Aksioma: Jurnal Matematika dan Pendidikan Matematika
Volume 16, No. 3, Desember 2025, pp. 443-454
ISSN: 2579-7646 (e) | 2086-2725 (p)
https://doi.org/10.26877/

The Influence of animated videos using plotagon and canva on quadratic function material on students' conceptual understanding

Widiana Dakhi [1], Andinasari [2], Risda Intan Sistyawati [3]

[1,2,3] Pendidikan Matematika, Universitas Sjakhyakirti, Sumatera Selatan, Indonesia
Correspondence: widianadakhi@gmail.com

Received: August 14, 2025 | **Revised**: Sept 16, 2025| **Accepted**: Dec 8, 2025 | **Published Online**: December 23, 2025

Abstract

The main problem in mathematics learning at the high school level, especially in quadratic function material, is the low level of students' conceptual understanding. The purpose of this scientific study is to determine the significant effect of using animatestudy used a quantitative approach using an experimental method with a pretest-posttest cd video media created with the help of Plotagon and Canva on quadratic function material on high school students' conceptual understanding abilities. This ontrol group design. The main instrument was a test designed to assess students' level of mathematical concept understanding. The data study shows that the use of animated video content significantly improves students' conceptual understanding, as indicated by a significance value (Sig.two-sided p) of less than 0.001. These results show that the use of Plotagon and Canva to create animated video-based learning materials is proven to be effective and feasible to be implemented as an innovative alternative in mathematics learning, especially in abstract materials such as quadratic functions.

Keywords: Animated Video; Plotagon; Canva; Quadratic Functions; Conceptual Understanding

How to Cite: Dakhi, Widiana., Andinasari, Sistyawati, Risda Intan. (2025). The Influence of animated videos using plotagon and canva on quadratic function material on students' conceptual understanding. *Aksioma: Jurnal Matematika dan Pendidikan Matematika, 16*(3), 443-454. https://doi.org/10.26877/

INTRODUCTION

The ability to understand concepts in learning is fundamental to understanding and mastering more complex material, and this ability should not be overlooked. A deep understanding of concepts will enable students to understand the subject matter more comprehensively. Understanding concepts aims to help students understand, identify, and express the information that has been given, rather than simply memorizing formulas or sentences provided by teachers or reading materials (Nurfajriyanti & Pradipta, 2021). When students understand mathematical concepts, they will be able to apply them in everyday situations, which will result in improved learning outcomes and the development of additional mathematical skills (Hidayati & Munandar, 2023).

Students' ability to understand mathematical concepts needs to be continuously developed, given its important role in supporting the achievement of learning objectives and encouraging improved learning performance (Septian et al., 2020). According to

research conducted by (Tahir & Marniati, 2021), the majority of students show a low level of understanding of mathematical concepts. Some only memorize formulas for solution methods without understanding the basic concepts, making it difficult to apply mathematical concepts in everyday life (Kariimah & Fatikhah, 2024). The lack of student participation in the learning process is often associated with the application of ineffective approaches in engaging students (Raudha et al., 2024).

Based on the results of the researcher's observations at Sjakhyakirti High School in Palembang, it was found that in the learning process in grade X, most students still experienced difficulties in mastering mathematical concepts, especially quadratic functions. The teaching methods used by teachers at Sjakhyakirti High School tend to be conventional and unvaried, with students only instructed to listen, take notes on important points, and summarize from existing textbooks. Interactive digital media effectively increases student attention, interest, and engagement in mathematics education, facilitating a deeper understanding of the subject matter (De Rosari, 2024).

The effectiveness of a learning model is largely determined by the learning media used (Rasiman et al., 2020). The experience of learning mathematics, especially abstract material, can be transformed with technology-based learning media (Ermilia et al., 2024). Each learning medium has different advantages and disadvantages. Therefore, to achieve optimal function, the use of learning materials must be tailored to specific needs (Raihanah et al., 2024).

Animated video media has several functions in learning, namely providing broader information, providing encouragement, motivating enthusiasm, and making the material easier to understand (Nurhasanah & Alfurqan, 2024). Animated video media is very important in mathematics learning because it allows students to focus on the material by providing interesting animations that prevent students from feeling tired (Tama & Sumargiyani, 2022).

