
Development of Canva-Assisted Learning Videos on Matrix Multiplication Material for Grade XI

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Abstract. *This study aims to develop and assess the feasibility of learning videos, created with the Canva application, for matrix multiplication material for eleventh-grade senior high school students. The study employed a development research method using a development model combined with Tessmer's formative evaluation, which includes the stages of preliminary, design, and formative evaluation (self-evaluation, expert review, one-to-one, small group, and field test). The research subjects consisted of three expert validators, namely a content expert, a media/design expert, and a language expert, as well as eleventh-grade students involved in the one-to-one test (3 students), small group test (9 students), and field test (36 students). Data collection techniques included needs analysis questionnaires, walkthroughs or expert validation, student response questionnaires, and pretest–posttest assessments. Data analysis was conducted by calculating validity and practicality percentages using a Likert scale, and effectiveness was tested using a paired-samples t-test with a significance level of 0.05. The results indicate that the developed learning video falls into the very valid category based on expert assessments. Practical testing shows that the media is efficient and receives positive responses from students. Effectiveness testing at the field test stage reveals a significant difference between the average pretest and posttest scores, indicating that the Canva-assisted learning video is efficacious in improving students' learning outcomes in matrix multiplication. Therefore, the developed learning video is declared valid, practical, and effective for use in eleventh-grade senior high school mathematics learning.*

Keywords: *Canva; Matrix Multiplication; Mathematics; Media Development*

INTRODUCTION

The development of information and communication technology has driven transformations in school learning practices, particularly in the use of digital media to support more effective and meaningful learning (Fuadah et al., 2023; Said, 2023). The demands of 21st-century learning require educators to integrate technology pedagogically to create innovative, interactive, and student-centred learning environments (Fatimah et al., 2025). In mathematics learning, the use of technology-based instructional media has become increasingly important, given the abstract and procedural nature of mathematical content, which requires

adequate visualisation skills to enable comprehensive conceptual understanding (Amaludin et al., 2025; Onoshakpokaiye, 2022).

At the senior high school level, particularly in grade XI, matrix multiplication is a highly complex topic that often causes difficulties for students (Hermanto & Susilawati, 2023). This material requires strong conceptual mastery, accuracy in following calculation procedures, and the ability to systematically connect matrix concepts with algebraic operations, which in practice still pose challenges for many students (Hermanto & Susilawati, 2023). However, in classroom settings, the delivery of matrix multiplication material still tends to rely on conventional approaches with limited use of instructional media, which has not been optimal for visualising matrix operation steps (Putri et al., 2020). These limitations result in learning processes that do not fully facilitate deep conceptual understanding, leading students to struggle to comprehend the systematic steps of matrix multiplication (Sitepu et al., 2023).

The use of learning videos is one alternative medium considered capable of addressing these issues, as video media can present content in a structured and communicative manner, thereby assisting students in understanding abstract concepts (Bulubaan et al., 2025). Learning videos present material through a combination of visual and auditory elements that complement each other, helping students understand concepts more concretely (Awaliyah & Yani, 2024). Through sequential visual presentations, learning videos can facilitate step-by-step explanations of the matrix multiplication process, starting from determining matrix order to calculating each element of the resulting matrix (Octaviani et al., 2024). Several previous studies have shown that the use of learning videos in mathematics can increase students' motivation, interest, and learning comprehension across various mathematical topics (Fahri et al., 2024; Rahmawati et al., 2022). Nevertheless, these studies generally position video as a broad learning medium, without examining in depth a media development process tailored to the characteristics of specific mathematical content, notably matrix multiplication (Vahini et al., 2022).

Along with the development of digital design platforms, the Canva application has become widely used in education as a tool for developing instructional media, thanks to its attractive visual design features and ease of use for educators (Octaviani et al., 2024). Canva offers ease of access, design flexibility, and a variety of visual features that support teachers in creating instructional media independently, including graphic elements, text, animations, and videos that can be adapted to instructional needs (Hermanto & Susilawati, 2023). Various studies indicate that using Canva can increase students' interest and engagement in learning; however, these studies are still dominated by non-mathematics subjects or focus primarily on visual and motivational aspects (Octaviani et al., 2024). Research that develops explicit Canva-assisted mathematics learning videos, especially on matrix multiplication material for grade XI, remains very limited. This indicates a research gap related to the development of video learning media that aligns with the abstract and procedural characteristics of mathematical content (Kaharudin et al., 2025).

