmetic series also holds the principle of the MURDER learning model activity. It can be seen that there are still respondents who are not able to interpret correctly. This is considered natural because no learning is perfect, but at least the learning obstacles in the posttest, namely learning obstacles related to understanding and expanding, have been able to be minimized with the didactic design of the concept of sequences and arithmetic series.

Question number 2

A child saves at a bank with a fixed difference in the increase in savings between months. In the first month it is Rp. 50,000.00, the second month is Rp. 55,000.00, the third month is Rp. 60,000.00, and so on. How much did the child save for two years? Write down the reasons why you chose these steps!

Figure 2 Posttest Question Number 2

In Figure 2, Question number 2 is a continuation question from question number 1. If question number 1 was developed to find out how respondents can interpret arithmetic series, then question number 2 was developed to find out the extent to which respondents inferred (made conclusions) from the questions given by using students' opinions. Indicators and distribution of respondents' ability to answer this question, it was found that only 28% of students were able to answer this question correctly. And 44% of respondents still answered that they were inaccurate in making conclusions regarding arithmetic sequences and series. and there were 17% of respondents who answered incorrectly. After interviews, several respondents found that they were confused about giving an opinion and found it difficult to describe why they chose these steps to solve the problem.

However, overall, the didactic design of arithmetic sequences and series was able to make respondents understand the steps to find the formula for the sum of the nth terms and its application, as well as being able to explain the reasons why they chose this method. Similar to the discussion in question number 1, in question number 2, learning obstacles can be minimized because when learning with the MURDER model the teacher gives students LKPD as well as stimuli that make them think critically, and respondents experience action steps according to didactic situation theory and principles. activities according to the MURDER learning model. When implementing the didactic design of arithmetic sequences and series at the first meeting, there was an activity where respondents were given LKPD and discussed with their group to determine the formula for the nth term of an arithmetic sequence, not only that, there was an expansion step where they were allowed to dig from other sources such as books and others. So it is easier for respondents to understand and get various information from books and friends.

The following are the answers of students who were able to solve question no. 2 correctly and students who were only able to make conclusions but they were not correct and did not match the savings results obtained.

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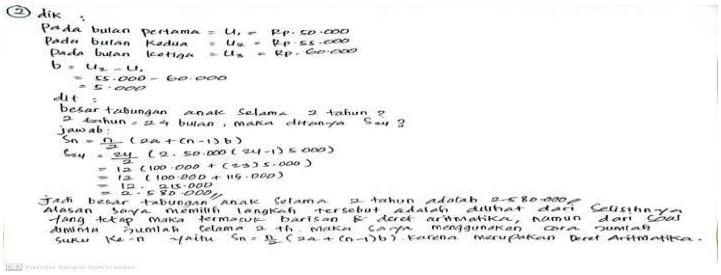

Figure 3 Answers of students who answered correctly

It can be seen from Figure 3 that the student's answer is correct because the student carried out the process correctly and gave the correct conclusion.

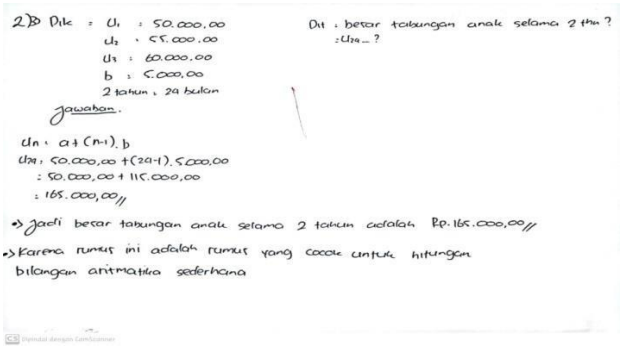

Figure 4 Answers of students who answered incorrectly

Judging from Figure 4, the student's answer was wrong, the student was wrong in determining the number of nth term formulas using the formula $S_n = \frac{n}{2}(2.a + (n-1)b)$, the student did not understand the question so the process was wrong and the student did not conclude the answer correctly. It can be seen that students experience epistemological obstacles, where students do not understand the concepts given. This is in line with research (Mariyani, Fuadiah, & Reta, 2021) which shows that there are still students' errors in determining the formula that applies to an arithmetic sequence. The mistake made by the student was when adding numbers that had variables, namely $3 + 6n - 6 = 9n - 6$, which should be $6n - 3$. To overcome this, the researcher will remind the students of material that the students did not understand. So that the same mistake will not occur again at the next meeting. It can be concluded that the learning obstacles in the posttest, namely learning obstacles related to understanding and expanding, have been able to be minimized with the didactic design of the concept of sequences and arithmetic series.