According to (Siragih & Sirait, 2023), the use of Plotagon animation media contributes significantly to student achievement, although data shows that prospective teachers rarely use it, possibly due to fear of technology or lack of familiarity (Naidoo, 2024). Meanwhile, research by (Samsul Bahri, 2024), shows that animated video learning media developed through Canva is very feasible to use. Canva can effectively illustrate problems and help students understand related topics (Novianti & Wayudi, 2024), This

study explores a new approach by combining Plotagon and Canva to create animated videos as more interactive and engaging learning media. The primary focus is to measure the significant impact of these animated videos on students' conceptual understanding of quadratic function material, while also helping prospective teachers overcome their fear of technology.

METHODS

This study uses a quantitative method that describes the effect of using Plotagon and Canva animated video media on quadratic material on high school students' understanding of concepts. According to (Adil, 2023), the quantitative method is a method for testing the relationship between variables to test a particular theory. This type of research is a True Experimental Design, which includes an experiment that is given treatment and a control group that does not receive treatment.

The research design used is the Pretest-Posttest Control Group Design. According to (Sugiyono, 2023) in this design, the experimental group and control group are selected randomly and given a pretest to determine the initial conditions. The pretest results are considered adequate if the group scores do not differ significantly. Next, a final test will be given to both groups after the experimental group receives the treatment. The Pretest-Posttest Control Group Design can be seen in the following table:

Table 1. The pretest-posttest control group design

Subject	**R** Experimental	**O1** Pretest	**X** Treatment	**O2** Observation/Posttest
	R Control	**O3** Pretest	No treatment	**O4** Observation/Posttest

Thirty students from class X.3 acted as the experimental group and thirty students from class X.2 acted as the control group. The population of this study was all students enrolled at Sjakhyakirti High School in Palembang for the 2024/2025 academic year.

Learning tools and pretest-posttest aimed at measuring the conceptual understanding of tenth-grade students on quadratic functions were used as research instruments. Research instruments were used to measure variables so that data could be measured statistically. The pretest and posttest each consisted of five questions compiled and assessed based on several indicators of mathematical conceptual understanding. According to the Ministry of Education and Culture in (Tanzimah, 2021), the following

are seven indicators of conceptual understanding: 1) repeating concepts; 2) grouping objects based on certain attributes related to concepts; 3) providing examples and counterexamples of a concept; 4) explaining concepts through different mathematical representations; 5) formulating necessary or sufficient conditions for a concept; 6) using, applying, and selecting specific procedures or operations; and 7) applying concepts or algorithms in situations involving problem-solving.

Before the pretest-posttest was used, validity testing was conducted. The tests used in this study were validated by Mrs. Dian Apriani, as a subject matter expert who assessed the construction, language, and content of the questions. To ensure the suitability of the pretest-posttest with the concept understanding indicators, an expert validation sheet was used. Based on the expert validation sheet, it was concluded that the pretest-posttest questions were suitable for use.

The testing in this study was conducted using IBM SPSS Statistics version 30. Before testing the hypothesis, a preliminary assessment was carried out, which included tests of normality and homogeneity. Prerequisite tests were conducted to evaluate data suitability, with the provision that data distribution was considered normal if the significance value exceeded 0.05. Next, hypothesis testing was conducted using a t-test to assess the impact of animated video content on students' understanding of mathematical concepts related to quadratic functions.

RESULTS AND DISCUSSION

Based on the data collection method in the form of a concept comprehension test, the researcher obtained evidence regarding the impact of animated video media on students' understanding of quadratic functions. The initial testing in this study began with a data normality analysis using the Shapiro-Wilk test. The normality criteria were met if the statistical significance showed a value above 0.05. The following are the results of the normality test conducted for both the experimental and control classes:

Table 2. Normality results

Data	***Sig.*** $_{calculated}$	**Meaning**
Experimental posttest	0,116	Normally distributed
Posttest control	0,219	Normally distributed

The normality test results for the pretest data showed a significant value of 0.116 for the experimental group and 0.219 for the control group. The data in both groups can be considered normally distributed, because the posttest results exceed the significance threshold of 0.05. Furthermore, a homogeneity test was conducted using Levene's test. If the significance value exceeds 0.05, the data is considered homogeneous based on the test criteria. This test aims to determine the equality of variance between the experiment group and control group. The homogeneity test results are presented in the following table:

Table 3. Homogeneity results

	Levene Statistik	**df1**	**df2**	**Sig.**
Hasil posttest	3,224	1	58	0,078

The results of the posttest data homogeneity test produced a significance value of 0.078. Because this value exceeds 0.05, it can be concluded that the variation in students' understanding of mathematical concepts in the two classes is homogeneous. Next, the researcher tested the hypothesis using a t-test. Hypothesis testing is a key step in statistical analysis to evaluate the effectiveness of an intervention or treatment. The following is a description of the t-test results:

Table 4. Results of the independent t-test

		t_{table}	**$t_{calculated}$**	**df**	**Sig. (two-sided p)**	**Conclusion**
Posttest of experimental class and control class	Equal variances assumed	2,002	-11,970	58	<,001	H_1 Accepted

In this study, the posttest results between the experimental group and the control group were compared using an independent t-test. Based on Table 3, the output of the independent t-test shows that the significance level (Sig.two-tailed) is below the significance threshold, which is 0.05 ($p < 0.001 < 0.05$). In accordance with the decision-making guidelines in the independent t-test, it is concluded that the hypothesis "H_1 " is supported by the data, while the hypothesis "H_0 " is rejected. The research results indicate a significant difference between the average conceptual understanding of the experimental group and the average comprehension ability of the control group. The pretest and posttest scores are presented in Table 3 to reinforce the statistical test results

and provide a clearer picture of the variation in students' abilities before and after the intervention.

Table 5. Statistical t-test results for groups

Class	N	Mean	Std. Deviation
Control class	30	60,57	4,854
Experimental class	30	74,10	3,854

Based on Table 4, it is known that the control class obtained a mean of 60.57 with a standard deviation of 4.854 and the experimental class obtained a mean of 74.10 with a standard deviation of 3.847. This indicates an increase in students' conceptual understanding, as seen in the increase in posttest scores compared to pretest scores.

Based on the posttest results comparing the experimental class and the control class on quadratic functions in grade X at Sjakhyakirti High School in Palembang, the use of animated video content improved students' understanding of mathematical concepts, as determined by concept understanding indicators. An example of student learning outcome evaluation can be seen from the indicator of the ability to restate mathematical concepts. Students are expected to be able to accurately repeat concepts and identify relevant information in questions. The results of several students' answers were categorized based on the measurement of mathematical concept comprehension as follows:

1. Ability to Restate a Concept

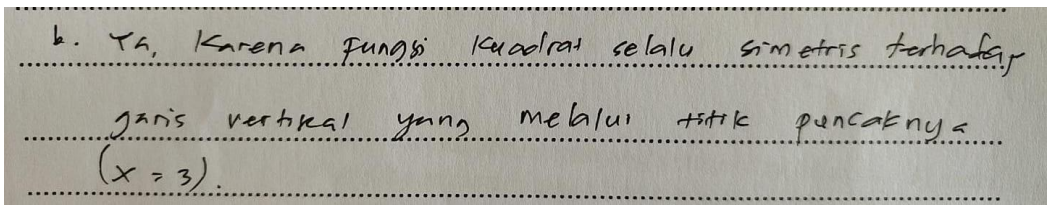

Figure 1. Answer 4b from the experimental class

In Figure 1, it can be seen that the student was able to understand the question well and provide an appropriate answer. For question number three, the student received four points out of a possible total of eight points. The score was given in accordance with the scoring guidelines based on the indicator of the ability to restate a concept.

2. Ability to Present Concepts in Various Mathematical Representations

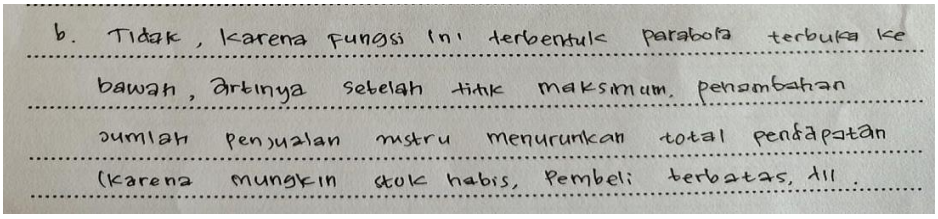

Figure 2. Answer 3b experimental class

Figure 2 shows that the student has successfully presented the topic using several mathematical representations with accuracy and precision. Based on the scoring guidelines set for question number 3, the student received 4 points out of a maximum of 8 points.