Based on these considerations, a study is needed that not only emphasises the use of learning video media but also focuses on a relevant, systematic, and needs-based media development process suitable for grade XI mathematics learning. Therefore, this study focuses on developing Canva-assisted learning videos for matrix multiplication material in grade XI. The novelty of this research lies in integrating Canva as a platform for developing mathematics learning videos that visually illustrate the matrix multiplication process in a step-by-step, conceptual manner. In addition, this study emphasises aligning the media with the characteristics of the material and students' learning needs, thereby producing instructional media that are not only visually engaging but also feasible to use as an alternative support for mathematics learning at the secondary school level.

RESEARCH METHOD

This study applies a development research (Development Research/DR) method that combines a development model with formative evaluation. This model was selected because it can produce instructional products with high levels

of validity, practicality, and effectiveness through systematically conducted evaluation stages. This development research consists of three main stages, namely:

1. Preliminary Stage: This stage includes analysing students' and teachers' needs, determining learning objectives, and planning the overall content outline for matrix multiplication material for grade XI, aligned with the curriculum and student characteristics.
2. Design Stage: At this stage, the Canva-assisted learning video is designed, including selecting the application, preparing flowcharts, developing storyboards, and creating the initial prototype.
3. Evaluation Stage (Formative Evaluation): The formative evaluation follows Tessmer's (1998) model, which consists of self-evaluation, expert review, one-to-one evaluation, small-group evaluation, and field testing. These evaluation stages aim to assess the validity, practicality, and effectiveness of the developed learning video.

The research subjects include three expert validators and students. The expert validators consist of a subject matter expert, a media/design expert, and a language expert, who are responsible for assessing the validity of the developed learning video. In addition, the research subjects include grade XI senior high school students: 3 in the one-to-one stage, 9 in the small-group stage, and 36 in the field-test stage.

The data collection techniques used in this study include several methods, namely needs analysis questionnaires administered to students and teachers to identify learning needs, walkthroughs or expert validation to assess the validity of the instructional media, student response questionnaires to measure the level of media practicality, and pretest and posttest assessments used to evaluate the effectiveness of the learning video on students' learning outcomes. Media validity was assessed by experts in material, media, and language using a Likert scale. The validity score was calculated using the following formula.

$$X = \frac{\text{score obtained}}{\text{Ideal score}} \times 100\%$$

The calculation results were then categorised as follows:

Table 1. Validity Criteria

Percentage (%)	Qualification
81–100	Very Valid
61–80	Valid
41–60	Fair
≤ 40	Less Valid

Media practicality was analysed based on students' responses during the small-group stage using a Likert-scale questionnaire. The practicality score was calculated using the same formula. The practicality criteria were determined as follows:

Table 2. Practicality Criteria

Percentage (%)	Qualification
81–100	Very Practical
61–80	Practical
41–60	Less Practical
≤ 40	Very Little Practical

Effectiveness testing was conducted at the field test stage using a pre-experimental one-group pretest–posttest design. Learning outcome data were analysed using a paired-samples *t*-test with a significance level of 0.05.

The hypotheses tested were:

- H_0 : There is no difference between the mean pretest and posttest scores.
- H_1 : There is a difference between the mean pretest and posttest scores.

The decision-making criteria were as follows:

- $\text{Sig} \geq 0.05 \rightarrow H_0$ accepted
- $\text{Sig} < 0.05 \rightarrow H_1$ accepted

In addition, the level of learning outcome achievement was calculated using the following formula:

$$\text{Percentage achievement} = \frac{\text{total score obtained}}{\text{total score maksimum}} \times 100\%$$

The Effectiveness criteria were determined as follows:

Table 3. Effectiveness Criteria

Percentage (%)	Qualification
81–100	Very practical
61–80	Practical
41–60	Less practical
≤40	Very little practical

RESULTS AND DISCUSSION

The development of instructional media in this study began with determining the type of media and application to be used based on the results of the needs analysis. The media development took the form of a learning video, with Canva as the primary development platform. The selection of Canva was based on technical and functional considerations, including ease of use, the availability of visual and animation features, and its ability to support teachers' independent development of instructional media.