Question number 3

In 2019, the cattle population in city A was 1,600 heads, and in city B 500 heads. Every month there is an increase in the growth of 25 cows in city A and 10 in city B. When the population of cattle in city A is three times the population of cattle in city B, so that the population of cattle in city A is 2,100, prove whether the answer is correct? Explain your reasons!

Figure 5 Posttest Question Number 3

In Figure 5, Question number 3 is a continuation question from question number 2. If question number 2 was developed to find out how respondents can infer related to arithmetic series, then question number 3 was developed to find out the extent to which respondents can analyze (identify and prove the number of the city's cow population A and B) from the questions given, and students can express and describe the reasons.

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Indicators and distribution of respondents' ability to work on this question, it was found that there were no students who were able to answer this question correctly. And there were 78% of respondents who answered correctly but inaccurately, there were 17% of respondents who answered incompletely and inaccurately, and 6% of them answered only the mathematical model, and the answer was not correct. Based on the results of the respondents who had been interviewed, it turned out that they had difficulty in making the proof, whether it only involved the nth term formula or using the nth term sum formula, because what was asked for proof, so students only did the operation without proving whether the answer to the question Correct.

But overall, the didactic design of arithmetic sequences and series is able to make respondents understand the steps in proving a number of series whose results are already known, and can explain the reasons why they choose that method. Same with the discussion on question number 2, in question number 3, learning obstacles can be minimized, but in question number 3 students have a little obstacle in the analysis, but because during learning with the MURDER model the teacher gives LKPD to students as well as stimuli, understand problem statements, as well as generalizations.

The following are the answers of students who were able to complete question no.3 correctly but were not correct and students who were only able to make a mathematical model.

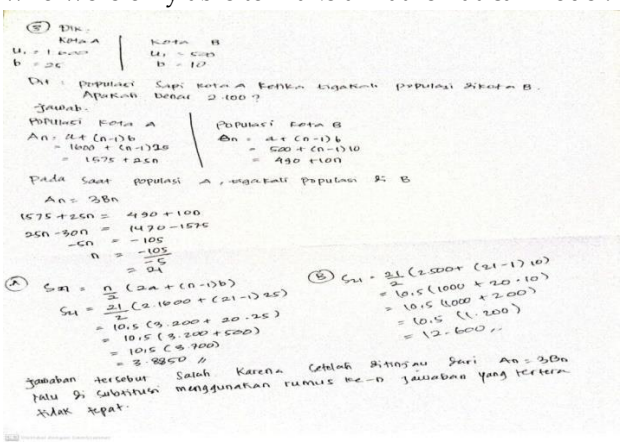

Figure 6 Answers of students who answered correctly

Seen from picture 6, the student's answer is not correct, but the process is correct and complete, it's just that the student didn't re-analyze what was asked, the student should have searched for U_{21} using the arithmetic sequence formula $U_n = a + (n-1)b$

