

DEVELOPMENT OF ETHNOMATHEMATICS BASED DIGITAL LEARNING MEDIA ON THE SARON MUSICAL INSTRUMENT

Nur Annisa Muslimah¹, Herera Hotiah², Neneng Aminah^{3*}, Ferry Ferdianto⁴

^{1,2,3,4} Universitas Swadaya Gunung Jati, Cirebon, Indonesia

*Corresponding author. JL. Perjuangan, 45131, Cirebon, Indonesia.

E-mail: nurannisaamuslimah@gmail.com¹⁾

hereraaahotiah@gmail.com²⁾

nenengaminah@ugj.ac.id^{3*)}

ferryferdianto@ugj.ac.id⁴⁾

Received 22 May 2025; Received in revised form 03 August 2025; Accepted 27 September 2025

Abstract

Mathematics learning is still separated from local culture, and the concept of ethnomathematics is rarely applied in education, particularly in the context of traditional musical instruments. This research is essential to implement to present contextual and meaningful learning media through a cultural approach. This study aims to develop and assess the feasibility of the GEETNOSAR (Google Sites Ethnomathematics Saron) learning media. This research employs the R&D (Research & Development) method with the ADDIE model (Analysis, Design, Development, Implementation, Evaluation). The subjects of the study consisted of 32 eleventh-grade students at SMAN 1 Cilimus. The data collection techniques used in this research are questionnaires, interviews, observations, and documentation. Based on the research results, the GEETNOSAR learning media was successfully developed and declared very valid based on the assessment by media experts and material experts, with a percentage of 96.5%. In addition, this media was also assessed as very practical by students, with a response percentage of 84.6%. Thus, GEETNOSAR has proven to be suitable for use as contextual and engaging mathematics learning media. It can serve as an innovative learning tool that integrates the potential of local culture with advancements in digital technology, thereby providing meaningful learning experiences for students.

Keywords: ADDIE; Ethnomathematics; GEETNOSAR; Google Sites; Saron

Abstrak

Pembelajaran matematika yang ada masih terpisah antara materi dan budaya lokal, konsep etnomatematika masih jarang diterapkan dalam pembelajaran, khususnya dalam konteks alat musik tradisional. Penelitian ini penting untuk dilaksanakan dalam menghadirkan media pembelajaran kontekstual dan bermakna melalui pendekatan budaya. Tujuan dari penelitian ini adalah untuk mengembangkan dan mengetahui kelayakan dari media pembelajaran GEETNOSAR (Google Sites Etnomatematika Saron). Penelitian ini menggunakan metode R&D (Research & Development) dengan model ADDIE (Analysis, Design, Development, Implementation, Evaluation). Subjek penelitian terdiri dari 32 siswa kelas XI di SMAN 1 Cilimus. Teknik pengumpulan data yang digunakan pada penelitian ini adalah angket, wawancara, observasi, dan dokumentasi. Berdasarkan hasil penelitian, media pembelajaran GEETNOSAR berhasil dikembangkan dan dinyatakan sangat valid berdasarkan penilaian ahli media dan ahli materi dengan persentase 96,5%. Selain itu, media ini juga dinilai sangat praktis oleh siswa dengan persentase respon sebesar 84,6%. Dengan demikian, GEETNOSAR terbukti layak digunakan sebagai media pembelajaran matematika yang kontekstual dan menarik. Dapat menjadi inovasi pembelajaran yang mengintegrasikan potensi budaya lokal dengan kemajuan teknologi digital, sehingga memberikan pengalaman belajar yang bermakna bagi siswa.

Kata kunci: ADDIE; Ethnomathematics; GEETNOSAR; Google Sites; Saron



This is an open access article under the [Creative Commons Attribution 4.0 International License](https://creativecommons.org/licenses/by/4.0/)

DOI: <https://doi.org/10.24127/ajpm.v14i3.12766>

INTRODUCTION

Mathematics is often perceived as a complex subject by students at various educational levels. This is due to conventional teaching methods that have not provided students with a fundamental understanding of the materials they are studying (Pujiastuti et al., 2025). This difficulty is particularly evident in understanding number patterns, where many students struggle to apply the concepts to solve practice problems (Iskandar et al., 2025). Similarly, in geometry, although the concepts are very close to everyday life, students still face challenges in understanding them due to their abstract nature and the lack of effective learning media (Lestari et al., 2022).

