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EFFECTIVENESS OF LEARNING VIDEOS ON STUDENTS' UNDERSTANDING OF MATHEMATICAL CONCEPTS

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ABSTRACT This study was conducted to address the issue of students' low comprehension of mathematical concepts. Learning videos were explored as a potential instructional medium to improve this comprehension. The purpose of the research was to examine the effectiveness of learning videos on the comprehension of mathematical concepts among grade XI students at SMA Negeri 3 Sukoharjo. A quantitative research method was employed using a true experimental design with a pretest-posttest control group. The sample consisted of 66 students from classes XI F.5A and XI F.5B, selected through a cluster random sampling technique. Data were collected through a test assessing students' comprehension of mathematical concepts. Prerequisite tests, including normality and homogeneity tests, were conducted prior to hypothesis testing, which was carried out using the t-test. The results indicated that learning videos effectively improved students' comprehension of mathematical concepts. This conclusion was supported by the t-test results, where t_{count} (2.1085) exceeded t_{table} (1.669), leading to the rejection of H_0 and acceptance of H_1. Furthermore, the experimental group showed a significant increase in average scores after the intervention with learning videos, with the pretest average of 76.24 rising to a posttest average of 87.91. Based on these findings, it can be concluded that learning videos are an effective instructional medium for enhancing the comprehension of mathematical concepts among grade XI students at SMA Negeri 3 Sukoharjo in the 2023/2024 academic year.

Keywords: learning videos, mathematical concepts, concept comprehension, quantitative research

ABSTRAK Penelitian ini dilakukan untuk mengatasi rendahnya pemahaman konsep matematis siswa. Video pembelajaran dieksplorasi sebagai salah satu media pembelajaran potensial untuk meningkatkan pemahaman ini. Tujuan penelitian ini adalah untuk menguji efektivitas penggunaan video pembelajaran terhadap pemahaman konsep matematis siswa kelas XI di SMA Negeri 3 Sukoharjo. Metode penelitian yang digunakan adalah kuantitatif dengan desain eksperimen sejati menggunakan pretest-posttest kelompok kontrol. Sampel

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penelitian terdiri atas 66 siswa dari kelas XI F.5A dan XI F.5B yang dipilih melalui teknik cluster random sampling. Data dikumpulkan melalui tes yang mengukur pemahaman konsep matematis siswa. Uji prasyarat, termasuk uji normalitas dan uji homogenitas, dilakukan sebelum pengujian hipotesis yang dilakukan menggunakan uji t. Hasil penelitian menunjukkan bahwa video pembelajaran secara efektif meningkatkan pemahaman konsep matematis siswa. Kesimpulan ini didukung oleh hasil uji t, di mana t_{hitung} (2,1085) lebih besar dari t_{tabel} (1,669), yang menyebabkan penolakan H_0 dan penerimaan H_1. Selain itu, kelompok eksperimen menunjukkan peningkatan rata-rata skor yang signifikan setelah intervensi dengan video pembelajaran, yaitu rata-rata pretest sebesar 76,24 meningkat menjadi rata-rata posttest sebesar 87,91. Berdasarkan hasil analisis data, dapat disimpulkan bahwa video pembelajaran merupakan media pembelajaran yang efektif untuk meningkatkan pemahaman konsep matematis siswa kelas XI di SMA Negeri 3 Sukoharjo pada tahun ajaran 2023/2024.

Keywords: video pembelajaran, konsep matematika, pemahaman konsep, penelitian kuantitatif

INTRODUCTION

Education is a common human activity, so that it can be found everywhere and knows no time. One of the important factors in determining the progress and quality of a country's human resources is education. The Government of Indonesia has made several efforts to improve education. One way is by developing a curriculum. The independent curriculum is a new curriculum at this time. The independent curriculum is part of an effort to restore learning and encourage the growth of students' character, potential, and quality by presenting a flexible curriculum framework that refers to a number of subject matter. Curriculum development of course experiences many problems, one of which is mathematics learning. Mathematics is a very important science in all aspects of human life. Many students find math difficult because of its abstract concepts and the need for special evidence. According to Heruman (Ruqoyyah, Murni, & Linda, 2020) to ensure that students not only memorize but also understand what they are learning, abstract mathematics learning must be reinforced so that these concepts are inherent in students' memories and mindsets.