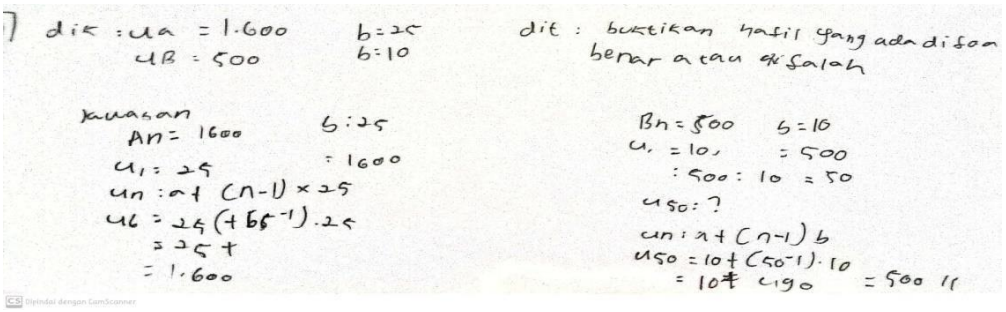

Figure 7 Answers of students who answered incorrectly

Judging from Figure 7, the student's answers were wrong, the student only changed the question into a mathematical form, only up to the interpretation of the question, did not get to the next stage, namely analyzing, based on the results of the interview with the student, he did not understand the question and did not know the next step so not the process was wrong and the student did not analyze the answer correctly. It can be seen that students experience an epistemological obstacle, where students do not understand the concepts given. This is in line with the opinion (Setiani, Haqq,

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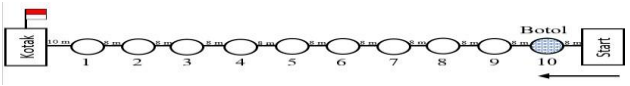
& Izzati, 2018) that students only understand some of the concepts of sequences where students forget the formulas for arithmetic sequences. It can be concluded that the learning obstacles in the posttest, namely learning obstacles related to understand and expand, have been able to be minimized with the didactic design of the concept of arithmetic sequences and series.

Question number 4

Look at the following sketch.



Rules of the game: There are 10 flags in a box and must be moved into the available bottles one by one (not all at once). All contestants start moving (start) from bottle number 10 to take the flag in the box. What is the distance traveled by the competitors? Write down the reasons why you chose these steps!

Figure 8 Posttest Question Number 4

In figure 8, question number 4 is a follow-up question from question number 3. If question number 3 is developed to find out how respondents can analyze related arithmetic sequences, then question number 4 is developed to find out how far respondents can evaluate (perform the correct calculation to find out the distance traveled by contestants) from the questions given, and students can express and describe the reasons.

Indicators and distribution of the ability of respondents to work on this question, it was found that 28% of students were able to answer this question correctly. And many respondents who answered correctly but were not quite right there were 39%, there were 11% of respondents who answered incomplete and inaccurately, and 22% who answered only wrote down the formula, did not use the correct strategy, and the answer was not correct. Based on the results of the respondents who were interviewed, it turned out that he was wrong in determining the number of Sn because he was wrong in determining the start of the game, then the student could only count the number of starlings listed, because there was a distance from one flag place to another, so he immediately counted it without the correct formula.

But overall, the didactic design of arithmetic sequences and series was able to make the respondents understand the calculations or operations that had to be used from the problem, and could explain the reasons why they chose that method. Same with the discussion in question number 3, in question number 4, learning obstacles can be minimized, but in question number 4 students have a little obstacle in evaluating, but because during learning with the MURDER model the teacher gives LKPD to students and provides stimulus, understands problem statement, then data collection and generalization. So only a small portion of students do not understand.

The following are the answers of students who were able to solve question no. 4 correctly but not yet and students who answered incorrectly.

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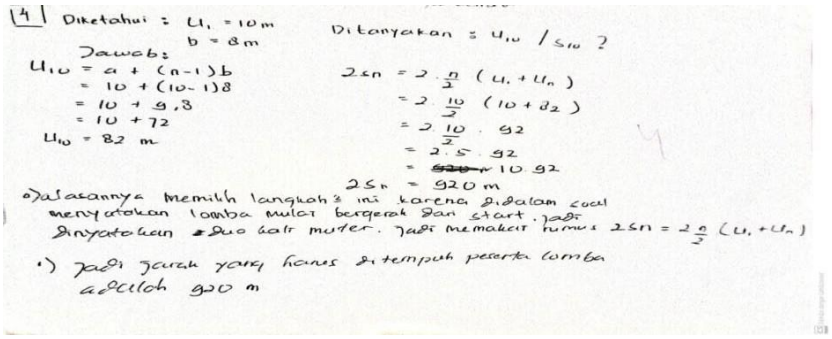

Figure 9 Answers of students who answered correctly

It can be seen from Figure 9 that the student's answer is correct because the student carried out the process correctly and gave the correct conclusion.