The subsequent development stage focused on the design and realisation of the learning video content. The material was systematically organised into three main sections: matrix order, scalar multiplication of matrices, and multiplication of two matrices. Each segment was designed as a series of consistent visual slides, complemented by illustrations, animations, and voice narration aligned with the instructional flow. Synchronisation between visual displays and narration was carried out to ensure clarity in the delivery of the material.

The development of ideas and concepts for the learning video was based on the results of a needs analysis involving both students and teachers. The video content was designed using a contextual approach by presenting examples drawn from everyday life, thereby making the material more relevant, meaningful, and easier for students to understand. The selection of illustrations, colours, and animations was carefully considered to enhance student engagement throughout

the learning process. To ensure coherence and continuity in the presentation of the material, the video development followed a structured and systematic instructional sequence, beginning with an introduction, followed by the presentation of material for each subtopic, and ending with a closing section. This structured sequence served as a guideline during the media production process to ensure that the development was carried out in an orderly and consistent manner.

The final output of this development stage was a Canva-assisted learning video on matrix multiplication for grade XI students. The video presents the material in a well-organised manner, supported by visualisations that facilitate conceptual understanding and a clear instructional flow, making it ready for expert validation and subsequent student trials.

Validity Testing

The expert validation stage was conducted to assess the feasibility and quality of the developed learning video before it was tested on students. This validation aimed to ensure that the media met criteria for content appropriateness, media design and visual quality, and the accuracy of language use in instructional delivery. The validation process involved expert validators, including a subject-matter expert, a media/design expert, and a language expert. Each validator provided assessments using systematically prepared instruments, along with suggestions and feedback that served as a basis for product revision. The results of this expert validation stage were used to determine the validity level of the learning media and to guide revisions before the media were deemed suitable for subsequent trials.

Table 4. Recapitulation of Expert Validation Results

Assessment Aspect	Score (%)	Category
Content	93	Very Valid
Language	91	Very Valid
Media Design	94	Very Valid

The expert validation results indicate that the developed learning video falls into the very valid category across all assessment aspects. The content aspect obtained a score of 93%, indicating that the instructional content aligns with the targeted competencies, demonstrates conceptual accuracy, and is presented logically and coherently. This suggests that the matrix multiplication material meets academic standards and is appropriate for instructional use.

In the language aspect, a score of 91% was obtained, indicating very high validity. This result indicates that the language used in the learning video is communicative, appropriate to students' developmental levels, and consistent with standard mathematical terminology, thereby avoiding ambiguity in the delivery of the material. The media design aspect received a score of 94%, which is also categorised as very valid. This score indicates that the visual appearance, layout, and use of animation effectively support clarity of presentation and help visualise the abstract process of matrix multiplication.

Overall, the expert validation results confirm that the Canva-assisted learning video meets validity criteria and can be used in subsequent trial stages without requiring substantial revisions. After being declared valid, the product proceeded to the practicality testing stage.

Practicality Testing

Practicality testing was conducted after the learning video media had been revised based on feedback from expert validators. This test aimed to assess the ease of use, acceptability, and usefulness of the media from students' perspectives. Practicality testing was carried out in two stages: one-to-one and small-group testing.

In the one-to-one testing stage, the learning video was tried out with three grade XI students representing high, medium, and low ability levels. Students were asked to provide comments and suggestions after using the learning media. The results of the one-to-one test indicated that students responded positively to the developed media. One student stated, "This learning video is interesting and not boring because the visuals and animations are clear." Another student expressed that "the explanation of the material is easy to understand because it is

accompanied by example problems explained step by step.” In addition, a student with lower ability noted that “the narration in the video is clear, which helps in understanding matrix multiplication.” These findings indicate that the developed learning media can be used by students with varying ability levels without significant difficulty.

A small-group practicality test involving nine grade XI students assessed the media's usability, engagement, and design. The resulting data is detailed in Table 5.