Mathematics learning has a goal, one of which is for students to understand relevant mathematical concepts and materials. Considering the purpose of learning mathematics Understanding mathematical concepts is one of the skills that students must have to learn mathematics, in accordance with the learning objectives (Maulani, Asih, & Alamsyah, 2020). Schools hope that mathematics teachers ensure that students understand all mathematics material and obtain good learning results (Lumbantoruan & Herman, 2025). The learning process to understand has become a top priority among educators and psychologists, as well as one of the most important targets for students in all subjects because it is physically more beneficial and practical (Patmaniar, Amin, & Sulaiman, 2021). Susanto (2015) define understanding as the capacity to associate knowledge about an object with its

related schemas. Concepts, on the other hand, are more abstract ideas that allow us to group something into a predefined category or not.

The definition of conceptual understanding is also put forward by (Baiduri, Utomo, & Wardani, 2021), Baiduri et al. It states that conceptual understanding is the ability of individuals to understand what is taught, translate it into their own language, and divide a topic based on the material that has been studied beforehand. Wulandari, Exacta, & Sungkono (2021) defines concept understanding, namely the ability of individuals to explain concepts in more detail and creatively. Students end up doing more than just memorize; They have a strong understanding of the material. Actually, students have more difficulty understanding mathematical ideas and tend to rely more on memorizing formulas.

Research by Zuliyanti & Novaliyosi (2023) supports this which states that students still fail to understand mathematical concepts because they prefer to memorize formulas rather than understand material concepts, students also do not do assignments carefully and in detail. In addition, the lecture method that teachers usually do is also the cause of students' lack of understanding due to one-way learning. This research focuses on students' ability to understand concepts from students' motivation to learn, there is no way to overcome the lack of concept understanding. In line with the opinion of Rismayanti & Pujiastuti (2020), learning that uses lectures is only carried out in the direction so that students only obtain information, not shape it. This results in no mathematical thinking process, it can be seen that students face difficulties depending on how they solve problems. The SSCS learning model used in this study does not use learning media.

The low understanding of mathematical concepts is supported by the results of observations and interviews from one of the schools. Findings from interviews and class observations show that certain students at SMA Negeri 3 Sukoharjo have difficulties with mathematical concepts. This is shown through the average score of the summative final assessment, where the average score of the F.5.A class is $55{,}30$, while the average grade of class F.5.B is a number of $69{,}05$. KKM which is set at 75 so that the scores of both classes are still below average. In an interview with a grade XI math teacher, it was revealed that students remember formulas more often than they understand concepts. As a result, students have difficulty solving mathematical problems.

After observations in class F.5, B, it was found that students were not interested and bored during the teacher's explanation, making it difficult for them to understand the concept. During the lesson, some students even got sleepy. Apart from being less interested, students do not understand concepts because the teacher explains the material too quickly. In addition, discussions were held with 35 students of class F.5.B. The result of the discussion is learning that uses the lecture method so that students are less interested and bored, resulting in a lack of understanding of student concepts. The problem faced by teachers in the field is that teachers have

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been accustomed to teacher-centered learning, where students are placed as passive recipients. Meanwhile, learning tools with the learning model suggested in the independent curriculum, have not been developed (Armiati, Yerizon, & Hersika, 2019).

As a result, teachers must innovate in learning to make the atmosphere of mathematics learning fun and engaging for students. In order to successfully communicate information or subject matter, educators must be creative and open-minded when choosing and creating learning media. They must also be able to align their media with the learning materials to ensure students get the topic. To ensure that students can understand the content through media, make sure the content is in harmony with the learning material (Kusria & Deswita, 2020). In addition, the media can be reached by students in various places and at an unlimited time. Various components of the learning environment that function as a link between teachers and students or otherwise known as learning media (Hidajat, Susilowati, & Wulandari, 2018). Learning videos are one of the types of media that can be used.

