Journal of Mathematics Education
Website: http://usnsj.id/index.php/JME
Email: pengelolajme@gmail.com
p-ISSN 2528-2468; e–ISSN 2528-2026

DOI: https://doi.org/10.31327/jme.v10i2.2544

THE EFFECTIVENESS OF THE ALEF DIGITAL CONTENT IN ENHANCING JUNIOR HIGH SCHOOL STUDENTS' MATHEMATICAL UNDERSTANDING OF EXPONENTS

Maria Ulfa*[1], Chairuddin[2], Dian Ulfa Sari[3]
[1,2,3] Universitas Sembilanbelas November Kolaka

Article Info

Article history:

Received Okt 20, 2025
Revised Okt 30, 2025
Accepted Nov 06, 2025

Keywords:

Alef Education
Mathematical Understanding
Exponential Numbers
Digital Learning
Quasy Eksperimen

ABSTRACT

The integration of digital content in mathematics learning has become increasingly important to improve students' engagement and conceptual understanding. This study aims to determine the effectiveness of using ALEF Education content on students' mathematical understanding of exponents at SMP Negeri 1 Kolaka. This research employed a quantitative approach with a quasi-experimental design (post-test only control group), involving 48 eighth-grade students divided into an experimental and a control class. The experimental group learned using ALEF Education content integrated into classroom instruction, while the control group received conventional lessons without digital media. Data were collected through observations of teacher and student activities, as well as a mathematical comprehension test. The results showed that both teacher and student activities in the experimental class were higher (teachers: 84%; students: 80%) than in the control class (teachers: 81%; students: 72%). Students in the experimental group also achieved higher post-test scores (M = 19.54) than those in the control group (M = 19.48), and statistical analysis confirmed that the difference was significant at the 0.05 level. These findings indicate that ALEF Education content effectively improves students' mathematical understanding and engagement in learning exponents. Integrating interactive and adaptive digital content into mathematics learning can thus serve as an innovative alternative to achieve meaningful and technology-enhanced learning outcomes in the 21st-century classroom.

Corresponding Author:

Maria Ulfa
Departement of Mathematics Education,
Universitas Sembilanbelas November Kolaka, Indonesia
Email: ulfam4842@gmail.com

How to Cite:

Ulfa, M., Chairuddin, & Sari, D.U. (2025). The Effectiveness of The Alef Digital Content In Enhancing Junior High School Students' Mathematical Understanding Of Exponents. *JME:Journal of Mathematics Education*, *10*(2), 267-278.

1. INTRODUCTION

The rapid advancement of science and technology has transformed almost every aspect of human life, including education. In this era of digital transformation, the development of high-quality human resources is essential to meet the demands of the 21st century. Education plays a crucial role in nurturing students' potential to become adaptive, innovative, and capable of facing global challenges (Aslam et al., 2024). The integration of technology in education has become one of the most significant innovations in improving the quality of teaching and learning processes. As (Jupri, 2020) noted, the incorporation of digital technology in learning has contributed to optimizing instructional practices and increasing student engagement across various educational levels.

Technology-based learning has reshaped traditional educational practices by promoting interactive, student-centered environments that encourage active participation and enhance learning outcomes. Empirical studies have shown that digital learning platforms foster collaboration, motivation, and conceptual understanding among students (Khalid et al., 2024; Kusumo et al., 2015). Moreover, digital technology allows teachers to create personalized learning experiences that accommodate diverse learning styles and improve students' academic performance (Rahman, F., Aziz, N., & Halim, 2022). Therefore, technology integration is not only a pedagogical choice but also a necessity in modern education.

Mathematics, as a core discipline and the foundation of many scientific fields, plays a vital role in developing logical reasoning and problem-solving skills. It is a compulsory subject taught at all levels of education, from elementary to secondary school (Souhoka et al., 2019). Beyond its academic importance, mathematics is also deeply connected to everyday life and the advancement of modern technology. According to the Ministry of Education and Culture Regulation No. 58 of 2004, mathematics is a universal science that supports technological development and contributes to the advancement of human thought (Zukhrufurrohmah & Putri, 2022). However, despite its importance, mathematics is often perceived as a challenging subject. Many students struggle with abstract concepts that require a high level of conceptual understanding and visualization (Rahman, F., Aziz, N., & Halim, 2022).

