SitiNabila

by Sofia Vidya

Submission date: 09-Dec-2021 06:27PM (UTC-0800)
Submission ID: 1726117385
File name: SN.pdf (724.52K)
Word count: 4080
Character count: 21753

Jurnal Elemen, 8(1), 1-9, January 2022
https:/doi.org/10.29408/jel.v8i1.XXXX

e- ISSN: 2442 - 4226

Mathematical Reasoning Skills Number Pattern Materials using Video Media with PMRI and Collaborative Learning

Siti Nabila [1], Ratu Ilma Indra Putri [2*]

[1] Department of Mathematics Education, Sriwijaya University, South Sumatra, Indonesia
[2] Department of Mathematics Education, Sriwijaya University, South Sumatra, Indonesia

[*] Correspondence: ratuilma@unsri.ac.id

Abstract

This study aims to determine the skills of mathematical reasoning after the implementation of the learning process using video media with the PMRI approach and collaborative learning on number pattern material for class VIII students. This research uses a descriptive type of research. The research subjects were students of class VIII.A of SMP Srijaya Negara Palembang with a total of 25 students out of a total of 39 students. This research was conducted in two meetings where the first meeting was a learning process using video media with PMRI and collaborative learning, while the second meeting was working on test questions. Data collection techniques are observation, a written test consisting of 2 questions, and interviews. The data analysis technique is descriptive. The results obtained from this study are students' mathematical reasoning abilities after the implementation of the learning process using video media with the PMRI approach and collaborative learning on number pattern material for grade VIII.A students of SMP Srijaya Negara Palembang in good category with an average value of 68.89. The indicators that appear the most are those that make assumptions, while the indicators that appear the least are those that draw conclusions. The implementation of the learning process using video media can make students not feel bored and feel happy so that it can be applied in schools.

Keywords: collaborative learning; mathematical reasoning; PMRI; video media

Received: Date Month Year | Revised: Date Month Year | Accepted: Date Month Year | Published: Date Month Year

Introduction

Reasoning and mathematical material are something that cannot be separated Sari, et al., 2018). Based on Permendikbud number 21 of 2016 which states that one of the skill competencies in the 2013 curriculum is reasoning skills. Reasoning is also included in one of the National

Council of Teachers of Mathematics (NCTM) process standards in 2000. Mathematical reasoning skills is the skills to process mathematical thinking in order to get logical conclusions based on existing or relevant methods, concepts, and facts or data (Munawaroh, et al., 2019). For students, this skills is very important because it can help students generate new ideas, prove and conclude a statement, and solve mathematical problems (Sumartini, 2015). The importance of mathematical reasoning skills is also expressed by Cahya, et al (2021) that these skills when students are faced with complex problems can be solved easily. From the explanation above, mathematical reasoning skills are needed in learning mathematics

Inductive reasoning can be used by students through pattern learning to find mathematical relationships (NCTM, 2000: 262). Thus, students can practice their mathematical reasoning skills through learning number patterns (Sari, et al., 2018). One of the competencies in learning mathematics is an explanation of patterns in real life and provides advanced assumptions from repetitive patterns (Kemendikbud, 2016). According to NCTM (2000) the two content standards in mathematics related to number patterns are the content of numbers and operations (number and operations) and algebraic content (algebra). Number pattern material is important for students to learn because it is part of an important component of success in mathematics (Diana & Fauzan, 2018). Number patterns are also included in the quantity content of PISA questions where the questions are widely applied to real life (Bidasari, 2017).

But in reality, students experience difficulties in determining the pattern of the questions given and formulating generalizations from number patterns (Ariyanti & Setiawan, 2019). When solving number pattern problems, students have not been ablle to write the formulas for the nth term which is the basis for solving problems (Sari, et al., 2018), and students also have difficulty in analyzing questions (Saleh, et al., 2021). One of the reasons is due to the learning activities implemented by the teacher where the activities still use procedural, monotonous, and are dominated by teachers (Munawaroh, et al., 2019). In the learning process the teacher also only uses the lecture method (Erissa, et al., 2018; Saleh & Lubis, 2018), and the learning approach is still teacher-centered (Fatimah, 2016). Of course, this kind of learning is less interesting for students. In the research of Kusumaningtyas, et al (2017), it is suggested that teachers should use the right learning approach in learning number patterns. The learning approach in question should be contextual (Dewi & Agustika, 2020), namely by providing daily problems so that students are more interested and feel challenged.