3. Ability to Apply Concepts or Problem-Solving Algorithms

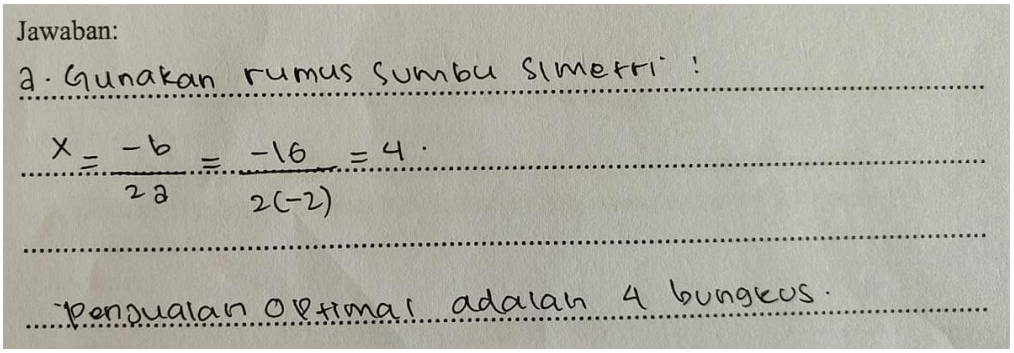

Figure 3. Answer 3a experimental class

Figure 3 shows that the student has used concepts or algorithms effectively in problem-solving tasks. Therefore, the student received 4 points out of a maximum of 8 points for question number 3.

4. Ability to Use, Utilize, and Select Specific Procedures

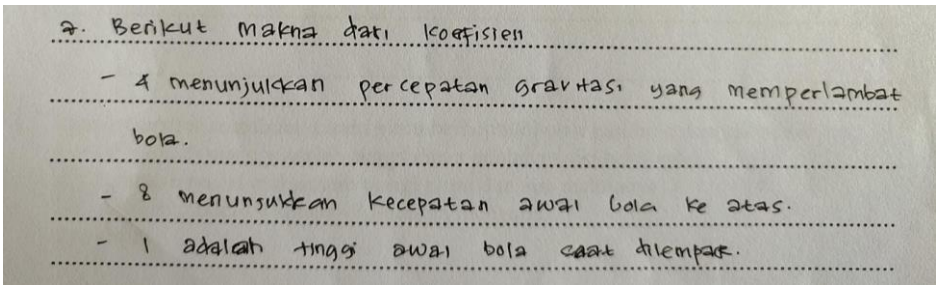

Figure 4. Answer 2a experimental class

Figure 4 shows that the student has successfully grouped items based on specific qualities according to the correct idea. The student obtained 4 points out of a total of 8 points for question number 2, based on the criteria of item grouping ability.

5. Ability to Use, Utilize, and Select Specific Procedures

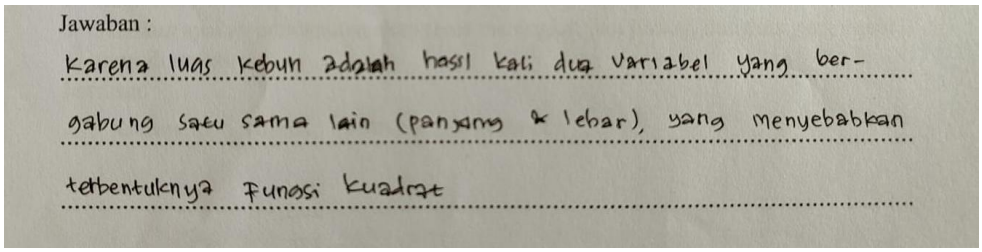

Figure 5. Answer number 1, experimental class

Figure 5 shows that students can use, apply, and select specific processes accurately. As a result, students obtained 4 points out of a total of 4 points for question number 1.

Based on the observation results, it was concluded that the use of animated video media supported by Plotagon and Canva was proven to improve students' understanding of quadratic function concepts. Video animation significantly improves mathematics education by graphically and interactively illustrating abstract topics (Tri Permadani et al., 2024). During the learning activities, students were seen to actively participate and show high enthusiasm for the material provided. These findings are in line with the statement (Putri et al., 2024).

The results obtained in this study are essentially supported by and in line with various previous studies that evaluated the effectiveness of using animated video media in mathematics learning. One of the previous research references is a study conducted by (Khasanah et al., 2024), which examined the impact of integrating the PBL model supported by animated video media. These findings are in line with the statement (Ummah, 2019), that the use of technology not only facilitates access and provides flexibility in learning activities, but also enriches students' experiences through more interesting and interactive material presentation.

Both the study (Siragih & Sirait, 2023) and this study emphasize the advantages of animated video media in helping students understand complex mathematical concepts, while also providing a fun and engaging learning experience. The findings of this study are also directly supported by the results of research conducted by (Siregar et al., 2023),

which found that Canva-based mathematics learning media is considered more effective than traditional learning media.