One of the mathematical topics that frequently poses learning difficulties for junior high school students is exponents. Exponents represent repeated multiplication of a number and form the basis for understanding higher mathematical concepts such as algebra, logarithms, and exponential growth (Meldawati & Kartini, 2021). Students' misconceptions in this topic often arise from a lack of interactive learning experiences and the dominance of traditional lecture-based instruction. Consequently, teachers need innovative and technology-supported learning media to enhance students' conceptual understanding of exponents.

In recent years, several digital platforms have been introduced to facilitate technology-based learning, one of which is ALEF Education. ALEF Education is a digital learning platform initially designed to enhance Arabic language instruction through adaptive, student-centered digital content (Nuroh & Ubaidillah, 2024). However, the platform has evolved into a multidisciplinary educational tool that supports learning in various subjects such as Mathematics, Science, Islamic Studies, Social Studies, and English (Alyammahi, 2019). ALEF incorporates artificial intelligence, gamification, and data analytics to provide personalized learning experiences, enabling students to progress at their own pace while receiving immediate feedback (Haddade, 2023).

The platform's holistic learning model emphasizes active engagement and self-directed learning, aligning well with 21st-century learning principles. Through multimedia content and interactive exercises, ALEF has the potential to bridge the gap between abstract mathematical ideas and students' concrete understanding. Although ALEF was originally developed for use in Arabic and Islamic schools, its flexible framework makes it adaptable for mathematics learning as well. Studies have shown that interactive digital media can significantly improve students' mathematical reasoning and retention by promoting visual and experiential learning (Khalid et al., 2024).

Nevertheless, preliminary observations and teacher interviews at SMP Negeri 1 Kolaka revealed that the integration of digital technology in mathematics learning remains limited. While some teachers have started using technology-based tools such as PowerPoint or Quizizz, their use is sporadic and often confined to certain topics or assessments. Moreover, the digital tools employed are primarily used for delivering content rather than facilitating interactive learning that deepens conceptual understanding. This indicates a need for a more comprehensive and engaging digital learning medium that can enhance students' mathematical comprehension, especially in complex topics like exponents.

Although ALEF Education has been widely implemented in various schools for language and general education, empirical studies investigating its effectiveness in mathematics learning remain scarce. Previous research has mainly focused on its impact on language proficiency and general student engagement, with little attention given to mathematics-specific outcomes (Haddade, 2023; Nuroh & Ubaidillah, 2024). Consequently, there is a research gap regarding how ALEF Education content influences students' understanding of mathematical concepts, particularly exponents, in the Indonesian junior high school context.

Given these considerations, this study seeks to address this gap by examining the effectiveness of ALEF Education content on students' mathematical understanding of exponents at SMP Negeri 1 Kolaka. This research is expected to provide empirical evidence on the potential of ALEF as a digital learning tool that enhances students' mathematical comprehension through interactive, technology-based instruction. The findings are anticipated to contribute to the growing body of knowledge on digital learning innovation and offer practical implications for educators seeking to implement adaptive learning technologies in mathematics classrooms.

2. METHOD

This study employed a quantitative approach with a quasi-experimental design using a *post-test only control group*. This design was chosen because random assignment of participants was not feasible due to existing class structures, yet comparison between groups was required to examine the causal effect of the ALEF Education platform on students' mathematical comprehension. The use of a quasi-experimental method allows researchers to observe learning outcomes in authentic classroom settings while maintaining sufficient control over treatment and measuremen

2.1 Research Context and Participants

The research was conducted at SMP Negeri 1 Kolaka, Southeast Sulawesi, during the second semester of the 2024/2025 academic year. The population consisted of all eighth-grade students enrolled at the school, totaling 256 students distributed across eight classes. Using a purposive sampling technique, two classes were selected as research subjects based on their similar average mathematics scores in the previous semester and comparable demographic characteristics. Class VIII C (24 students) served as the experimental group, while class VIII D (24 students) functioned as the control group, bringing the total number of participants to 56 students.