Videos are also a very effective tool for individual and group learning. In addition, videos have the privilege of technology that presents moving images and sound. It is known that the process of acquiring information through the senses of sight and hearing can be significantly improved, developing students' absorption and memory of the subject matter (Daryanto, 2016). Visual representations play an important role in understanding and understanding mathematics. Students and teachers are more likely to use colorful variations of images, drawings, diagrams, and graphs. Visualization is an important step in understandingand trying to solve mathematical problems (Yerizon, Fatimah, & Tasman, 2021). Therefore, with this learning video, students are expected to understand the material more easily so that learning is more efficient. Learning videos allow students to retrieve information at their desired time where the material can be paused, replayed, and revisited for the required tempo (Vidanaralage, Dharmaratne, & Haque, 2022). Based on the description of the problem above, the purpose of this study is to find out how well Sukoharjo students in Class XI SMAN 3 understand mathematical concepts using learning videos.

METHODS

This study uses a quantitative method of experimental type. The design in this study is a True Exsperimental Design type of Pretest-Posttest Control Group Design (Sugiyono, 2019). Two classes were chosen at random. One class that is given the treatment of using learning videos is called an experimental class, while another class that is not given the treatment of using learning videos is called a monitoring class.

Table 1. Research Design

Class	Pretest	Treatment	Posttest
A	O_1	X	O_3
B	O_2	C	O_4

Notes:

O : Test
X : Treatment for the experimental group in the form of video media learning media
C : Treatment for the experimental group in the form of conventional media

With a sample of students from Class XI. F. 5.A and XI. F. 5.B by using cluster sampling random sampling approach (area random sampling), this study examines the population of students of Class XI Sukoharjo SMA Negeri 3. The use of cluster random sampling is based on several things, namely the same material, the same module, and the same teacher. In this two-variable model, the learning video (X) serves as the independent variable, and students' understanding of mathematical concepts (Y) serves as the dependent variable.

Data collection used documentation and test methods. The tests consisted of pretests and posttests in the form of descriptions with a total of 10 questions. The test was tested on other students to obtain the validity of the instrument. Information was collected from students' performance on the tests that measured their understanding of mathematical concepts. As a next step, the data collected was subjected to the necessary analysis, such as the chi-squared test for normality and the Bartlett test for homogeneity. An independent sample t-test was used to test the hypothesis after all requirements were met. If the data is not valid and normal, then a non-parametric test can be used.

FINDING AND DISCUSSION

Pretest Data Description

The pretest was carried out before the treatment in the experimental class and the monitoring class. The test was carried out with 10 description questions to find out the students' initial understanding of mathematical concepts. The results of the initial stage of the test of both classes are presented in the following figure:

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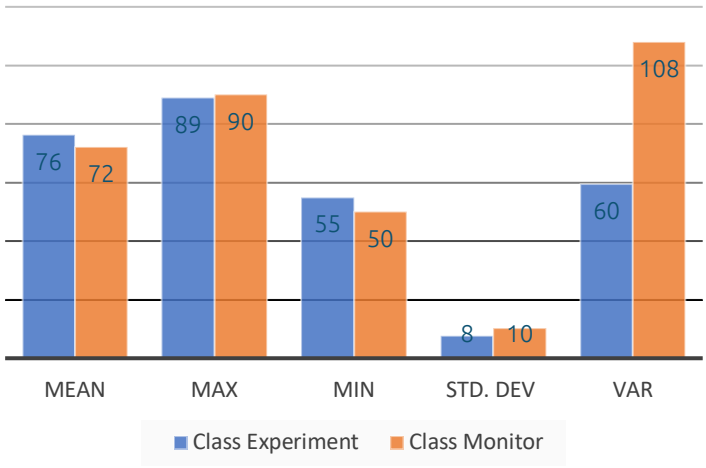

Figure 1. Pretest Result Data

Based on Figure 1, it can be concluded that the average value of the experimental class is higher than the monitored class.

Description of Posttest Data

Posttest which was carried out after treatment in the experimental class and the monitoring class. The test was carried out with 10 description questions to find out the students' understanding of the final mathematical concepts after the treatment. The results of the final stage test of both classes are presented in the following figure:

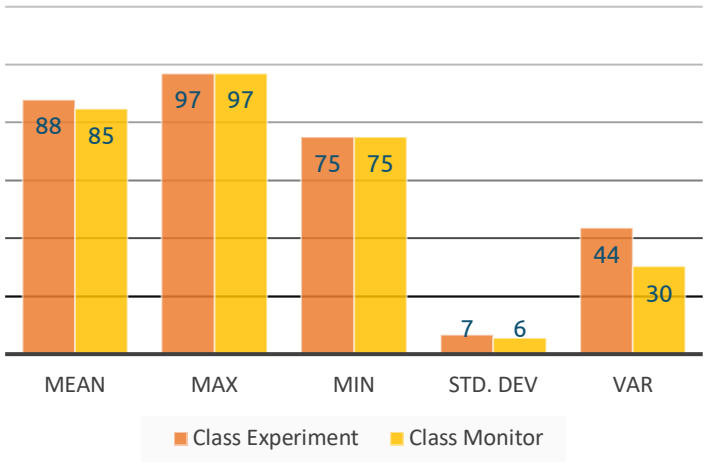

Figure 2. Posttest Result Data

Based on figure 2, it is stated that the average monitoring class is 85, the average trial class is 88. In addition, the maximum value of the trial class is 97, while the monitor class is 97. The minimum value of the trial class is 75 and the monitor class is 75. The standard deviation value of the experimental class is 7 and monitoring

classes namely 6. While the variance of the experimental class is 44 and monitoring classes namely 30.

Normality Test

To find out whether the data is normal, a normality test is required. The Chi-square test was used to find out whether the data in this study was normally distributed. The normality test was carried out on the data from the pretest and posttest results.

The results of the normality test of the pretest data are presented in the following table:

Table 2. Pretest Normality Test

Class	Pretest Understanding of Mathematical Concepts		
	$x^2{}_{count}$	$x^2{}_{table}$	Information
Experiment	6,3934	7,8147	Usual
Monitor	5,0521	7,8147	Usual

Based on table 2, $x^2{}_{table} = 7{,}8147$ obtained from $dk = k - 3 = 6 - 3 = 3$ using significant levels $5\%\ (0{,}05)$. The trial class obtained $x^2{}_{count} = 6{,}3934$, while the monitoring class obtained $x^2{}_{count} = 5{,}0521$. Based on this, the normality test of the experimental class is $6{,}3934 < 7{,}8147$ and monitoring classes namely $5{,}0521 < 7{,}8147$. Thus $x^2{}_{count} < x^2{}_{table}$ we can conclude that the pretest data from both groups followed a normal distribution when we selected the significance level of $5\%\ (0.05)$ and the degree of freedom $dk = k - 3$.

The results of the normality test of posttest data are presented in the following table:

Table 3. Posttest Normality Test

Class	Posttest Understanding of Mathematical Concepts		
	$x^2{}_{count}$	$x^2{}_{table}$	Information
Experiment	7,499	7,8147	Usual
Monitor	4,7782	7,8147	Usual

Based on table 3, $x^2{}_{table} = 7{,}8147$ obtained from $dk = k - 3 = 6 - 3 = 3$ using significant levels $5\%\ (0{,}05)$. The trial class obtained $x^2{}_{count} = 7{,}499$, while the monitoring class obtained $x^2{}_{count} = 4{,}7782$. Based on this, the normality test of the experimental class is $7{,}499 < 7{,}8147$ and monitoring classes namely $4{,}7782 < 7{,}8147$. Thus $x^2{}_{count} < x^2{}_{table}$ the results showed that the posttest scores of the two groups followed the normal distribution when tested at a significance level of $5\%\ (0.05)$ and degrees of freedom $dk = k - 3$.

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Homogeneity Test

One way to determine whether items in a population have the same variant is to use a homogeneity test. This study uses the Bartlett test as a homogeneity test. Comparison of scores before and after the test was carried out using a homogeneity test.

Pretest homogeneity test

The results of the homogeneity test on the pretest data were obtained as follows $2{,}7979$. With the value of ${x^2}_{table} = 3{,}8415$ obtained from the degree of freedom $dk = k - 1 = 2 - 1 = 1$ with a significant degree $5\%\ (0{,}05)$. Based on this, the homogeneity test is $2{,}7979 < 3{,}8415$. Thus ${x^2}_{count} < {x^2}_{table}$ we can conclude that the pretest data is homogeneous because the degree of freedom is $dk = k - 1$ and the significance level is $5\%\ (0.05)$.

Posttest homogeneity test

The results of the homogeneity test in the initial stage data were obtained, namely $2{,}7979$. With the value of ${x^2}_{table} = 3{,}8415$ obtained from the degree of freedom, namely $dk = k - 1 = 2 - 1 = 1$ with a significant degree $5\%\ (0{,}05)$. Based on this, the homogeneity test is $1{,}0526 < 3{,}8415$. Thus ${x^2}_{count} < {x^2}_{table}$ using significant levels $5\%\ (0{,}05)$ and degrees of freedom, namely $dk = k - 1$, so it can be concluded that the initial stage data is homogeneous.