A learning approach that emphasizes the presentation of contextual problems is Realistic Mathematics Education (RME), so that during learning activities students will feel more fun and meaningful (Narmi, et al., 2020). This is in line with the thoughts of Rahayu & Putri (2021) that the learning process carried out by involving the context makes the knowledge that students learn will be meaningful. RME is known in Indonesia as the Indonesian Realistic Mathematics Education (PMRI). According to Meitrilova & Putri (2020) PMRI is one solution to help students understand learning material. The use of the PMRI approach can make learning more interesting because learning begins with a real context for students (Putri, 2015), this acts as a bridge from contextual problems to formal mathematics (Trisnawati, et al., 2015). According to Zulkardi & Putri (2010) PMRI is a theory that is based on real problems or student experiences, emphasizing processing skills, collaborating, and discussing, as well as sharing

opinions with classmates so that students can find their own mathematical concepts to solving problems using the mathematics. The principles of PMRI are Guided Reinvention/Progressive Mathematizing, Didactical Phenomenology, and Self Developed Models, while for the characteristics of PMRI are using contextual problems, using models, student contributions, interactivity, and being integrated with other learning topics (Zulkardi & Putri, 2010). The PMRI approach is one of the active and innovative approaches (Salsabilla, 2020). In PMRI learning, as a result of interaction with the environment where students become individuals (subjects) who have experience and knowledge (Munir & Sholehah, 2020), while the teacher is only a guide and facilitator (Lisa, 2020).

In the 21st century, by improving the curriculum in accordance with the demands of 21st century competencies, education is challenged to produce human resources who can create economic and social order (Sumantri, 2019). The hope is that teachers and students have 21st century skills, skills, and competencies which consist of: collaborative skills, critical thinking, communication skills, and creative and innovation skills (Sumantri, 2019). According to Rahmawati (2016), through 4C, there will be an increase in the quality of Indonesian education.

One of the 4Cs, namely Collaborative, is where students will be actively involved in small groups during the learning process (Septikasari & Frasandy, 2018). Collaborative Learning involves two or more students who are together in groups in providing information, knowledge, ideas, and experiences so that the understanding of all group members can increase (Deswita & Niati, 2020). Collaborative learning activities consist of sharing and jumping lessons (Wikanta, 2017). In this activity, students who do not understand must dare to ask for help with friends who already understand by saying "Please Teach Me" (Sato, 2014). The purpose of Collaborative Learning is for students to be active in groups and create student-centered learning situations (Inah & Pertiwi, 2017). Thus, the PMRI approach and Collaborative Learning can be applied together to create more enjoyable learning for students.

In addition to Collaborative Learning, technology is also progressing very rapidly in the 21st century so that it will be very useful in the field of education (Isti'adah, et al., 2020). This is evidenced by the increasing use of technology-based learning media to support the course of learning activities (Firmadani, 2020), one of which is video media which includes the type of audio-visual media, namely media that uses the senses of hearing and sight, so that when participating in learning can make students don't feel bored. and feel happy (Hadi, 2017). Video media can also bring up students' creative ideas because the visualization is in the form of moving images and sound (Febriani, 2017). Not only used as a tool in learning activities, but video media can also be used as a messenger or information (Aeni & Yuhandini, 2018).

There was a previous study on the PMRI approach to number pattern material by Octriana, et al. (2019) to see mathematical reasoning abilities, while research by Situmorang, et al. (2020), which is about the analysis of HOTS questions. However, previous studies have not used learning media in the form of videos. Therefore, researchers are interested in researching "Mathematical Reasoning Skills Number Pattern Materials using Video Media with PMRI and Collaborative Learning".