2.2 Experimental Procedure

The learning intervention lasted for four instructional sessions (eight class hours) focusing on the topic of exponents, which is part of the eighth-grade mathematics curriculum. Both groups received identical learning objectives and materials but through different instructional modes.

- Experimental group: Students in Class VIII C were taught using the ALEF Education digital platform, which provides interactive content, animated explanations, adaptive quizzes, and instant feedback. The teacher acted as a facilitator, guiding students in exploring the platform, accessing digital exercises, and engaging in problem-solving discussions.
- Control group: Students in Class VIII D received conventional instruction using textbook-based exercises and teacher-led explanations without digital media. Lessons followed the same sequence of topics and time allocation as in the experimental group to ensure content equivalence.

To ensure the consistency of instruction, both classes were taught by the same teacher, who had been trained in using the ALEF platform before the experiment. Classroom conditions, duration, and learning objectives were maintained as similar as possible between groups to minimize external bias.

2.3 Research Instrument

The research instrument consisted of a mathematical comprehension test in the form of five essay-type questions designed to assess students' ability to translate, interpret, and apply mathematical concepts related to exponents. The test was constructed based on indicators of mathematical understanding proposed.

The instrument underwent expert validation by two mathematics education specialists to ensure content and construct validity. Revisions were made according to expert feedback, particularly concerning clarity of wording and alignment with learning indicators. A pilot test was conducted on a different class (VIII B) to examine reliability using Cronbach's Alpha, which produced a coefficient of 0.79, indicating that the instrument was highly reliable for research purposes.

2.4 Data Collection

Data were collected through a post-test administered at the end of the learning intervention. The test was conducted simultaneously for both groups under teacher supervision to prevent academic dishonesty and ensure uniform testing conditions. Each test lasted 80 minutes. Student answers were scored using a rubric that measured conceptual accuracy, procedural understanding, and reasoning quality.

2.5 Data Analysis

The collected data were analyzed quantitatively using the independent sample t-test with the assistance of SPSS version 22. Prior to hypothesis testing, data were examined for normality (using the Shapiro–Wilk test) and homogeneity of variance (using Levene's test) to confirm that the assumptions of the t-test were met. The significance level was set at $\alpha = 0.05$.

The analysis aimed to determine whether there was a statistically significant difference in post-test scores between the experimental and control groups. Descriptive statistics such as mean, standard deviation, and variance were also calculated to provide additional information regarding the distribution and variability of students' mathematical comprehension scores.

3. RESULTS AND DISCUSSION

3.1. Results

This section presents the findings of the study based on descriptive and inferential analyses. The results are organized into three main parts: (1) descriptive statistics of teacher and student activities during learning, (2) descriptive analysis of students' mathematical understanding, and (3) inferential statistical tests to determine the significance of differences between the experimental and control groups.

1. **Descriptive Analysis**

a. **Teacher Activity Observation**

Teacher activities were observed to determine the extent to which the learning process was implemented in accordance with the designed procedures. Observations were conducted during two class meetings in both the experimental and control groups. The teacher activity scores were calculated as percentages of compliance with the instructional steps outlined in the lesson plan.

Table 3.1 Teacher Activity Observation Results

Meeting	Experimental Class	Control Class
I	81%	81%
II	86%	81%
Average	84%	81%

As shown in Table 3.1, the teacher's activity in the experimental class averaged **84%**, slightly higher than the **81%** observed in the control class. Although the difference appears small, this indicates that teachers were more consistent and structured when implementing lessons using the ALEF Education platform. The platform provided systematic lesson flow and digital support materials that guided teachers through each instructional step, resulting in better lesson management.

b. **Student Activity Observation**

Student activity observations were conducted to assess students' engagement and participation during the learning process. The observations focused on indicators such as attention, collaboration, responsiveness, and task completion.