CONCLUSION

The use of animated video media with the help of Plotagon and Canva in teaching quadratic functions has a significant effect on students' understanding of the concept at the high school level. Students who participated in the experimental class showed better performance in identifying, analyzing, and solving problems related to quadratic functions, unlike students in the control group who continued to use traditional techniques. This is evidenced by the test results in the experimental class, which were superior in several indicators of conceptual understanding. However, it should be noted that the quality of the animated video content is important. This study highlights the importance of the quality of animated content, its relationship with curricular resources, and the application of contextual teaching methods.

ACKNOWLEDGMENTS

Thank you, Almighty God, for all your blessings and gifts. Thank you to my parents and everyone who helped me complete this article. Thanks also to the supervising lecturer at Sjakyakirti University Palembang who has guided and assisted the researcher in compiling this article. Not to forget, thanks also to the editors of Aksioma Journal: Journal of Mathematics and Mathematics Education for their cooperation in publishing this article.

DECLARATIONS

Author Contribution : Author 1: Conceptualization, Writing - Original Draft, Editing and Visualization; Author 2: Writing - Review & Editing, Formal analysis, and Methodology; Author 3: Validation and Supervision.

REFERENCES

Adil, A. (2023). *Metode Penelitian Kuantitatif dan Kualitatif: Teori dan Praktik* (Issue January).

De Rosari, L. E. D. (2024). Pengaruh Penggunaan Media Digital Interaktif terhadap Minat Belajar Matematika di SMP Cahaya Sakti Jakarta. *Cendekia Pendidikan*, *4*(4), 50–54. https://doi.org/10.9644/sindoro.v3i9.252

Ermilia, R., Laila, F., & Vitri, R. (2024). *Geogebra dalam Pembelajaran Fungsi Kuadrat*

dan Pengaruhnya terhadap Motivasi dan Hasil Belajar Siswa. *13*(4), 1237–1251.

Hidayati, H. A., & Munandar, D. R. (2023). The Influence of mathematics learning interest on the conceptual understanding of eighth-grade middle school students. *Union: Jurnal Ilmiah Pendidikan Matematika*, *11*(1), 136–142. https://doi.org/10.30738/union.v11i1.13639

Kariimah, H., & Fatikhah, F. A. (2024). Analysis of Mathematical Concept Under the Review of Students Learning Interest in Solving Algebraic Problems. *International Journal of Research in Mathematics Education*, *2*(2), 131–148. https://doi.org/10.24090/ijrme.v2i2.10675

Kartika, R. A., Apriza, B., & Darwanto. (2025). The Effectiveness of Using Animated Videos in Learning Mathematics to Improve Student Learning Outcomes in Elementary Schools: A Systematic Literature Review. *Indonesian Journal of Educational Research and Review*, *13*(1), 64–76. https://doi.org/10.23887/jjpgsd.v13i1.92313

Khasanah, N. U., Rini, Z. R., Agung, E., Fitra, P., & Konsep, P. (2024). *Efektivitas Model Pembelajaran Problem Based Learning Berbantuan Media Video Animasi Terhadap Pemahaman Konsep Siswa Dalam Pembelajaran Tematik Kelas III di SD Negeri Wonoyoso*. *10*(1), 79–90.

Naidoo, R. C. (2024). From Technophobia to Techno Confidence: Integration of iPad Software Applications in Teacher Training. *Proceedings of the International Conference on Education Research, ICER 2024*, 428–431. https://doi.org/10.34190/icer.1.1.3119

Novianti, N., & Wayudi, M. (2024). Improving Elementary School Student' Mathematical Communication and Self-Efficacy Through Realistic Mathematics Learning Assisted by Canva Media. *Daya Matematis: Jurnal Inovasi Pendidikan Matematika*, *12*(3), 166. https://doi.org/10.26858/jdm.v12i3.66382

Nurfajriyanti, I., & Pradipta, T. R. (2021). *Analisis Kemampuan Pemahaman Konsep Matematis pada Materi Bangun Ruang Sisi Datar Ditinjau dari Kepercayaan Diri Siswa*. *05*(03), 2594–2603.