Table 5. Recapitulation of Practicality Test Results (Small Group)

Assessment Aspect	Obtained Score	Ideal Score	Percentage (%)
Ease of Use	153	180	85.00
Engagement	158	180	87.77
Material Understanding	150	180	91.11
Visual Design	160	180	90.00
Average	159.4	180	87.1

Based on Table 5, the average practicality percentage was 87.1%, placing it in the very practical category. These results indicate that the learning video is easy to use, increases student engagement in the learning process, and supports understanding of matrix multiplication material. In addition, the visual design and media presentation were found to be effective in supporting learning. Thus, the Canva-assisted learning video meets practicality criteria and is suitable for use in the field test stage.

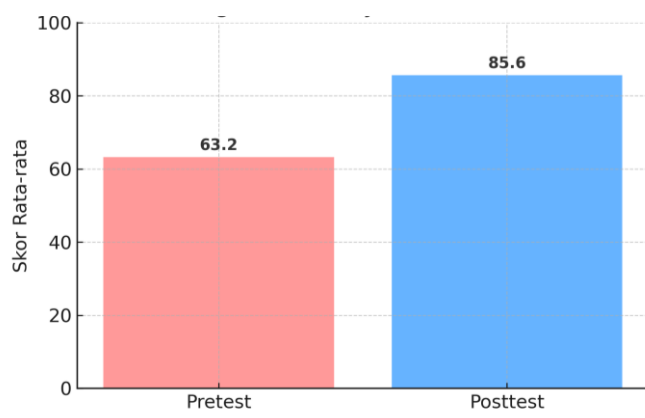
Effectiveness Testing

Effectiveness testing was conducted to determine the extent to which the use of the Canva-assisted learning video influences improvements in students' learning outcomes on matrix multiplication material. This test was conducted by administering pre- and posttests to students, providing an overview of changes in ability before and after using the developed learning media. The results of students' pretest and posttest scores are presented in Table 6.

Table 6. Pretest and Posttest Results

Test Stage	Mean Score	Category
Pretest	63.2	Low
Posttest	85.6	High

The effectiveness test results show an improvement in students' learning outcomes after using the Canva-assisted learning video on matrix multiplication material. The average pretest score was 63.2, which falls into the low category. After participating in learning using the developed video media, the average posttest score increased to 85.6, which is categorised as high.

**Figure 2. Learning Outcome Improvement Graph**

The increase in the average score indicates that using the learning video has a positive impact on students' understanding. The developed media effectively assist students in understanding matrix multiplication concepts and procedures, thereby improving learning outcomes. To ensure the appropriateness of further statistical analysis for hypothesis testing, a prerequisite analysis was conducted: a normality test of the pretest and posttest data.

Table 7. Recapitulation of Normality Test Results

Statistic	Probability Value	Description
Normality Test	p-value = 0.001 < 0.05	Not Normally Distributed

Based on the normality test results for pretest and posttest data, a probability value (p-value) of 0.001 was obtained, which is less than the

significance level of 0.05. This indicates that the learning outcome data are not normally distributed and therefore do not meet the assumptions required for parametric statistical analysis.

Accordingly, subsequent data analysis was conducted using a non-parametric statistical test, namely the Mann–Whitney test. This test was chosen because it is appropriate for comparing two sets of data that are not normally distributed. The Mann–Whitney test was used to examine the research hypothesis regarding differences in students' learning outcomes before and after using the Canva-assisted learning video. The results of the hypothesis testing using the Mann–Whitney test are presented in Table 8

Table 8. Hypothesis Testing Using the Mann–Whitney Test

Statistic	Value
Mann–Whitney U	0.000
Wilcoxon W	666.000
Z	-7.497
Asymp. Sig. (2-tailed)	< 0.001

The results of the Mann–Whitney test indicate that the Asymp. Sig. (2-tailed) value is < 0.001, which is smaller than the significance level of 0.05. These findings indicate a significant difference between students' pretest and posttest learning outcomes. Thus, the null hypothesis (H_0) is rejected, while the alternative hypothesis (H_1) is accepted.

The Mann–Whitney U value of 0.000, Wilcoxon W value of 666.000, and Z value of -7.497 further confirm the presence of a highly significant difference between the two data sets. These results demonstrate that the use of Canva-assisted learning videos significantly improves students' learning outcomes in matrix multiplication material.

Overall, the results of the Mann–Whitney test confirm that the developed learning video is not only valid and practical but also effective in improving the learning outcomes of grade XI students, making it suitable as a supporting medium for mathematics learning at the secondary school level.