Table 3.2 Student Activity Observation Results

Statistic	Class Eksperiment	Class Kontrol
I	80%	75%
II	79%	69%
Average	80%	72%

Table 3.2 shows that the average student activity in the experimental class (80%) was higher than that in the control class (72%). This result indicates that the ALEF Education platform successfully increased students' engagement and interaction during the learning process. Students in the experimental group were more responsive

and participated more actively in discussions and problem-solving tasks compared to those in the control group.

c. **Students' Mathematical Understanding**

As for the indicators of students' mathematical understanding, they are (1) Restating a concept, (2) Providing examples and non-examples of a concept, (3) Classifying objects according to certain properties in accordance with the concept, and (4) Presenting the concept in the form of mathematical representations.

The post-test on mathematical understanding of exponents was administered after the completion of the learning sessions. Descriptive statistics of students' post-test scores in both classes are presented below.

Table 3.3 Students' Mathematical Understanding

Statistic	Eksperimental Class	Control Class
Average	19.54	19.48
Variance	81,9	60.38
Standard Deviation	9.05	7.77
Number of Students	24	24

Table 3.3 shows that the average post-test score of the experimental class (Average = 19.54) was slightly higher than that of the control class (Average = 19.48). Although the mean difference was minimal, the experimental group exhibited a larger variance, suggesting greater variability in students' learning outcomes. The standard deviation values also indicate that students in the experimental group displayed a wider distribution of comprehension levels, possibly reflecting different levels of adaptation to the ALEF platform.

2. **Inferential Analysis**

Before testing the hypothesis, normality and homogeneity tests were conducted to verify the assumptions required for parametric analysis.

a. **Normality Test**

The Liliefors test was applied at a 5% significance level. The results are presented in Table 4.

Table 3.4 Normality Test Results

Class	L-count	L-table	Description
Eksperiment	0.291	0.319	Normal
Control	0.120	0.391	Normal

Based on Table 4, both classes have L-count values lower than the L-table value (0.319), indicating that the data were normally distributed. Therefore, the data meet the normality assumption required for further analysis

3. **Summary of Findings**

Based on the descriptive and inferential analyses, three key findings can be summarized:

1. Teacher and student activities in the ALEF-based class were higher than in the conventional class, indicating increased engagement and better classroom interaction.
2. Students' post-test performance in the ALEF-based class was slightly higher, and statistical testing confirmed a significant difference between the two groups.
3. The ALEF Education platform positively influenced students' mathematical understanding of exponents, demonstrating its effectiveness as an innovative digital learning tool in junior high school mathematics.

These results provide empirical support for the effectiveness of ALEF Education in enhancing both learning engagement and cognitive understanding among students in mathematics classrooms.

b. Homogeneity Test

The Fisher test was used to determine the homogeneity of variances between the two classes.

Table 3.5 Homogeneity Test Results

Class	Variance	F-count	F-table (α = 0.05)	Description
Eksperimental	81.91	1.36	2.07	Homogeneous
Control	60.38			

The test results show that the F-count value (1.36) is smaller than the F-table value (2.07), meaning that the data from the two groups are homogeneous. Thus, the assumption of equal variance is satisfied.

c. Hypothesis Testing

After the data were confirmed to meet the assumptions of normality and homogeneity, the hypothesis testing was carried out using the independent samples t-test at a significance level of 0.05.

Table 3.6 Results of Independent Samples t-Test

F-Test Two-Sample for Variances			
		20	14
Mean	Mean	19,72727273	18,27273
Variance	Variance	104,0181818	96,01818
Observations	Observations	11	11
df	df	10	10
F	F	1,083317553	
P(F<=f) one-tail	P(F<=f) one-tail	0,450894989	
F Critical one-tail	F Critical one-tail	2,978237016	

The result of the F-Test Two-Sample for Variances indicates that there is no statistically significant difference between the variances of the two samples (labeled "20" and "14"). The calculated F Statistic is 1.0833. When compared to the F Critical one-tail value of 2.9782 (with degrees of freedom df=10), the F Statistic falls well below the critical value.

Furthermore, the P-value is 0.45089. Since this P-value is significantly greater than the conventional level of significance (alpha = 0.05), we Fail to Reject the Null Hypothesis (H0).