One of the factors contributing to this issue is the minimal use of media in mathematics education. The use of media in mathematics learning is still minimal, primarily relying on textbooks as the main learning resource, which leads to students being passive and easily bored (Hariyanti et al., 2021).

Amid digital technology development, education is also required to adapt by utilizing various available technology platforms. Technological advancements in the form of digital platforms provide flexible access, both in terms of time and location. This allows students to learn anywhere and anytime, adjusting to their own pace and learning styles (Lämsä et al., 2025; Wiedbusch et al., 2021). One platform that can be used as a learning medium is Google Sites.

The integration of writing and reading commands makes Google Sites a preferred medium for delivering learning concepts in schools. This platform enables teachers to organize materials in an interactive, flexible manner that is easily accessible to

students (Agrullina et al., 2023). However, the use of Google Sites as a medium for mathematics learning is still rarely applied optimally in schools, either due to limited internet access or a lack of teachers' skills in developing digital content (Yuniarti et al., 2023).

Mathematical material is connected to students' daily experiences, social life, and even touches on local cultural domains. One approach to learning that links mathematical concepts and culture is known as ethnomathematics. The ethnomathematics approach can be an innovative solution to bridge this gap.

Ethnomathematics is an approach that connects mathematical concepts with the culture of the community (Priyatna & Marsigit, 2024). One form of local culture that has the potential to be utilized in mathematics learning is the traditional musical instrument, saron. The saron is part of the gamelan ensemble and has an interesting mathematical structure, both in terms of its physical form, the arrangement of notes, and the techniques used to play it.

The traditional musical instrument, saron, contains mathematical elements that can serve as a context for learning, such as its physical shape representing geometric concepts, the variations in the length of its bars, and the notation on the saron reflecting number patterns, which can help students understand mathematical material more contextually.

In line with this issue, it is essential to research ethnomathematics within digital technology platforms. The current research builds upon a previous study titled "Ethnomathematics in the Slendro Saron Musical Instrument" (Nurochman, 2020). In that study, mathematical concepts embedded in the saron instrument were identified,

DOI: <https://doi.org/10.24127/ajpm.v14i3.12766>

providing a fundamental basis for the development of the GEETNOSAR (Google Sites Ethnomathematics Saron) learning media in the current research.

To date, there has been no development of digital learning media based on ethnomathematics for the saron musical instrument. This learning media is named GEETNOSAR (Google Sites Ethnomathematics Saron). Therefore, this study aims to develop the learning media and test the feasibility of the GEETNOSAR learning media. This learning media can serve as a contextual and engaging solution for mathematics learning, providing meaningful learning experiences for students.

METHODS

The methodology used in this research is R&D (research and development) with the ADDIE model (analysis, design, development, implementation, evaluation). The product produced in this research is the GEETNOSAR learning media (Google Sites Ethnomathematics Saron).

This research was conducted at SMAN 1 Cilimus, Kuningan Regency, West Java. The study's subjects were 32 students from the XI grade of SMAN 1 Cilimus. The implementation cycle can be seen in Figure 1.

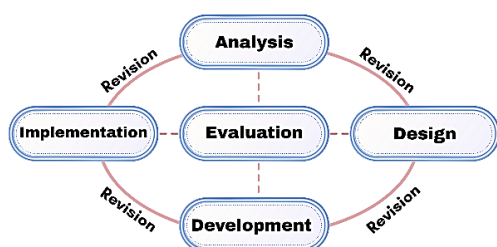


Figure 1. Cycle of the ADDIE model stages

Based on the cyclical stages of the ADDIE model, this research begins with the analysis stage, which includes

a needs and problem analysis in mathematics learning through interviews with one mathematics teacher and direct observations during mathematics classes at SMAN 1 Cilimus. The design stage focuses on creating the design for the GEETNOSAR learning media. In the development stage, the product is developed in the form of Google Sites, followed by validation to test the feasibility of the learning media by experts (validators), including media experts and content experts, before it is trialed. In the implementation stage, a trial was conducted with 32 eleventh-grade students to assess the practicality of the GEETNOSAR learning media through a questionnaire. The final stage involved evaluating the GEETNOSAR learning media in terms of quality and value, utilizing the results from media expert validators, material experts, and the media's practicality to determine the final assessment.

The primary variable measured in this study is the feasibility of the GEETNOSAR learning media, evaluated from the aspects of content, appearance, and practicality concerning ethnomathematics-based mathematics material. The research instruments consist of a media expert validation questionnaire, a content expert validation questionnaire, and a student response questionnaire.