Methods

This research uses a descriptive type of research, where the researcher describes mathematical reasoning skills on the number pattern material using video media with the PMRI approach and Collaborative Learning in class VIII students. The subjects of this study were students of class VIII.A of SMP Srijaya Negara Palembang in the odd semester in the academic years 2021/2022, totaling 39 students. The data collection techniques were observation, a written test that opened 2 questions, and interviews. There are three indicators used in this study, namely:

Table 1. Indicators of mathematical reasoning skills

Indicator	Descriptor
Submit a conjecture	Able to make assumptions about patterns that might be formed
Finding patterns or properties of mathematical phenomena to make generalization	Able to find the right pattern to make general equations or generalizations
Draw a conclusion	Able to make conclusions that are in accordance with the problem and can be accepted by reason

The results of student test answers will be given a score, then will be assessed with a scoring guideline. In this study there are three stages, namely (1) the preparation stage, namely the researcher prepares research instruments and learning tools, observations to schools, validates and revises, and manages research permits, (2) the implementation stage, which consists of two meetings where the first meeting is a learning process using video media with PMRI and collaborative learning, while the second meeting is working on test questions, and (3) the last stage, the researchers analyzed the results of the data from the observation sheets, tests, and interviews. Then, the researcher will describe the data results and draw conclusions. Finally, the researcher will prepare a written research report. To analyze the results of the answers to the test questions, they will be converted based on the category of qualitative values of mathematical reasoning abilities as follows:

Table 2. Category of qualitative value of mathematical reasoning skills

Score	Category
81-100	Very Good
61-80	Well
41-60	Enough
21-40	Not Enough
0-20	Very Less

Results

The learning process is carried out through the WhatsApp and Google Meet applications with class VIII.A students of SMP Srijaya Negara Palembang.

In the preparation stage, researchers will prepare learning tools and research instruments. After that, the researcher also made initial observations by visiting the Srijaya Negara Palembang Junior High School to discuss with the school to get permission to carry out research at the school. Then, the researchers validated three validators, namely Prof. Dr. Ratu Ilma Indra Putri, M.Si., Mrs. Lipa Meisinta, S.Pd., and Mr. Drs. M. Amin, M.Si. After completion, the researcher takes care of the documents needed to carry out the research.

At the implementation stage, after the instrument was revised and declared valid, the researchers tested one-to-one with three students who were not research subjects. Furthermore, the researchers tested a small group on six students who were also not included in the research subject. After that, the implementation of the learning processs was carried out in two meetings. The first meeting carried out the learning process using video media through the PMRI approach and Collaborative Learning. Students are formed into several groups with each member consisting of 4 people. Then, a video media is given that contains the problem of sharing tasks and jumping tasks (Wikanta, 2017). The problem is related to real problems, this is in accordance with PMRI, which is a theory that is based on real problems (Zulkardi & Putri, 2010). In doing so, students who do not understand must dare to ask for help with friends who already understand by saying "Please Teach Me" (Sato, 2014). Giving problems through this video media can make students not feel bored and feel happy, this is because video media is included in the type of audio visual media, namely media that uses the senses of hearing and sight, so that when participating in learning can make students not feel bored and feel happy (Hadi, 2017). The researcher asked 7 people for help to become observers in each group. In the second meeting, students will be given test questions. After getting the results of student answers, the researchers will conduct interviews with three students with categories of low, medium, and high students.

The last stage, the researchers analyzed the results of the data from the observation sheets, tests, and interviews. Then, the researcher will describe the data results and draw conclusions. Finally, the researcher will prepare a written research report.