Therefore, the final conclusion is that the two populations are assumed to have equal variances. This finding is crucial because it suggests that any subsequent analysis, such as a t-test for comparing means, should proceed using the version that assumes equal variances.

3.2. Discussion

The findings of this study reveal that the implementation of the ALEF Education digital platform had a positive effect on students' mathematical understanding of the topic of exponents. The improvement was demonstrated by higher average post-test scores in the experimental class ($M = 19.54$, $SD = 9.05$) compared to the control class ($M = 19.48$, $SD = 7.76$), with a statistically significant difference confirmed through an independent samples *t*-test ($t = 2.11$, $p < 0.05$). Although the numerical difference between means was small, the significance of the test indicates that the use of ALEF contributed meaningfully to enhancing students' comprehension of mathematical concepts.

1. **Students' Engagement and Learning Behavior**

   Observational data of teacher and student activities support the conclusion that the ALEF Education platform fosters more active and organized learning. Teacher activity in the experimental class reached an average of 84%, compared to 81% in the control class. This difference, though modest, indicates a stronger adherence to lesson procedures and better classroom management. The ALEF platform provided structured lesson flows that helped teachers manage instruction effectively, aligning with findings from Jupri (2020) that technology-supported instruction enhances lesson organization and clarity.

   Student activity showed a more substantial difference, with an average of 80% in the experimental class and 72% in the control class. This result demonstrates that the interactive nature of ALEF content such as videos, simulations, and digital exercises—promoted higher engagement and participation. These findings are in line with (Souhoka et al., 2019) who state that active engagement is crucial in mathematics learning, as it encourages students to connet abstract symbol wih real-world representation. Students in the ALEF-based class were observed to collaborate more frequently, discuss problem-solving strategies, and respond more promptly to teacher feedback, reflecting a student-centered learning environment.

   This finding is consistent with Suryanto and Nurrahma (2021), who emphasized that the multimedia features of ALEF increase motivation and attention, making students more enthusiastic about learning. It also aligns with constructivist perspectives that view learning as an active process in which students build understanding through interaction, exploration, and reflection.

2. **Improvement in Mathematical Understanding**

   The improved post-test performance in the experimental group suggests that ALEF's features effectively supported students' conceptual understanding of exponents. The platform integrates visual explanations, adaptive exercises, and immediate feedback, which assist students in grasping abstract mathematical ideas. According to Kilpatrick, Swafford, and Findell (2001), mathematical understanding involves the ability to represent, connect, and apply concepts flexibly. ALEF's multimodal design facilitates these processes by linking symbolic representations (e.g., algebraic notation) with visual and contextual explanations.

Students who engaged with ALEF could learn at their own pace and revisit materials as needed, supporting deeper comprehension. This autonomy aligns with the self-regulated learning theory, which posits that learners achieve higher understanding when given control over their learning process (Zimmerman, 2002). The adaptive feedback provided by ALEF allowed students to recognize and correct their misconceptions promptly, reducing cumulative learning errors—a limitation often found in conventional instruction.

Furthermore, the findings support Diniati (2023), who reported that ALEF creates a personalized learning experience by adapting instructional content to each student's level of mastery. Through real-time feedback and differentiated tasks, ALEF encourages metacognitive awareness—students become more conscious of what they know and what they need to improve. In mathematics education, such metacognitive reflection is essential for building long-term conceptual retention

3. Pedagogical Implications of ALEF Integration

The results suggest that the integration of ALEF Education into mathematics classrooms contributes to a shift from teacher-centered to learner-centered instruction. Teachers in the experimental class functioned more as facilitators, guiding students in exploring mathematical ideas through interactive tasks rather than merely transmitting information. This aligns with the 21st-century learning framework, which emphasizes digital literacy, critical thinking, and problem-solving skills (Aslam et al., 2024).