Research Hypothesis Testing

Pretest hypothesis testing

Hypothesis testing carried out on early-stage data was used to compare the two groups that would be used as an example to find out how well they understood mathematical ideas. If the understanding of mathematical concepts in both classes is the same, it can be used as a research sample. Meanwhile, if the understanding of mathematical concepts in the two classes is different, it cannot be used as a research sample because it is not balanced. After the initial stage of the data prerequisite test is met, hypothesis testing can be continued. Hypothesis testing on the early-stage data uses an Independent Sample t-test (two) because it wants to see the mean difference between the two sample classes. The results of hypothesis testing with independent sample t-test are presented in the following table:

Table 4. Pretest hypothesis testing

No	Statistics	Class		Decision
		Experiment	Monitor	
1	Mean	76,2424	72,2727	
2	Standard Deviation	7,7137	10,3901	H_0 Accepted
3	N	33	33	

No	Statistics	Class		Decision
		Experiment	Monitor	
4	dk	64		
5	s	9,1503		
6	t_{count}	1,7635		
7	t_{table}	1,997		

Based on table 4, $t_{table} = 1{,}997$ at a significant level $\frac{\alpha}{2} = \frac{0{,}05}{2} = 0{,}025$ and degrees of freedom, namely $dk = n_1 + n_2 - 2 = 33 + 33 - 2 = 64$. While t_{count} in the early stage data, $1{,}7635$. So that it is obtained that $t_{count} < t_{\frac{\alpha}{2}}$ with a significant degree 5% $(0{,}05)$, where $\frac{\alpha}{2} = \frac{0{,}05}{2} = 0{,}025$ with a degree of freedom, namely $dk = n_1 + n_2 - 2$ that is $1{,}7635 < 1{,}997$. It can be concluded that H_0 accepted, it means that the understanding of the initial mathematical concepts of the two samples is the same.

Posttest hypothesis testing

Hypothesis testing of the final stage test result data is needed to answer the research hypothesis. Hypothesis testing is necessary to find out whether the understanding of grade XI students of mathematical ideas can be improved by using instructional films. Testing the hypothesis using an Independent Sample t-test against the data collected after testing. The following table displays the results from the posttest data for hypothesis testing:

Table 5. Posttest hypothesis testing

No	Statistics	Class		Decision
		Experiment	Monitor	
1	Mean	87,9091	84,7576	
2	Standard Deviation	6,5972	5,5002	
3	N	33	33	
4	dk	64		H_1 Accepted
5	s	6,0735		
6	t_{count}	2,1085		
7	t_{table}	1,669		

Based on table 5, $t_{table} = 1{,}669$ at a significant level 5% $(0{,}05)$ with a degree of freedom, namely $dk = n_1 + n_2 - 2 = 33 + 33 - 2 = 64$. While t_{count} the final stage

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data is $2{,}1085$. So that it is obtained that $t_{count} \geq t_{table}$ using significant levels 5% $(0{,}05)$ with a degree of freedom, namely $dk = n_1 + n_2 - 2$ that is $2{,}1085 \geq 1{,}669$. It can be concluded that the use of learning videos is effective in understanding the mathematical concepts of grade XI students.

This research was conducted with a sample of class XI F.5 at SMA Negeri 3 Sukoharjo. Class XI F.5 B as a trial class and XI F.5 A as a monitoring class. In the experimental class, learning video media was given while the monitoring class did not use learning video media. Before being given treatment in the two classes, a pretest was conducted to test students' understanding of initial mathematical concepts. After conducting the pretest, the average trial class was $76{,}2424$and the monitor class is $72{,}2727$.

After knowing the student's initial understanding of mathematical concepts, in addition, to educate and learn about matrix operations, use several teaching resources with the same content. Utilizing video learning media in experimental courses and not utilizing video learning media in monitoring classes.

The next stage is a posttest to find out the student's understanding of the final mathematical concept. After conducting the posttest, the average trial class was $87{,}9091$ and the monitor class is $84{,}7576$. Based on the average posttest, the average class experiment outperformed the average class monitor.