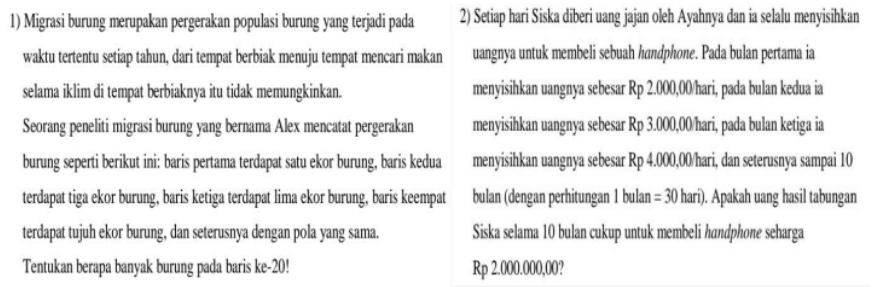

Figure 1. Test questions number 1 and 2

Description of Student Answer Results

a. Test Question Number 1

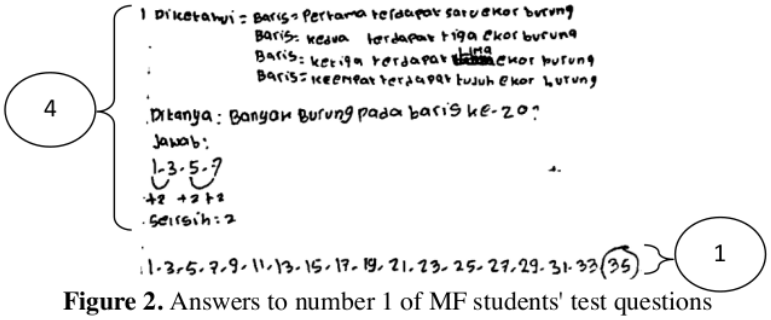

Figure 2. Answers to number 1 of MF students' test questions

Based on the results of the MF students' answers, it can be seen that he has brought up the indicators of submitting conjectures perfectly, namely making assumptions about patterns that may be formed completely and correctly, so that he gets a score of 4. mathematical symptoms to make generalization where he got the answer 35, while the correct answer was 39, so he got a score of 1, this was supported when interviewed he also admitted that he was wrong in writing the answer because the time given was limited. Then, the MF student did not come up with an indicator of drawing conclusions, so he got a score of 0. So for the number one test item, MF students only got a score of 5.

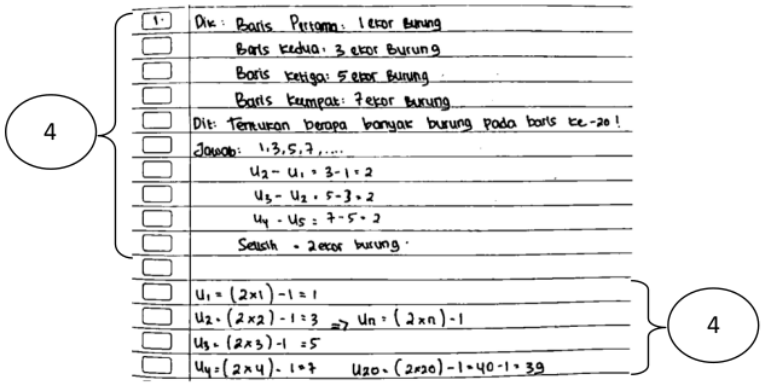

Figure 3. Answers to number 1 VA student test questions

Based on the answers of the VA students, it can be seen that he understood question number 1, but he forgot to write down the conclusions. VA students have brought up the indicators of submitting conjectures perfectly and obtained a score of 4. Furthermore, students have found the right pattern to make general equations or generalization completely and correctly, so that these students have come up with indicators of finding patterns or properties of mathematical symptoms to make generalizations. perfect and got a score of 4. Then, the VA student did not come up with an indicator to draw conclusions, so he got a score of 0. So, for the number 1 test item, the VA student got a score of 8.