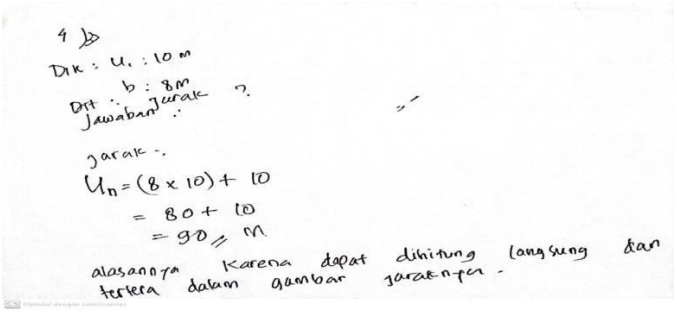

Figure 10 Answers of students who answered incorrectly

Seen from figure 10, the student's answer is wrong, the student does not perform calculations using the formula, the student is only correct until the interpretation of the question, does not go to the next stage, namely evaluating and calculating it using the arithmetic series formula, based on the results of the interview with the student, he does not understand because he felt rushed in working on the questions, in the end he did not carry out the analysis and calculations correctly. It can be seen that students experience an epistemological obstacle, where students do not understand the concepts given. It can be concluded that the learning obstacles in the posttest, namely learning obstacles related to understand and expand, have been able to be minimized with the MURDER model with the help of didactic design concepts of sequences and arithmetic series.

Based on the results of the Learning Obstacles that have been described, in question number 1 students experience difficulties in mathematical critical thinking skills, namely in interpreting, students who have a low level of ability have difficulty making mathematical models correctly, not even writing "known" and "asked" . In question number 2 students have difficulty in mathematical critical thinking skills, namely in making inferences, students who have a low level of ability have difficulty in giving conclusions, so the answer is not complete. In question number 3 students experience difficulties in mathematical critical thinking skills, namely in analyzing, students who have low levels of ability have difficulty proving the correct answer, and are still confused in determining the formula used. In question number 3, no one can answer perfectly. In question number 4 students experience difficulties in mathematical critical thinking skills, namely in evaluation, students who have a low level of ability have difficulty determining the correct calculation and do not understand the concepts given.

The following can be seen from the results of the posttest presentation of students' critical thinking abilities in the experimental class and control class.

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Table 1
Posttest Presentation of Mathematical Critical Thinking Ability

No	Indicator Ability Critical thinking	Experimental Class		Control Class	
		n	%	n	%
1	Interpretation	16	89	6	40
2	Inference	5	28	0	0
3	Analysis	0	0	0	0
4	Evaluation	5	28	0	0
Score		18		15	

Based on Table 1, the results of the Posttest presentation on students' mathematical critical thinking abilities, in the experimental class question number 1 with indicators of students' mathematical critical thinking abilities in interpreting, there were 89% of students who answered correctly, and in the control class only 40% of students answered correctly. Question number 2 with indicators of students' critical mathematical thinking skills in inferring in the experimental class was that there were 28% of students who answered correctly, and in the control class there were 0%, so it can be interpreted that there were no students who answered correctly. Question number 3 with an indicator of students' mathematical critical thinking skills in analyzing in the experimental class is 0%, which means there are no students who answered correctly, and in the control class there is 0%, which means there are no students who answered correctly. Question number 4 with indicators of students' critical mathematical thinking skills in evaluating the experimental class was that there were 28% of students who answered correctly, and in the control class there were 0%, so it can be interpreted that there were no students who answered correctly.

It can be seen from the description above that students in the experimental class, namely students who received the MURDER learning model assisted by didactic design, were superior to the control class, namely students who received treatment with the conventional learning model. In question no. 3, there were no students who were able to answer correctly in the experimental class and control class, this could mean that students in the experimental class and control class were not able to analyze the posttest questions well.