With the use of learning videos, students get a new atmosphere in the learning process. Students can also view the shared learning videos at any time. Students can better understand the matrix operation material from the shared video. Videos featuring images and sounds attract students to concentrate while learning, which affects the extent to which students understand mathematical ideas.

Figure 3. Students Pay Attention to the Learning Video

The results of the study have similarities with the research conducted by Sarumaha, Putra, & Hermawan (2024), namely a digital-based learning model using learning videos that provide better results in students' understanding of mathematical concepts than conventional learning models. The next research that supports the results of this research is conducted by Rosyita & Tsurayya (2021) which resulted in the conclusion that learning videos can improve students' understanding of concepts.

Furthermore, research conducted by Permata (2022) shows that the use of learning video media has an impact on students' understanding of mathematical ideas. As shown by the fact that students whose lessons include learning video media have a better understanding of mathematical concepts than those whose lessons do not. In addition, the study also concluded that students who use learning videos are more active and more focused on the learning process. Research by Nurlayli, Hidajat, & Primasari (2021), shows that the evaluation of the form of video is effectively used which is shown by the average student in the second meeting, although the questions are more challenging than in the first meeting.

Data analysis and hypothesis testing in this study resulted in the conclusion that studying video media helps students of Class XI of SMA Negeri 3 Sukoharjo better understand mathematics topics. Using video learning materials helps improve students' understanding of mathematical ideas. Matrix operations are complicated and may take a while to master, but with the help of instructional films, students can quickly grasp the concepts.

Based on the analysis of the results of the research conducted by the researcher and supported by relevant research, it can be concluded that the use of learning videos is effective for mathematics learning and can reduce students' lack of understanding of mathematical concepts.

CONCLUSIONS AND RECOMMENDATIONS

The study concluded that the use of learning videos effectively improved the understanding of mathematical concepts among grade XI students at SMA Negeri 3 Sukoharjo during the 2023/2024 academic year. Learning with video media introduced a fresh and engaging atmosphere for students, enabling them to revisit the videos either at home or during school breaks to deepen their understanding of matrix operations. The combination of visual and auditory elements in the videos helped capture students' attention, fostering better focus and significantly enhancing their comprehension of mathematical concepts, ultimately leading to improved learning outcomes.

To maximize the benefits of this approach, it is recommended that teachers receive training to develop effective learning models and create engaging media for mathematics instruction. Such training can empower teachers to become more creative and innovative in their teaching practices. Future research could explore the

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application of learning videos in other mathematical topics to further investigate their potential impact.

REFERENCES

Armiati, Yerizon, & Hersika, R. O. (2019). Trigonometry learning device based guided discovery for high school students of class X. *International Journal of Scientific and Technology Research*, 8(8), 31–37.

Baiduri, Utomo, D. P., & Wardani, C. (2021). *Monograf pemahaman konsep geometri ditinjau dari kecerdasan intrapersonal dan interpersonal*. Malang: UMM Press. Retrieved from https://ummpress.umm.ac.id/buku/detail/monograf-pemahaman-konsep-geometri-ditinjau-dari-kecerdasan-intrapersonal-dan-interpersonal

Daryanto. (2016). *Media Pembelajaran Peranannya Sangat Penting Dalam Mencapai Tujuan Pembelajaran*. Yogyakarta: Gava Media.

Hidajat, D., Susilowati, D., & Wulandari, A. A. (2018). Pengaruh penggunaan miniatur mobil terhadap prestasi belajar matematika. *Jurnal Pendidikan Dan Pembelajaran*, 3(1), 14–22. https://doi.org/10.32585/edudikara.v3i1.74

Kemdikbud. (2023). *Rapor pendidikan indonesia*. Retrieved from https://raporpendidikan.kemdikbud.go.id/login

Kusria, J., & Deswita, H. (2020). Pengembangan video pembelajaran matematika dengan menggunakan aplikasi geogebra pada materi bangun ruang sisi datar kelas viii sekolah menengah pertama. *Jurnal Absis : Jurnal Pendidikan Matematika Dan Matematika*, 3(1), 203–211. https://doi.org/10.30606/absis.v3i1.497