Data collection techniques were conducted through expert validation, completion of practicality questionnaires by students, interviews, observations, and documentation during the implementation process. The data were analyzed descriptively and quantitatively. The questionnaires were constructed using a Likert scale. Each statement item in the questionnaire used a 4-point Likert scale, with categories: Strongly Agree (4), Agree (3), Disagree (2), and Strongly Disagree (1).

DOI: <https://doi.org/10.24127/ajpm.v14i3.12766>

The score results were calculated in the form of the percentage of questionnaire validity (Riduwan & Akdon, 2015) using the formula (1).

$$\text{Validity Level} = \frac{\text{Score Obtained}}{\text{Highest Score}} \times 100 \dots (1)$$

The percentage of validity level is significant. This level is used to support data obtained from the questionnaire. As seen from the formula above, the validity level is obtained by identifying the score obtained and the highest score. The score obtained is divided by the highest score to produce the percentage of validity level.

The data interpretation was classified based on intervals ranging from 0 to 100, which were used to analyze the questionnaire results (in Table 1).

Table 1. Criteria for the validity of learning media

Interval	Criteria
81%-100%	Very Valid
61% – 80%	Valid
41% – 60%	Reasonably Valid
21% – 40%	Less Valid
0% – 20%	Not Valid

(Rosdiana et al., 2022)

The results of the questionnaires from experts and students are analysed using intervals with specific criteria. Assessment scores between 80 and 100 are considered very valid. Meanwhile, assessment scores below 20 are considered invalid. The learning media is considered feasible for use if the percentage of validation test results falls into the "Valid" category, namely at least 61%, allowing it to be field-tested. Furthermore, if the student response results obtained exceed 60%, the learning media can be deemed practical. The criteria for the practicality of the produced learning media are presented in Table 2.

Table 2. Criteria for the practicality of learning media

Interval	Criteria
81%-100%	Very Practical
61% – 80%	Practical
41% – 60%	Reasonably Practical
21% – 40%	Less Practical
0% – 20%	Not Practical

(Kamid et al., 2025)

RESULTS AND DISCUSSION

The GEETNOSAR learning media (Google Sites Ethnomathematics Saron) is developed using the ADDIE model, which consists of five stages: Analysis, Design, Development, Implementation, and Evaluation.

Analysis

The analysis stage aims to identify the needs and issues in mathematics learning at SMAN 1 Cilimus. Based on the results of interviews with one of the eleventh-grade mathematics teachers at SMAN 1 Cilimus, mathematics learning at the school still rarely utilizes learning media, particularly digital-based media. The learning process generally relies on textbooks and lecture methods. The consistency of these findings is evident from the observation results, which show that the dominant teaching methods are lectures, discussions, and question-and-answer sessions, with the primary teaching material being textbooks, in line with the interview results that indicate the use of technology-based media in mathematics learning is still infrequently employed.

Additionally, the younger generation abandoning traditional culture is also a concern, even though local culture has great potential in mathematics learning through ethnomathematics. Therefore, a learning media based on ethnomathematics in the form of a website, GEETNOSAR, has been developed to provide a more

engaging and contextual learning experience by linking mathematical concepts to local culture, particularly traditional musical instruments such as the saron.

The design stage focuses on structuring the GEETNOSAR learning media through Google Sites. The initial design considers readability, clarity of navigation, visual aesthetics, and the integration of mathematical content with local culture.

The screenshot shows a presentation slide with a purple background and floral decorations. At the top, there is a navigation bar with links: 'Home', 'Etnomatematika', 'Saron', 'Etnomatematika Pada Saron', 'New Breaking', and 'Evolusi'. The main title of the slide is 'FUNGSI DAN PERAN SARON DALAM GAMELAN'. Below the title, there are two yellow boxes with black text, each pointed to by a white arrow. The left box states: 'Saron berfungsi sebagai pembawa melodi pokok dalam gamelan.' The right box states: 'Biasanya terdapat dua pasang saron dalam satu set gamelan, yaitu saron pelog dan saron slendro.' At the bottom right, there is a black navigation bar with icons for back, forward, and search.

OLETINOSAR

Home Etnomatematika Saron Etnomatematika Pada Saron New Breaking Evolusi

FUNGSI DAN PERAN SARON DALAM GAMELAN

Saron berfungsi sebagai pembawa melodi pokok dalam gamelan.