The results of this study indicate that the Canva-assisted learning video on matrix multiplication material for grade XI meets the criteria of validity, practicality, and effectiveness. These findings empirically confirm that video-based learning media can support meaningful mathematics learning through systematic, contextually rich visual presentations, thereby helping students more effectively connect symbolic representations with real-life situations (Sari et al., 2025). The high validity across content, language, and media design indicates that the developed content is aligned with learning objectives, mathematical and scientific principles, and students' cognitive characteristics. The structured, step-by-step presentation of the material is consistent with the principles of cognitive load theory, which emphasize the importance of managing cognitive load to prevent overload of working memory, particularly with abstract and procedural materials such as matrix multiplication (Adhikari, 2025). Thus, the Canva-assisted learning video serves not only as a visualisation tool but also as an instructional strategy that supports the optimisation of students' cognitive processes.

The practicality findings, which fall into the very practical category, indicate that the developed media are easy to use, actively engage students, and support conceptual understanding. These results align with studies showing that interactive learning videos can enhance engagement and motivation in mathematics learning, thereby encouraging more meaningful learning activities (Fauziyah et al., 2025). Explicit visual and audio representations in the learning video enable the media to accommodate diverse student learning styles and simultaneously stimulate both cognitive and affective engagement (Putra et al., 2025). The high level of positive student responses in the practicality test further confirms that Canva-assisted learning videos are effective in facilitating active learning and understanding of complex mathematical concepts.

From a constructivist perspective, active student engagement is an indicator of meaningful learning, as students construct knowledge through interactions between learning materials and their prior experiences. Contextually designed learning has been shown to enhance engagement and mathematical understanding. Moreover, applying instructional scaffolding principles in digital

learning media provides gradual support that helps students develop mathematical thinking skills, particularly in complex topics (Sunaryo & Fatimah, 2019). Visualisation of matrix multiplication steps through animations and voice narration enables students to observe solution processes concretely, thereby reducing misconceptions and strengthening procedural understanding. The integration of visuals, audio, and text in learning videos also supports multimedia learning processes, encouraging students to independently and sustainably construct conceptual understanding.

The effectiveness of the learning media is reflected in the significant improvement in students' learning outcomes between pretest and posttest scores, as reinforced by the Mann–Whitney test results. This significant difference indicates that Canva-assisted learning videos make a substantial contribution to improving students' understanding of matrix multiplication material. These findings are consistent with numerous empirical studies that report that learning via video media can significantly enhance mathematics learning outcomes. The use of learning videos in mathematics instruction has been shown to improve students' mastery of classical learning (Nuroidah & Maf'ulah, 2021), while the use of interactive videos in online learning has demonstrated consistent improvements in learning outcomes across instructional cycles (Surur et al., 2023). The development of Canva-based animated video media has also been reported to increase learning outcome scores on multiplication material, highlighting the effectiveness of video media in overcoming conceptual barriers in mathematics (Astuti et al., 2024). Presenting concepts through a combination of visuals, animations, and audio enables students to build stronger mental representations compared to conventional instruction dominated by verbal explanations and symbolic representations.

The use of real-life contexts in presenting the material, such as classroom layouts, monetary calculations, and transaction simulations, has been shown to strengthen students' conceptual understanding by linking abstract matrix concepts to real situations. This approach is consistent with studies indicating that integrating real-world contexts into mathematics learning can enhance conceptual

understanding and student engagement (Parhusip et al., 2020; Setiono, 2024). Contextual learning based on digital media has also been reported to help students more easily make sense of mathematical concepts by connecting everyday experiences with instructional content (Aulia et al., 2025). Other findings suggest that contextual approaches improve mathematical understanding and active student participation because the material presented is relevant to students' lives (Sihombing et al., 2025; Surur et al., 2023). Therefore, contextual visualisation in learning videos serves not only as a visual attraction but also as a cognitive tool that deepens conceptual understanding.

The use of the Canva application as a platform for developing instructional media has significant pedagogical implications, as it enables the creation of systematic, engaging, and easily accessible media without requiring complex technical expertise. This supports the role of teachers as designers who actively construct learning experiences tailored to students' needs. The findings of this study extend previous research by demonstrating that Canva functions not merely as a visual presentation tool but can also be effectively utilised to develop mathematics learning videos that enhance instructional quality in abstract and procedural subject matter.