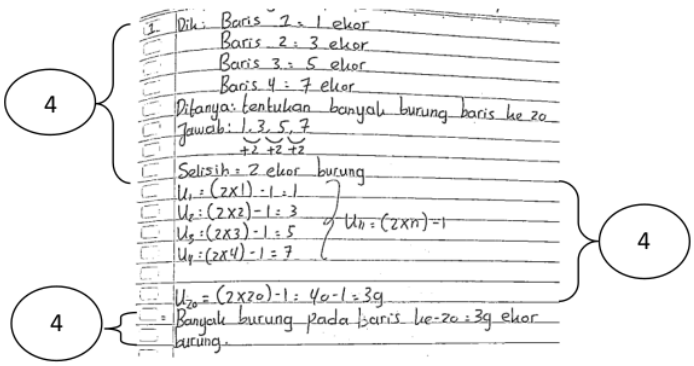

Figure 4. Answers to number 1 of the SY students' test questions

When SY students were interviewed, it was seen that he had understood question number 1 and was able to solve it correctly. SY students have brought up the indicators of perfecting conjectures, i.e. submitting conjectures against patterns that might be formed completely and correctly, so that they get a score of 4. Furthermore, SY students have found the right pattern to make general equations or generalization completely and correctly, so that he has brought up an indicator of finding patterns or properties of mathematical phenomena to make generalizations perfectly and get a score of 4. Then, he has also brought up indicators of drawing conclusions and getting a score of 4 because he has made conclusions that are in accordance with the problem and can be accepted by reason completely and right. So for the number one test question, SY students get a maximum score, which is 12.

b. Test Question Number 2

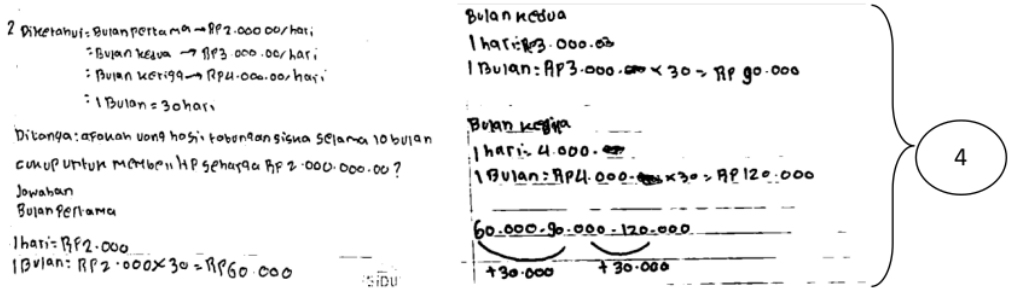

Figure 5. Answers to number 2 of MF students' test questions

When interviewed, MF students said that he did not do it until it was finished because the time for the work was not enough. However, MF students have raised the indicator of submitting conjectures perfectly, i.e. submitting conjectures against patterns that might be formed completely and correctly, so that they get a score of 4. indicator draws conclusions, so it scores 0 on both indicators. So, for test number two, MF students only get a score of 4.

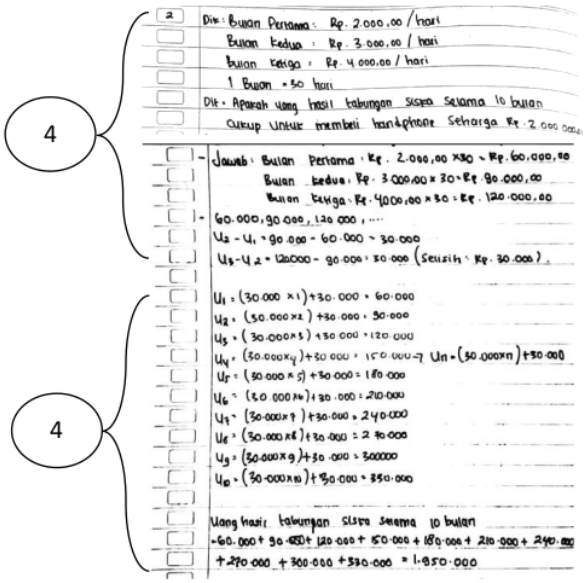

Figure 6. Answers to number 2 of VA students' test questions

Based on the answers of the VA students, it can be seen that he already understood question number 2, but he forgot to write down the conclusions. The VA student has brought up the indicator of proposing the conjecture perfectly, i.e. submitting an allegation of the pattern that might be formed completely and correctly, so that he gets a score of 4. Furthermore, the student has found the right pattern to make general equations or generalization completely and correctly, so that the student has brought up an indicator of finding patterns or properties of mathematical symptoms to make generalizations perfectly and get a score of 4. However, the VA student did not bring up the indicator of drawing conclusions, so he got a score of 0. So, for test item number 2 the VA student got a score of 8.