Biasanya terdapat dua pasang saron dalam satu set gamelan, yaitu saron pelog dan saron slendro.

A screenshot of a presentation slide with a dark blue background and gold decorative elements. The title "KONSEP YANG TERKANDUNG PADA SARON" is centered at the top in white. Below it are four numbered items in yellow circles: 01 Konsep Keliling dan Luas Bangun Datar pada Saron Slendro, 02 Konsep Bangun Ruang pada Saron Slendro, 03 Konsep Pola Bilangan pada Saron Slendro, and 04 Konsep Deret Fibonacci pada Saron Slendro. At the bottom, there is a navigation bar with icons for back, forward, search, and other controls, along with the page number "Page : 2 / 12". A small logo is visible in the bottom left corner, and a copyright notice "Created by: Hermawan Muliadi & Nur Amalia Al-Makhsbi" is at the bottom center.

The development stage is creating the GEETNOSAR learning media based on the designed framework. This media is developed in the form of a website using Google Sites. Figur 2 until 7 shows the stages of the development process for GEETNOSAR.



Figure 7. Evaluation view

DOI: <https://doi.org/10.24127/ajpm.v14i3.12766>

Figure 2 shows the main menu display of GEETNOSAR, which consists of five sections: Ethnomathematics, Saron, Ethnomathematics in Saron, Ice Breaking, and Evaluation. The menu is systematically organised so students can easily follow the learning flow. Figure 3 presents an introduction to ethnomathematics, including examples of its application in traditional house structures and the reliefs of Borobudur Temple, along with its advantages, disadvantages, and benefits in mathematics education.

Furthermore, Figure 4 introduces the saron musical instrument through a video that covers its history, types, functions, and how to play it. Figure 5 presents the integration of mathematical concepts with Saron, including perimeter, area, volume, number patterns, and the Fibonacci sequence, organised contextually for student understanding.

Figure 6 displays Ice Breaking as an educational game using Educaplay. Figure 7 contains a link to a Google

Form for a student response survey regarding the GEETNOSAR media, measuring interest, ease of use, and understanding of the material.

Expert Validation Test of Media and Content Experts on the GEETNOSAR Learning Media

In the development stage of the ADDIE model, the researcher conducted a validation test on the GEETNOSAR media to assess its feasibility before implementation the validation test involved two categories of experts: media experts and content experts.

Validation Test by Media Experts

The media validation was conducted by three experts: one mathematics education lecturer (Media Expert 1) and two ICT teachers (Media Experts 2 and 3). The validation covered four aspects: usability, functionality, quality of text and images, and language use. The following are the validation results from the media experts in Table 3.

Table 3. Results of the media expert validation questionnaire

Aspect	Media Expert 1	Media Expert 2	Media Expert 3
Usability of Google Sites	11	12	12
Functionality of Google Sites	20	20	18
Quality of text and images on Google Sites	11	11	12
Use of words and language in Google Sites	7	7	8
Total	49	50	50
Percentage (%)	94,2	96,2	96,2
Average Percentage (%)	95,5		
Category	Very Valid		

Based on Table 3, the validation results from the media experts indicate that the GEETNOSAR learning media falls into the 'Very Valid' category with an average percentage of 95.5%. This demonstrates the media's feasibility in mathematics education regarding usa-

bility, visual appearance, and technical aspects. This is supported by earlier research, which stated that the validation assessment of Google Sites media obtained 85.5%, thus making it appropriate for use in mathematics learning (Mardiyah et al., 2025).

DOI: <https://doi.org/10.24127/ajpm.v14i3.12766>

Validation Test by Content Experts

The content validation was conducted by two content experts: one mathematics education lecturer as Content Expert 1 and one high school

mathematics teacher as Content Expert 2. The following are the validation results from the content experts in Table 4.

Table 4. Results of the Content Expert Validation Questionnaire

Aspect	Content Expert 1	Content Expert 2
Content of Google Sites	15	16
Language and communication in Google Sites	4	4
Total	19	20
Percentage (%)	95	100
Average Percentage (%)	97,5	
Category	Very Valid	

Based on Table 4, the results of the content validation show an average percentage of 97.5%, which falls into the 'Very Valid' category, indicating that the media's content meets the feasibility criteria.

By previous research, the results from other studies indicate that the expert validation evaluation score is 80%, which shows that Google Sites is suitable for use (Buchori et al., 2023).