Overall, the findings of this study strengthen the theoretical foundation that integrating digital technology into mathematics learning—particularly through multimedia-based video content and contextual approaches—can improve the quality of learning processes and outcomes. Canva-assisted learning videos function as pedagogical tools that bridge the gap between abstract mathematical concepts and students' understanding. Therefore, the development of pedagogically and contextually designed technology-based learning media represents a relevant and effective strategy for addressing the challenges of mathematics learning at the senior high school level.

CONCLUSION

Based on the research results and discussion, it can be concluded that the Canva-assisted learning video on matrix multiplication material for grade XI is

feasible and effective for use in mathematics learning. The developed media meets the validity criteria based on expert evaluations in the areas of content, language, and media design, indicating alignment with learning objectives, appropriate use of language, and a high-quality visual presentation that supports conceptual understanding.

The practicality test results show that the media is easy to use and received positive responses from students during the one-to-one and small group stages, thereby supporting active engagement and learning comfort. In addition, the effectiveness test indicates a significant improvement in learning outcomes between pretest and posttest scores. This difference is further reinforced by the Mann–Whitney test results, which show that using the learning video significantly improves students' understanding of matrix multiplication material.

Thus, the Canva-assisted learning video can serve as an innovative, contextual, and relevant alternative to traditional mathematics instruction to support instruction in abstract subject matter. The findings of this study imply that the use of technology-based video media, when designed pedagogically and systematically, can enhance the quality of both the learning process and learning outcomes in senior high school mathematics education.

REFERENCES

- Adhikari, A. K. (2025). Cognitive Load Theory In Mathematics Learning : A Comprehensive Review For School-Level. *International Education & Research Journal*, September, 234–241. <https://doi.org/10.5281/zenodo.17339835>
- Amaludin, R., Akib, I., & Sukmawati. (2025). Integrating Technology In Mathematics Education : A Research Synthesis Of Learning Outcomes And Pedagogical Implications. *Ppsdp International Journal Of Education*, 4(November), 445–459. <https://doi.org/10.59175/pijed.v4i2.738>
- Astuti, M. W., Cahyadi, F., & Budiman, M. A. (2024). Media Video Animasi Pembelajaran Untuk Meningkatkan Hasil Belajar Matematika Siswa Kelas 3 Sekolah Dasar. *Jurnal Papeda*, 6(2), 239–247. Retrieved from <https://e-journal.unimudasorong.ac.id/index.php/jurnalpendidikandasar/article/view/1838>
- Aulia, A., Mailani, E., & Siregar, N. A. (2025). Meningkatkan Pemahaman Matematika Dengan Pembelajaran Kontekstual Berbasis Digital Dan Lokal.