Nurhasanah, A., & Alfurqan. (2024). Penggunaan Media Video Animasi dalam Pembelajaran Manasik Haji di PAUD Mawar. *Tazakka: Jurnal Pendidikan Dan Keislaman*, *2*(02), 92–106. https://doi.org/10.24036/tazakka.v2i02.37

Putri, E. K., Isrok`atun, & Sunaengsih, C. (2024). *Pengaruh Media Video Animasi terhadap Pemahaman Konsep Siswa pada Materi Keliling Bangun Datar Kelas III SDN Sadagori 1*. *8*(4), 1854–1869. https://doi.org/10.35931/am.v8i4.4092

Raihanah, F. S., Sina, I., & Paridjo, P. (2024). Pengembangan video animasi matematika berbantuan Animaker untuk meningkatkan pemahaman matematis siswa. *AKSIOMA : Jurnal Matematika Dan Pendidikan Matematika*, *15*(3), 385–395. https://doi.org/10.26877/aks.v15i3.20216

Rasiman, Prasetyowati, D., & Kartinah. (2020). Development of learning videos for junior high school math subject to enhance mathematical reasoning. *International Journal of Education and Practice*, *8*(1), 18–25. https://doi.org/10.18488/journal.61.2020.81.18.25

Raudha, A., Alim, J. A., & Fendrik, M. (2024). Impact of animated video media on enhancing numeracy skills among primary school students. *Al-Jabar : Jurnal Pendidikan Matematika*, *15*(2), 611–621. https://doi.org/10.24042/ajpm.v15i2.23992

Samsul Bahri, S. M. R. (2024). Pengembangan Media Video Animasi Berbasis Canva

Pada Soal Cerita Matematika Materi Operasi Hitung Campuran Bilangan Cacah Dikelas IV SD Negeri 108075 Kec. Deli Tua. *Ability: Journal of Education and Social Analysis*, *4*, 1–9. https://doi.org/10.51178/jesa.v4i4.1731

Septian, A., Agustina, D., & Maghfirah, D. (2020). Model Pembelajaran Kooperatif Tipe Student Teams Achievement Division (STAD) untuk Meningkatkan Pemahaman Konsep Matematika. *Mathema: Jurnal Pendidikan Matematika*, *2*(2), 10. https://doi.org/10.33365/jm.v2i2.652

Siragih, E. M., & Sirait, S. (2023). Pengaruh Penggunaan Media Animasi Berbasis Plotagon untuk Meningkatkan Hasil Belajar Siswa. *Jurnal Pendidikan Mipa*, *13*(4), 1005–1011. https://doi.org/10.37630/jpm.v13i4.1265

Siregar, F. A., Sumatera, W., Saragih, A. H., Sumatera, W., Julia, E., & Sumatera, W. (2023). Canva Application-Based Learning Media: Improving Mathematics Learning Outcomes in Fraction Materials for Elementary School Students. *International Journal of Computer Applications Technology and Research*, *12*(08), 1–7. https://doi.org/10.7753/ijcatr1208.1001

Sugiyono. (2023). *Metode Penelitia Pendidikan: Kuantitatif, Kualitatif, Kombinasi R&D dan Penelitian Pendidikan* (Edisi ke-3). ALFABETA.

Tahir, T., & Marniati, M. (2021). Analisis Kemampuan Pemahaman Konsep Matemati Dan Kesalahan Menyelesaikan Soal Cerita Menggunakan Prosedur Newman. *AKSIOMA: Jurnal Program Studi Pendidikan Matematika*, *10*(4), 2765. https://doi.org/10.24127/ajpm.v10i4.4289

Tama, S., & Sumargiyani. (2022). Analisis kebutuhan siswa terhadap media video animasi dalam pembelajaran matematika. *AKSIOMA: Jurnal Matematika Dan Pendidikan Matematika*, *13*(2), 315–324.

Tanzimah. (2021). Analisis Kemampuan Pemahaman Konsep Matematis Mahasiswa Pgsd Pada Mata Kuliah Aritmatika. *SEMINAR NASIONAL PENDIDIKAN PPs UNIVERSITAS PGRI PALEMBANG*, 80–86.

Tri Permadani, N. A., Sutrisni Andayani, & Rahmawati, D. (2024). Analysis of Mathematics Learning Needs Using Animated Videos Based on Discovery Learning in Junior High Schools. *International Journal of Multidisciplinary Research of Higher Education (IJMURHICA)*, *8*(1), 74–3. http://ijmurhica.ppj.unp.ac.id/index.php/ijmurhica

Ummah, M. S. (2019). Manfaat Media dalam Pembelajaran. *Sustainability (Switzerland)*, *11*(1), 1–14.