Implementation

The implementation stage involved a trial conducted with 32 students from the XI grade at SMAN 1 Cilimus. Students were directed to use the GEETNOSAR learning media to access material that connects mathematical concepts with the saron musical instrument, as well as to receive explanations about the integration of local cultural values in mathematics.

After the lesson, students assessed the practicality of the GEETNOSAR learning media through a student response questionnaire. The results of the student response questionnaire are shown in Figure 13.

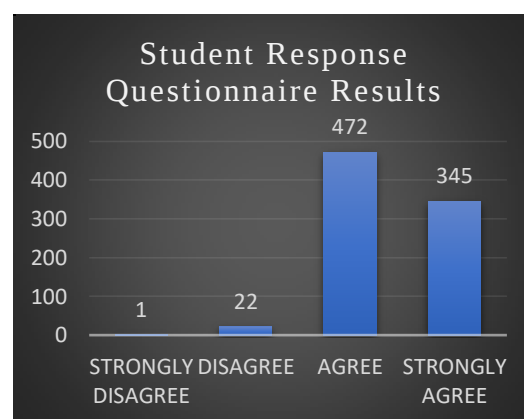


Figure 13. Student Response Questionnaire Results

Based on Figure 13, the questionnaire results show that one 472 agreed, and 345 strongly agreed, indicating a positive response to the GEETNOSAR media. The total score of student responses is 2841 (84.6%) out of the maximum total score of 3360 (100%) and is categorized as "Very Practical."

These results align with previous research indicating that Google Sites-based learning media achieved an average percentage of 95.90% in the convenient category (Waseso et al., 2022). Consistent with earlier studies stating that the student response questionnaire yielded a score of 89%, Google Sites learning media can be used as an alternative in mathematics

DOI: <https://doi.org/10.24127/ajpm.v14i3.12766>

education (Lutfiyah et al., 2025). This supports the notion that Google Sites-based media, including GEETNOSAR, is appropriate for use in the learning process.

The student response questionnaire also indicates that the GEETNOSAR learning media is engaging to use. Previous research stated that digital learning media based on Google Sites is considered interesting and compelling by students (Skulmowski & Xu, 2022).

Furthermore, the GEETNOSAR learning media helps students understand the relationship between culture and mathematics. Previous studies have shown that the presentation of material and exercises in interactive media based on ethnomathematics also facilitates student learning (Yenti et al., 2022). Ethnomathematics can simplify students' understanding of mathematics through culture, thus providing solutions to everyday problems (Jabali et al., 2020).

EVALUATION

The final stage in the ADDIE development model is evaluation. The purpose of this stage is to assess the GEETNOSAR learning media in terms of quality and value. The results obtained from the media expert validator, material expert validator, and the practicality of the GEETNOSAR learning media are used to determine the assessment in this final stage.

Results of Media and Material Expert Validation

Based on the validation results conducted by the media and material experts on the developed GEETNOSAR learning media, the assessment can be seen in Table 5.

Table 5. Recapitulation of expert validation assessment

Respondents	Score	Criteria
Media Expert	95,5%	Very Valid
Material Expert	97,5%	Very Valid
Average	96,5%	Very Valid

Based on Table 5, the assessment for the GEETNOSAR learning media developed by the media expert is 95.5% with a "Very Valid" criterion, and by the material expert is 97.5% with a "Very Valid" criterion. The average percentage from the recapitulation of assessments by the media expert and material expert is 96.5% with a "Very Valid" criterion. This indicates that the developed learning media have received a very valid assessment and are suitable for use in the learning process with an ethnomathematics approach related to the saron musical instrument.

Results of the Practicality of GEETNOSAR Learning Media

Based on the results of the practicality of the GEETNOSAR learning media through the student response questionnaire, the assessment can be seen in Table 6.

Table 6. Recapitulation of practicality assessment

Respondents	Score	Criteria
Students	84,6%	Very Practical

Based on Table 6, the results of the student response questionnaire reached 84.6% with the criterion of "Very Practical." This score indicates that the GEETNOSAR learning media is rated as very practical by students.

The findings of this study indicate that the GEETNOSAR media is appropriate for use as a learning medium that integrates local cultural elements into mathematics education. Several factors

DOI: <https://doi.org/10.24127/ajpm.v14i3.12766>

contributing to the high evaluation results include the visually appealing design of the media, ease of access through digital devices, and the presentation of learning materials linked to local cultural contexts that are close to students' lives. The use of Google Sites also offers advantages in terms of ease of navigation, multimedia integration, and flexibility (Aisyah et al., 2025).