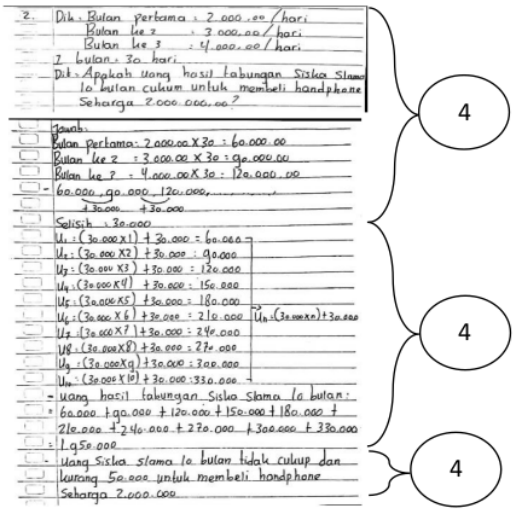

Figure 7. Answers to number 2 of the SY students' test questions

When SY students were interviewed, it was seen that he had understood question number 2 and was able to solve it correctly. SY students have brought up the indicator of submitting conjectures perfectly, i.e. submitting allegations of patterns that might be formed completely and correctly, so that they get a score of 4. Furthermore, SY students have found the right pattern to make general equations or generalization completely and correctly, so that the student has brought up an indicator of finding the pattern or nature of mathematical symptoms to make generalizations perfectly and get a score of 4. Then, the student has also brought up indicators of drawing conclusions and getting a score of 4 because he has made conclusions that are in accordance with the questions and can be accepted by reason completely and correctly. So for test number two, SY students have got a maximum score of 12.

Table 3. The emergence of indicators of mathematical reasoning skills

Indicator	**Total Eligible Students**	
	Test Question Number 1	**Test Question Number 2**
Submit a conjecture	25	23
Finding patterns or properties of mathematical phenomena to make generalization	22	20
Draw a conclusion	18	18

Table 4. Qualitative value of mathematical reasoning skills

Score	f_1	f_2	f_{tot}
81-100	8	5	13
61-80	12	13	25
41-60	4	4	8
21-40	1	2	3
0-20	-	1	1

Information:

f_1: Number of students in test number 1

f_2: Number of students in test number 2

f_{tot}: $f_1 + f_2$

Table 5. Average students' mathematical reasoning skills

Score	f_{tot}	x_i	$f_{tot}. x_i$	**Average**
81-100	13	90,5	1176,5	68,89
61-80	25	70,5	1762,5	
41-60	8	50,5	404	
21-40	3	30,5	91,5	
0-20	1	10	10	
Amount	50		3444,5	

Based on the table above, the mathematical reasoning skills obtained after the implementation

of the learning process using video media with the PMRI approach and Collaborative Learning on number pattern material for class VIII.A SMP Srijaya Negara Palembang is categorized as good.

Discussion

This study was aimed to determine the skills of mathematical reasoning after the implementation of the learning process using video media with the PMRI approach and Collaborative Learning on number pattern material for class VIII students. Mathematical reasoning skills is the skills to process mathematical thinking in order to get logical conclusions based on existing or relevant methods, concepts, and facts or data (Munawaroh, et al., 2019). The data from this research is seen from the results of the students' mathematical reasoning skills tests that have been carried out at the second meeting with the number of questions there are two questions. Questions are made by adjusting the characteristics of PMRI and its indicators, namely submit a conjecture, finding patterns or properties of mathematical phenomena to make generalization, and draw a conclusion.