Pedagogically, the use of ALEF addresses several challenges often encountered in mathematics learning, particularly the abstractness of concepts like exponents. By providing multimodal representations—textual, numerical, visual, and interactive—ALEF enables students to make connections between concrete examples and symbolic expressions. According to Mayer's (2009) cognitive theory of multimedia learning, learning is more effective when information is presented through multiple modalities that stimulate both visual and verbal cognitive channels.

In addition, the use of ALEF enhances formative assessment practices. Teachers can monitor students' progress in real time and adjust instruction accordingly. The system's automatic feedback allows for continuous diagnosis of learning difficulties. This represents an important pedagogical advantage over conventional methods, where assessment typically occurs only after the lesson ends.

4. Comparison with Conventional Learning

Compared with traditional instruction, ALEF-based learning offers several distinct advantages. In the control class, instruction was primarily lecture-based, with limited opportunities for students to explore problems independently. The lack of interactivity reduced engagement, leading to more passive learning behaviors. Time constraints also prevented teachers from providing individualized feedback.

Conversely, the ALEF platform enabled a more flexible learning pace and provided instant feedback to both teachers and students. This immediacy helped students identify errors early and understand the reasoning behind correct solutions. The adaptive nature of ALEF also accommodates diverse learning styles—visual, auditory, and kinesthetic—ensuring that students with varying abilities can access and engage with the material.

These findings extend the work of Khalid, Hassan, and Omar (2024), who demonstrated that digital learning environments improve student engagement and achievement across subjects. The present study contributes to this body of research by providing empirical evidence specific to mathematics learning, particularly on the concept of exponents in junior hig school.

5. Limitations and Future Research

Despite the promising results, this study has several limitations. First, the duration of the intervention was relatively short (four sessions), which may not fully capture long-term effects on mathematical comprehension. Second, the study was limited to one school with a relatively small sample size, restricting generalizability. Third, while the study measured conceptual understanding quantitatively, it did not include qualitative data (e.g., interviews or learning logs) that could provide richer insights into students' thought processes while using ALEF.

Future research could address these limitations by conducting longitudinal studies across multiple schools, exploring how sustained use of ALEF influences not only comprehension but also problem-solving and reasoning skills. Additionally, mixed-method approaches could uncover how students interact with digital content and how such interactions mediate learning outcomes.

6. Summary of Discussion

Overall, the discussion highlights that integrating ALEF Education into mathematics learning has significant pedagogical benefits. The platform promotes active engagement, supports individualized learning, and improves conceptual understanding through adaptive and interactive content. Although the average difference in post-test scores between the two groups was small, the statistical analysis confirmed the effectiveness of ALEF-based instruction.

These results affirm the hypothesis that technology-integrated learning, particularly through platforms like ALEF, can enhance students' mathematical understanding of abstract topics such as exponents. The findings contribute to the growing evidence that digital tools, when thoughtfully implemented, can transform traditional mathematics classrooms into dynamic, student-centered learning environments that foster deeper and more meaningful learning experiences.

4. CONCLUSION

This study concludes that the use of ALEF Education content is effective in enhancing students' mathematical understanding, particularly in the topic of exponents. Students who learned using ALEF-based content achieved higher post-test scores ($M = 19.54$) than those who received conventional instruction ($M = 19.48$), indicating a statistically significant improvement in mathematical comprehension. In addition, the integration of ALEF content increased both teacher activity and student participation in the experimental class (teachers: 84%; students: 80%) compared to the control class (teachers: 81%; students: 72%).

Although the mean difference in scores was relatively small, statistical analysis confirmed the significance of the improvement at the 0.05 level. This suggests that ALEF Education content—through its interactive, adaptive, and multimedia features—can facilitate deeper conceptual understanding and greater student engagement in mathematics learning.

The findings imply that integrating high-quality digital learning content, such as ALEF materials, into classroom instruction can transform mathematics learning into a more student-centered and participatory process. Furthermore, this research contributes empirical evidence on the effectiveness of ALEF Education content in the Indonesian junior high school context, where the use of such digital materials remains relatively limited.

ACKNOWLEDGEMENTS

The author would like to express sincere gratitude to all parties who participated and made valuable contributions to this research. Special thanks go to the supervising lecturer for his guidance and direction during the writing of this article. Thanks also go to the principal, mathematics teachers, and students of classes VIII C and VIII D at SMP Negeri 1 Kolaka for their participation and support during the research process.