The strengths of this research are its ability to present meaningful and contextual mathematics learning media through an ethnomathematics approach. The use of Google Sites as a medium also facilitates the delivery of material. However, this study faces challenges, including uneven internet access and limited supporting facilities. This is due to school policies that do not allow students to bring mobile phones, resulting in group learning using Chromebooks available at school. This condition indicates that the limitations of facilities remain a challenge in the optimal implementation of digital learning media.

The findings of this study align with previous research indicating that learning media with an ethnomathematics approach is capable of providing a deeper and more meaningful understanding in mathematics education by linking abstract concepts with cultural contexts (Putri et al., 2023). The use of Google Sites has proven to facilitate the digital delivery of learning materials as it supports the integration of various content forms, such as videos, files, and survey forms (Fauziyah & Martiningsih, 2025). The implementation of digital learning media faces various challenges, one of which is the limitation of facilities and access, impacting the optimization of technology-based learning processes (Wulandari et al., 2025).

Thus, the results of this study not only reinforce previous findings but also provide new contributions through the development of learning media that combines two approaches simultaneously: digital learning via Google Sites and ethnomathematics based on local culture. The implications of this research include the availability of contextual, innovative learning media alternatives that teachers in various regions can adapt. Additionally, GEETNOSAR can serve as a preliminary model for the development of other culture based digital learning media.

CONCLUSIONS AND SUGGESTIONS

Furthermore, the practicality of the GEETNOSAR learning media is rated as very practical based on student responses, with positive impacts related to presentation, material clarity, and its visual appeal. This positions the GEETNOSAR media as a solution for mathematics learning based on local culture that is contextual and engaging.

Based on the results of this study, it is recommended that the GEETNOSAR learning media be used as an innovative alternative in mathematics education that integrates other local cultural values. To optimize the use of digital learning media like GEETNOSAR, adequate facilities and policies that support the integration of technology in classroom learning are necessary. Furthermore, for future development, this media should be updated with interactive and contextual content according to student needs and tested in a broader range of educational levels and cultural contexts to expand its scope and effectiveness.

DOI: <https://doi.org/10.24127/ajpm.v14i3.12766>

REFERENCES

- Agrullina, Y., Rezeki, S., Dahlia, A., & Amelia, S. (2023). Development of Learning Media Assisted by Wordwall on the Material of Exponent for Phase E Students. *Mosharafa: Jurnal Pendidikan Matematika*, 12(4), 853–864. <https://doi.org/10.31980/mosharafa.v12i4.1197>
- Aisyah, S., Lusiana, L., & Retta, A. M. (2025). Pengembangan Media Pembelajaran Berbasis Google Sites pada Materi Bangun Ruang. *AKSIOMA: Jurnal Program Studi Pendidikan Matematika*, 14(1), 123–137. <https://doi.org/10.24127/ajpm.v14i1.10763>
- Buchori, A., Aryani, D. D., & Kusumaningsih, W. (2023). Google Sites-Based Math Book Development on Statistical Materials to Improve Students' Understanding of Mathematical concepts. *Al-Jabar: Jurnal Pendidikan Matematika*, 14(2), 467–481. <https://doi.org/10.24042/ajpm.v14i2.18515>
- Fauziyah, N., & Martiningsih, R. R. (2025). Effectiveness of Mathematics Learning using the Google Sites Application at Junior High School. *JTAM (Jurnal Teori Dan Aplikasi Matematika)*, 9(1), 297–313. <https://doi.org/10.31764/jtam.v9i1.28167>
- Hariyanti, S., Arjudin, A., & Baidowi, B. (2021). Efektivitas Media Pembelajaran Terhadap Prestasi Belajar Matematika Siswa Kelas XI SMA Negeri 10 Mataram. *Mandalika Mathematics and Educations Journal*, 3(1), 19–29. <https://doi.org/10.29303/jm.v3i1.2275>
- Iskandar, R. S. F., Darhim, D., Dahlan, J. A., & Jupri, A. (2025). Student's Learning Difficulties on Mathematical Understanding of a Number Pattern. *AKSIOMA: Jurnal Program Studi Pendidikan Matematika*, 14(1), 199–210. <https://doi.org/10.24127/ajpm.v14i1.9677>
- Jabali, S. G., Supriyono, S., & Nugraheni, P. (2020). Pengembangan Media Game Visual Novel Berbasis Etnomatematika untuk Meningkatkan Pemahaman Konsep pada Materi Aljabar. *Alifmatika: Jurnal Pendidikan Dan Pembelajaran Matematika*, 2(2), 185–198. <https://doi.org/10.35316/alifmatika.2020.v2i2.185-198>
- Kamid, K., Anwar, K., & Sofnidar, S. (2025). Pengembangan Media Augmented Reality Bernama E-Magazine Education Berbasis Etnomatematika Batik Jambi Untuk Meningkatkan Hasil Belajar Matematika Siswa. *AKSIOMA: Jurnal Program Studi Pendidikan Matematika*, 14(1), 70–82. <https://doi.org/10.24127/ajpm.v14i1.9569>
- Lämsä, J., de Mooij, S., Aksela, O., Athavale, S., Bistolfi, I., Azevedo, R., Bannert, M., Gasevic, D., Molenaar, I., & Järvelä, S. (2025). Measuring secondary education students' self-regulated learning processes with digital trace data. *Learning and Individual Differences*, 118. <https://doi.org/10.1016/j.lindif.2024.102625>
- Lestari, A. O., Susanti, E., & Hartono, Y. (2022). Pengembangan Digital