Judging from the learning process and student test results, there are differences between students who use MURDER learning assisted by didactic design and students who use conventional learning models, so that the MURDER model can be said to be better and more efficient in improving students' critical mathematical thinking skills.

The didactic design of the concepts of arithmetic sequences and series did not undergo many revisions, it's just that the observer's suggestion to give assignments in the form of providing even simpler stimuli or more apperceptions seems to be a good suggestion. So as revision material, it is necessary to provide more simple stimuli that students can do as assignments. In this way, students will have more experience in solving problems related to the concept of arithmetic sequences and series. By being given an additional stimulus to determine the formula for the sum of the n terms of an arithmetic series, students will better understand the concept of arithmetic sequences and series. The following (Figure 11) is a Learning Trajectory (LT) Didactical Design Concept of arithmetic sequences and series.

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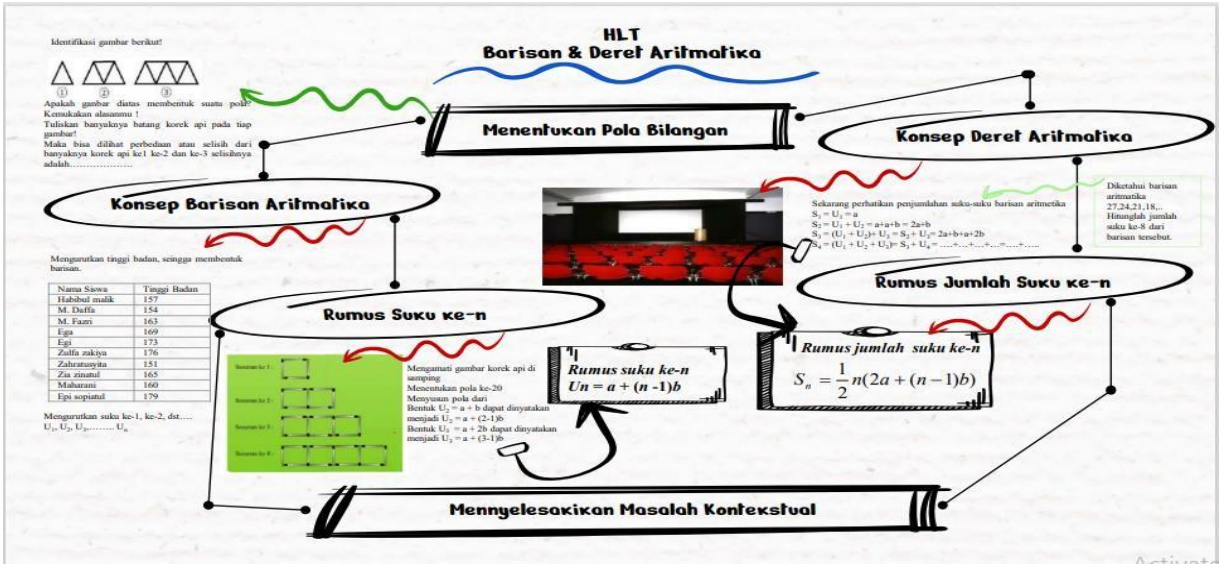

Figure 11
Results of Revision of Learning Trajectory (LT) Didactic Design
Concept of Arithmetic Sequences and Series

CONCLUSION

Based on the research results, it can be concluded that the use of the MURDER learning model (mood, understand, recall, digest, expand, and review) is able to help students understand the concept of arithmetic, and is able to increase students' level of critical thinking. Hypothetical Learning Trajectory or creating concepts and learning flows well is able to minimize students' Learning Obstacles, therefore didactic design is able to help students achieve learning goals, especially in mathematical critical thinking skills.

Suggestions from researchers, when implementing learning in class, it is recommended to use more varied learning models so that students can be enthusiastic during the learning process and they do not feel bored. It is hoped that future researchers will be able to see other mathematical abilities that students have, as well as apply the MURDER learning model to other materials.

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CONFLICTS OF INTEREST

The authors declare no conflict of interest.