The implementation of this learning process must be adjusted to the principles and characteristics of PMRI, as well as Collaborative Learning. According to Meitrilova & Putri (2020) PMRI is one solution to help students understand learning material. The use of the PMRI approach can make learning more interesting because learning begins with a real context for students (Putri, 2015), this acts as a bridge from contextual problem to formal mathematic (Trisnawati, et al., 2015). The principles of PMRI are Guided Reinvention/Progressive Mathematizing, Didactical Phenomenology, and Self Developed Models, while for the characteristics of PMRI are using contextual problems, using models, student contributions, interactivity, and being integrated with other learning topics (Zulkardi & Putri, 2010). In Collaborative Learning, students are formed into several groups with each member consisting of 4 people. Then, a video media is given that contains the problem of sharing tasks and jumping tasks (Wikanta, 2017). The problem is related to real problems, this is in accordance with PMRI, which is a theory that is based on real problems (Zulkardi & Putri, 2010). According to Rahayu & Putri (2021) that the learning process carried out by involving the context makes the knowledge that students learn will be meaningful. In doing so, students who do not understand must dare to ask for help with friends who already understand by saying "Please Teach Me" (Sato, 2014). Giving problems through this video media can make students not feel bored and feel happy, this is because video media is included in the type of audio visual media, namely media that uses the senses of hearing and sight, so that when participating in learning can make students not feel bored and feel happy (Hadi, 2017). Furthermore, students are given mathematical reasoning skills test questions at the next meeting.

It can be seen that after the learning process was caried out using video media with the PMRI approach and Collaborative Learning, it was found that the students' mathematical reasoning skills were classified as good, although there were still students who did not display indicators of their mathematical reasoning skills perfectly. The implementation of the learning process using video media through the PMRI approach and Collaborative Learning can make

students not feel bored and feel happy, so that learning using video media through the PMRI and Collaborative Learning approach can be applied in schools.

Conclusion

The conclusion is the students' mathematical reasoning skills after the learning process using video media with the PMRI approach and collaborative learning on number pattern material for class VIII.A students of SMP Srijaya Negara Palembang has been categorized as good with the indicators that appear the most, namely the indicators of proposing conjectures, while the indicators which appears the least, namely the indicators of drawing conclusions. The implementation of the learning process using video media can make students not feel bored and feel happy so that it can be applied in schools.

Acknowledgment

This article is part of a research project funded by a professional research grant from the Universitas Sriwijaya with the letter number of the Chancellor's letter number 0014/UN9/SK.LP2M.PT/2021.with the research contract number 0127/UN9/SB3.LP2M.PT/2021.

Conflicts of Interest

The authors declare that the publication of this manuscript does not constitute a conflict of interest. In addition, everything has been borne by the author, namely ethical issues, including, plagiarism, errors, falsification and/or falsification of data, publication and/or duplicate submissions, and redundancy.

SitiNabila

ORIGINALITY REPORT

5%	3%	4%	2%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	moam.info Internet Source	1%
2	N S Tama, N Aisyah, B Santoso, E Kurniadi. "Learning higher-order thinking skills using problem-based learning model", Journal of Physics: Conference Series, 2020 Publication	1%
3	N Happy, N H Rahmawati, M Muhtarom, D Wulandari et al. "The Photographs of the 5th Seminar Nasional Matematika dan Pendidikan Matematika (SENATIK) 2020", Journal of Physics: Conference Series, 2020 Publication	1%
4	Submitted to Sriwijaya University Student Paper	1%
5	repository.uin-malang.ac.id Internet Source	<1%
6	M Hasbi, A Lukito, R Sulaiman. " Mathematical Connection Middle-School Students 8 in	<1%

Realistic Mathematics Education ", Journal of Physics: Conference Series, 2019
Publication

7	conference.unsri.ac.id Internet Source	<1 %
8	lppm.itn.ac.id Internet Source	<1 %
9	Wara Sabon Dominikus, Juliana M H Nenohai, Marlenci Hale. " Increasing students' mathematical communication skills by applying probing-prompting learning model based on culture artefact ", Journal of Physics: Conference Series, 2020 Publication	<1 %
10	Dinda Mahardika, R I I Putri. "Design division mixed fractions materials using PMRI and lesson study", Journal of Physics: Conference Series, 2020 Publication	<1 %
11	www.slideshare.net Internet Source	<1 %
12	Wara Sabon Dominikus, Juliana M H Nenohai, Marlenci Hale. "Increasing students' mathematical communication skills by applying probing-prompting learning model based on Belu culture artefact", Journal of Physics: Conference Series, 2020 Publication	<1 %

Exclude quotes	Off	Exclude matches	Off
Exclude bibliography	Off		