Fibonacci Jurnal, 3, 10–18. <https://doi.org/10.24114/jfi.v6i2.67986>

- Awaliyah, I. N., & Yani, A. (2024). *Inovasi Pembelajaran Matematika : Video Pembelajaran Interaktif Untuk Meningkatkan Keaktifan Dan Motivasi Belajar Siswa Mathematics Learning Innovation: Interactive Learning Videos To Increase Student Learning Activity And Motivation*. <https://dx.doi.org/10.26737/jpmi.v10i1.6080>
- Bulubaan, S., Juandi, D., Putri, N., & Racmi, C. N. (2025). The Utilization Of Videos As Learning Media In Mathematics Learning : A Systematic. *Research And Development Journal Of Education*, 11(2), 1093–1105. <http://dx.doi.org/10.30998/rdje.v11i2.24662>
- Fahri, M, A. M., & Tadjuddin, N. F. (2024). Efektivitas Penggunaan Media Video Pembelajaran Terhadap Minat Dan Hasil Belajar Matematika Peserta Didik. *Saintifik: Jurnal Matematika, Sains, Dan Pembelajarannya*, 10(1), 2019–2022. <https://doi.org/10.31605/Saintifik.V10i1.488>
- Fatimah, F., Nurdin, N., & Dzakiah, D. (2025). Peran Teknologi Informasi Dalam Meningkatkan Kualitas Pembelajaran Abad 21. *Prosiding Kajian Islam Dan Integrasi Ilmu Di Era Society 5.0 (Kiiies 5.0) Pascasarjana Universitas Islam Negeri Datokarama Palu 2025*, 0, 152–155. Retrived from <https://jurnal.uindatokarama.ac.id/index.php/kiiies50/article/view/4167>
- Fauziyah, K. N., Maulana, A. R., & Izzati, N. L. (2025). Pengembangan Video Pembelajaran Matematika Berbasis Visual Interaktif Pada Materi Perkalian Bersusun Untuk Meningkatkan Motivasi Belajar Siswa Al-Adawat: Jurnal Pendidikan Madrasah Ibtidaiyah. *Al-Adawat: Jurnal Pendidikan Madrasah Ibtidaiyah*, 04(02), 199–207. Retrived From <https://ejournal.unhas.ac.id/index.php/aladawat/article/view/9670>
- Fuadah, A. T., Mudjenan, I. M., Hasan, M. L., Choerunnisa, N. A., Herniati, S. T., & Santoso, G. (2023). Jurnal Pendidikan Transformatif (Jupetra) Persfektif ; Pemanfaatan Teknologi Informasi Dan Komunikasi Dalam Pembelajaran Abad 21 Di Sekolah Menengah Pertama Jurnal Pendidikan Transformatif (Jupetra). *Jurnal Pendidikan Transformatif (Jupetra) E-Issn: 2963-3176 Vol. 02 No. 02 (2023): Juni 2023 Persfektif*, 02(02), 154–164. Retrived From <https://jupetra.org/index.php/jpt/article/view/531>
- Harianto, D., & Utami, S. (2025). The Use Of Canva Application As An Effective And Innovative Learning Media. *Didaktika: Jurnal Kependidikan*, 1–8. <https://doi.org/10.30863/didaktika.v19i1.8677>
- Hermanto, B. D., & Susilawati. (2023). Analisis Kesulitan Belajar Siswa Dalam Menyelesaikan Soal Matriks. *Al-Bahjah Journal Of Mathematics Education*, 1(1), 22–32. <https://doi.org/10.61553/abjme.v1i1.15>
- Kaharudin, Muslimin, & Suharti. (2025). Pemanfaatan Canva Sebagai Media Pembelajaran Interaktif Di Era Modern , Berbagai Segi Kehidupan Telah