Lumbantoruan, J. H., & Herman, T. (2025). The effectiveness of the logarithm module equipped with a jigsaw-type cooperative model in improving learning outcomes. *Journal of Education and Learning (EduLearn)*, 19(1), 24–33. https://doi.org/10.11591/edulearn.v19i1.21486

Maulani, F., Asih, I., & Alamsyah, T. P. (2020). Penerapan pendekatan concrete-pictorial-abstract terhadap kemampuan pemahaman konsep matematis pada mata pelajaran matematika kelas V SD. *Jurnal Absis : Jurnal Pendidikan Matematika Dan Matematika*, 2(2), 160–170. https://doi.org/10.30606/absis.v2i2.328

Nurlayli, Hidajat, D., & Primasari, E. (2021). Analisis video pembelajaran daring dalam permasalahan sistem persamaan linear tiga variabel. *Jurnal Gema Pendidikan*, 28(1), 33–41.

Patmaniar, Amin, S. M., & Sulaiman, R. (2021). Students' growing understanding in solving mathematics problems based on gender: Elaborating folding back. *Journal on Mathematics Education*, Vol. 12, pp. 507–530. https://doi.org/10.22342/JME.12.3.14267.507-530

Permata, W. C. (2022). Pengaruh media video pembelajaran terhadap pemahaman konsep matematis siswa. *Skripsi*. Universitas Lampung. Retrieved from https://digilib.unila.ac.id/64781/3/3. SKRIPSI TANPA BAB PEMBAHASAN.pdf

Rismayanti, T. A., & Pujiastuti, H. (2020). Pengaruh model search solve create share (sscs) terhadap kemampuan pemahaman konsep matematis. *JKPM (Jurnal Kajian Pendidikan Matematika)*, 5(2), 183–190. https://doi.org/10.30998/jkpm.v5i2.6345

Rosyita, M., & Tsurayya, A. (2021). Pengembangan video pembelajaran matematika materi peluang berbasis sparkol videoscribe untuk meningkatkan kemampuan pemahaman konsep matematika siswa kelas VIII SMP/MTs. *Jurnal Cendekia : Jurnal Pendidikan Matematika*, 5(3), 3136–3147. https://doi.org/10.31004/cendekia.v5i3.954

Ruqoyyah, S., Murni, S., & Linda. (2020). *Kemampuan pemahaman konsep dan resiliensi matematika dengan vba microsoft excel*. Purwakarta: CV. Tre Alea Jacta Pedagogie.

Sarumaha, Y. A., Putra, A. P., & Hermawan, T. (2024). Pengaruh penggunaan media pembelajaran berbasis digital terhadap pemahaman konsep matematika siswa kelas VII SMP. *APOTEMA: Jurnal Program Studi Pendidikan Matematika*, 10(1), 21–30. https://doi.org/https://doi.org/10.31597/ja.v10i1.1043

Sugiyono. (2019). *Metode Penelitian Kuantitatif*. Bandung: Alfabeta.

Susanto, H. A. (2015). *Pemahaman Pemecahan Masalah Berdasar Gaya Kognitif (1st ed.)*. Yogyakarta: Deepublish.

Vidanaralage, A. J., Dharmaratne, A. T., & Haque, S. (2022). AI-based multidisciplinary framework to assess the impact of gamified video-based learning through schema and emotion analysis. *Computers and Education: Artificial Intelligence*, 3(100109), 1–25. https://doi.org/10.1016/j.caeai.2022.100109

Wulandari, A. A., Exacta, A. P., & Sungkono, J. (2021). Efektivitas simulasi "R" dalam pembelajaran distribusi peluang variabel random. *Aksioma: Jurnal Program Studi Pendidikan Matematika*, 10(2), 692–700. https://doi.org/10.24127/ajpm.v10i2.3380

Yerizon, Fatimah, S., & Tasman, F. (2021). Development of a geogebra-assisted calculus worksheet to enhance students' understanding. *International Journal of Information and Education Technology*, 11(10), 456–463. https://doi.org/10.18178/ijiet.2021.11.10.1550

Zuliyanti, P., & Novaliyosi, N. (2023). Systematic literatur review: Kemampuan pemahaman konsep matematis ditinjau dari motivasi belajar matematika. *Prisma*, 12(2), 494–503. https://doi.org/10.35194/jp.v12i2.3242

https://doi.org/10.30606/absis.v7i2.2796