REFERENCES

Fauzi, I., & Suryadi, D. (2020). Didactical Design Research untuk Mengembangkan Kompetensi Pedagogik Guru di Sekolah Dasar. *INVENTA: Jurnal Pendidikan Guru Sekolah Dasar*, *4*(1), 58-68.

Herdiman, I., Nurismadanti, I. F., Rengganis, P., & Maryani, N. (2018). Kemampuan berpikir kritis matematik siswa SMP pada materi lingkaran. *Prisma*, *7*(1), 1-10.

Hidayati, A. R., Fadly, W., & Ekapti, R. F. (2021). Analisis keterampilan berpikir kritis siswa pada pembelajaran IPA materi bioteknologi. *Jurnal Tadris IPA Indonesia*, *1*(1), 34-48.

Intan, P. (2021). Pengaruh Model Pembelajaran Murder (Mood, Understand, Recall, Digest, Expand, Review) Terhadap Hasil Belajar Peserta Didik Mata Pelajaran Akidah Akhlak Kelas Viii Mts Darul Muqimin (Doctoral Dissertation, Uin Raden Intan Lampung).

Kempirmase, F., Ayal, C. S., & Ngilawajan, D. A. (2019). Kemampuan Berpikir Kritis Siswa Dalam Menyelesaikan Soal-Soal Higher Order Thinking Skill (Hots) Pada Materi Barisan Dan Deret Aritmatika Di Kelas Xi Sma Negeri 10 Ambon. In *Prosiding Seminar Nasional Pendidikan Matematika Universitas Pattimura* (pp. 21-24).

Mariyani, M., Fuadiah, N. F., & Retta, A. M. (2021). Antisipasi Didaktis dengan Strategi Scaffolding pada Pembelajaran Barisan dan Deret Aritmetika. *Jurnal Elemen*, *7*(2), 310-323.

Pertiwi, A. D., Nurfatimah, S. A., & Hasna, S. (2022). Menerapkan Metode Pembelajaran Berorientasi Student Centered Menuju Masa Transisi Kurikulum Merdeka. *Jurnal Pendidikan Tambusai*, *6*(2), 8839-8848.

Pristiwanti, D., Badariah, B., Hidayat, S., & Dewi, R. S. (2022). Pengertian Pendidikan. Jurnal Pendidikan Dan Konseling (JPDK), 4(6), 7911-7915.

Puspitasari, M., Fuadiah, N. F., & Murjainah, M. (2021). Desain Didaktis Konsep Bangun Ruang Materi Kubus Untuk Kelas V Sekolah Dasar. *Journal Of Mathematics Science And Education*, *4*(1), 1-16.

Putri, D. P., Manfaat, B., & Haqq, A. A. (2020). Desain didaktis pembelajaran matematika untuk mengatasi hambatan belajar pada materi matriks. *Jurnal Analisa*, *6*(1), 56-68.

Rohmah, A. N., & Ulya, H. (2021). Pengaruh Pembelajaran CORE Melalui Pendekatan Open-Ended terhadap Kemampuan Berpikir Kritis Matematis Siswa. Buana Matematika: Jurnal Ilmiah Matematika dan Pendidikan Matematika, 11(2), 137-150.

Samosir, I. R. (2020). Kemampuan Berpikir Kritis Matematika Siswa.

Saraswati, R. R., Nurizzah, N., Pitnawati, P., & Habibah, U. (2020). Integrasi sejarah matematika dalam pembelajaran matematika pada materi phytagoras. Risenologi, 5(1), 9-13.

Setiani, I. (2021). *Perkembangan Pendidikan dan Hubungannya dengan Pendidikan Guru Sains di Beberapa Negara (Indonesia, Malaysia, Singapura)* (Doctoral dissertation, IAIN Ponorogo).

Setiani, I., Haqq, A. A., & Izzati, N. Desain Didaktis Berbasis Problem Based Learning pada Materi Barisan dan Deret Aritmatika.

Soffyana, S. (2023). *Pengembangan Video Pembelajaran Bermuatan Karakter Pada Materi Barisan Dan Deret Aritmetika Kelas Xi Di Sma Negeri 1 Pengkadan* (Doctoral Dissertation, Ikip Pgri Pontianak).