-
- Mengalami Transformasi Akibat Kemajuan Teknologi , Salah Satunya Bidang Pendidikan . Pendidikan ialah Bidang Yang Selalu Berubah Dan Diperbarui Seiring D. *Jurnal Sekolah*, 10(1), 251–259. <https://doi.org/10.24114/js.v10i1.69071>
- Nuroidah, E., & Maf'ulah, S. (2021). Penerapan Discovery Learning Kombinasi Video Untuk Meningkatkan Hasil Belajar Matematika Siswa. *Transformasi : Jurnal Pendidikan Matematika Dan Matematika*, 5(2), 633–645. <https://doi.org/10.36526/tr.v5i2.1534>
- Octaviani, E. M., Humairah, H., & Khasanah, L. A. I. U. (2024). Penerapan Media Video Interaktif Pada Pembelajaran Matematika Untuk Meningkatkan Hasil Belajar Siswa Materi Pecahan Kelas V Sd. *Jagomipa: Jurnal Pendidikan Matematika Dan Ipa*, 4(2), 219–226. <https://doi.org/10.53299/Jagomipa.V4i2.518>
- Onoshakpokaiye, O. (2022). ICT Utilisation in Teaching-Learning Of Mathematics : A Call For Proper Integration And Enhancing Teachers – Students ' Performance In The Developing Countries. *Indonesian Journal Of Elementary Teachers Education (IJETE)*, 3(1), 35–45. <https://doi.org/10.25134/ijete.v3i2.6162>
- Parhusip, Y. P., Tyas, A., & Hardini, A. (2020). Meta Analisis Efektivitas Pembelajaran Kontekstual Terhadap Kemampuan Pemahaman Matematika Bagi Siswa Sekolah Dasar. *Jurnal Mimbar Ilmu*, 25(3), 319–326. <https://doi.org/10.23887/mi.v25i3.27954>
- Putra, D. A., Azwar, R., Efrina, G., Nahdlatul, U., & Sumatera, U. (2025). Pengembangan Video Pembelajaran Interaktif Untuk Meningkatkan Minat Dan Hasil Belajar Matematika Siswa Kelas Iv Sd. *Jurnal Pendidikan Tambusai*, 9, 23590–23598. <https://doi.org/10.31004/jptam.v9i2.30402>
- Putri, D. P., Manfaat, B., Haqq, A., Matematika, J. T., Ilmu, F., Nurjati, I. S., & Perjuangan, J. (2020). Desain Didaktis Pembelajaran Matematika Untuk Mengatasi Hambatan Belajar Pada Materi Matriks. *Jurnal Analisa*, 6(1), 56–68. <https://doi.org/10.15575/ja.v6i1.5694>
- Rahmawati, R., Mulyono, A., Fauziana, R., & Yusup, Q. S. (2022). Analisis Kebutuhan Media Pembelajaran Yang Aksesibel Untuk Meningkatkan Hasil Belajar Siswa Dalam Pembelajaran Matematika. *Genta Mulia: Jurnal Ilmiah Pendidikan*, 159–169. <https://doi.org/10.61290/gm.v14i2.465>
- Said, S. (2023). Peran Teknologi Sebagai Media Pembelajaran Di Era Abad 21. *Jurnal Penkomi : Kajian Pendidikan & Ekonomi*, 6(2), 194–202. <https://doi.org/10.33627/pk.62.1300>
- Sari, F. F., Sudatha, I. G. W., Santoso, M. H., & Suartama, I. K. (2025). Mengurangi Beban Kognitif Dalam Pembelajaran Matematika : Tinjauan Sistematis Strategi Dan Intervensi Pembelajaran. *Jurnal Pendidikan Dan Pembelajaran Indonesia (Jppi)*, 5, 1630–1644. <https://doi.org/10.53299/jppi.v5i3.2190>

-
- Setiono, W. B. (2024). Penerapan Pendekatan Kontekstual Untuk Meningkatkan Pemahaman Konsep Matematis Dan Aktivitas Siswa Kelas Iv Sdn Karyamulya I Batujaya Karawang. *Jurnal Pendidikan Tambusai*, 8. Retrieved from <https://jptam.org/index.php/jptam/article/view/20878>
- Sihombing, K. M., Fitriani, N., & Amelia, R. (2025). Application Of The Contextual Teaching And Learning Model Assisted by GeoGebra to Enhance Eighth-Grade Students ' Mathematical Understanding Of Systems Of Linear Equations In Two Variables. *Jurnal Pembelajaran Matematika Inovatif Volume*, 8(1), 15–22. <https://doi.org/10.22460/Jpmi.V8i1s.Xxxxx>
- Sitepu, E. M. R., Nainggolan, J. A., & Lumbansiantar, R. A. (2023). Urgensi Bagi Pendidikan Di Negera Indonesia Yang Sedang Berkembang. *Jurnal Edukasi Nonformal*, 4(1), 100–108. <https://doi.org/10.37755/jsm.v14i2.696>
- Sunaryo, Y., & Fatimah, A. T. (2019). Pendekatan Kontekstual Dengan Scaffolding Untuk Meningkatkan Kemampuan Berpikir Kritis Matematis. *Jnpm (Jurnal Nasional Pendidikan Matematika)*, 3(1), 66–79. <https://doi.org/10.33603/jnpm.v3i1.1468>
- Surur, A. M., Akhyar, M. K., Ridwanulloh, M. U., Mohamed, H. B., & Wahyuni, N. F. (2023). Application Of Video-Assisted Online Interactive Learning To *Jurnal Pengembangan Pembelajaran Matematika (Jppm)*, 5(2), 130–144. <https://doi.org/10.14421/jppm.2023.52.130-144>
- Vahini, P. D. P., Sudiarta, I. G. P., & Sariyasa. (2022). Pengembangan Video Pembelajaran Interaktif Berbasis. *Jurnal Pendidikan Dan Pembelajaran Matematika Indonesia*, 11(1), 9–18. <https://doi.org/10.23887/jppmi.v11i1.774>