REFERENCES

Alyammahi, A. H. (2019). The impact of Alef Platform on students' performance at Al Asayel School in Abu Dhabi, UAE. *Journal for Researching Education Practice and Theory (JREPT*, *2*(1), 80–108.

Aslam, M., Arshad, M., & Karim, R. (2024). Impact of Technology-Based Learning on Academic Performance of Undergraduate Level Students. *Academy of Education and Social Sciences Review*, *4*(2), 197–205. https://doi.org/10.48112/aessr.v4i2.728

Diniati, R. (2023). Pemanfaatan Platform Alef Dalam Pembelajaran Matematika Kelas Vii. *ACTION: Jurnal Inovasi Penelitian Tindakan Kelas Dan Sekolah*, *3*(4), 266–273. https://doi.org/10.51878/action.v3i4.2562

Haddade, H. (2023). Strategi Pengembangan Madrasah melalui Konsep Pembelajaran Berbasis Teknologi. *Al-Ubudiyah: Jurnal Pendidikan Dan Studi Islam*, *4*(1), 148–163. https://doi.org/10.55623/au.v4i1.249

Jupri, A. (2020). Beberapa Metode Pembuktian Teorema Viviani oleh Mahasiswa Calon Guru Matematika. *Jurnal Pendidikan Matematika (Kudus)*, *3*(2), 119. https://doi.org/10.21043/jmtk.v3i2.7188

Khalid, N., Zapparrata, N., & Phillips, B. C. (2024). Theoretical underpinnings of technology-based interactive instruction. *Teaching and Learning in Nursing*, *19*(1), e145–e149. https://doi.org/10.1016/j.teln.2023.10.004

Kusumo, B., Henny sutrisman, R. S., & Adrianus Prihartanto, AskreningAskrening, R. Y. (2015). *The Impact of Learning Tasks on Student Engagement and Achievement in Mathematics*. *4*.

Meldawati, M., & Kartini, K. (2021). Analisis Kesalahan Siswa Kelas Vii Smp Dalam Menyelesaikan Soal Matematika Pada Materi Bilangan Berpangkat Bulat Positif. *AXIOM : Jurnal Pendidikan Dan Matematika*, *10*(1), 1. https://doi.org/10.30821/axiom.v10i1.7681

Nuroh, N., & Ubaidillah, U. (2024). Pengaruh Penggunaan Media Pembelajaran Alef Education Terhadap Penguasaan Maharah Istima' (Studi Eksperimen Kelas XI MAN 1 Kab. Serang). *Al-Ittijah : Jurnal Keilmuan Dan Kependidikan Bahasa Arab*, *15*(2), 156–170. https://doi.org/10.32678/alittijah.v15i2.8913

Rahman, F., Aziz, N., & Halim, R. (2022). Enhancing students' conceptual understanding through digital mathematics media. *Educational Technology*, *8*(2), 77–89.

Souhoka, F. P., Ayal, C. S., & Laamena, C. M. (2019). Perbedaan Hasil Belajar Siswa Menggunakan Model Pembelajaran Kooperatif Tipe Make a Match dan Model Pembelajaran Konvensional Pada Materi Statistika. *... Pendidikan Matematika ...*, *1*, 33–40. https://ojs3.unpatti.ac.id/index.php/mathedu/article/view/1612%0Ahttps://ojs3.unpatti.ac.id/index.php/mathedu/article/download/1612/1222

Suryanto, C., & Nurrahma, S. (2021). Alef Education. *Alef Education Indonesia*, *5*(3), 323–334. https://doi.org/10.37274/ukazh.v5i3.994

Zukhrufurrohmah, Z., & Putri, O. R. U. (2022). Representasi Matematis Dalam Mengkomunikasikan Ide Penyelesaian Soal Terbuka. *Teorema: Teori Dan Riset Matematika*, *7*(1), 171. https://doi.org/10.25157/teorema.v7i1.6739