DOI: <https://doi.org/10.24127/ajpm.v14i3.12766>

- Worksheet Pada Materi Transformasi Geometri Untuk Melatih Kemampuan Berpikir Matematis. *AKSIOMA: Jurnal Program Studi Pendidikan Matematika*, 11(4), 2915–2928. <https://doi.org/10.24127/ajpm.v11i4.6160>
- Lutfiyah, F. M., Sari, A. C., & Kurniawati, N. (2025). Media Matematika Interaktif Exploring Math Berbasis Google Sites untuk Pembelajaran Transformasi Geometri. *AKSIOMA: Jurnal Program Studi Pendidikan Matematika*, 14(2), 546–557. <https://doi.org/10.24127/ajpm.v14i2.10882>
- Mardiyah, A. N., Murniasih, T. R., & Rahaju, R. (2025). Development of Evaluation Media Based on Wordwall All Games Integrated with Google Sites on SPLDV Material. *Jurnal Pendidikan Matematika Dan IPA*, 16(1), 140–152. <https://doi.org/10.26418/jpmipa.v16i1.75738>
- Nurochman, A. (2020). *Etnomatematika pada Alat Musik Saron Slendro*. Universitas Swadaya Gunung Jati.
- Priyatna, S., & Marsigit, M. (2024). Pengembangan Perangkat Pembelajaran Berbasis Etnomatematika Keraton Yogyakarta Berorientasi Pada Pemahaman Konsep Matematis Siswa. *AKSIOMA: Jurnal Program Studi Pendidikan Matematika*, 13(2), 458–468. <https://doi.org/10.24127/ajpm.v13i2.8825>
- Pujiastuti, N. I., Prahmana, R. C. I., & Evans, B. (2025). Innovative Ethno-Realistic Mathematics-based modules: Promoting Pancasila values in Indonesian mathematics education. *JPM: Jurnal Pendidikan Matematika*, 19(1), 1–22. <https://doi.org/10.22342/jpm.v19i1.pp1-22>
- Putri, S. A. M., Putra, Z. H., & Alpusari, M. (2023). Pengembangan Modul Materi Bangun Datar Berbasis Etnomatematika Melayu Kuansing Di Sekolah Dasar. *AKSIOMA: Jurnal Program Studi Pendidikan Matematika*, 12(3), 3309–3329. <https://doi.org/10.24127/ajpm.v12i3.6139>
- Riduwan, & Akdon. (2015). *Rumus dan Data dalam Analisis Statistika*. Alfabeta.
- Rosdiana, R., Raupu, S., & Hilma, H. (2022). Pengembangan Buku Saku Digital Berbasis STEM Pada Materi Bangun Ruang Sisi Datar. *AKSIOMA: Jurnal Program Studi Pendidikan Matematika*, 11(3), 1818–1827. <https://doi.org/10.24127/ajpm.v11i3.5664>
- Skulmowski, A., & Xu, K. M. (2022). Understanding Cognitive Load in Digital and Online Learning: a New Perspective on Extraneous Cognitive Load. *Educational Psychology Review*, 34(1), 171–196. <https://doi.org/10.1007/s10648-021-09624-7>
- Waseso, R. K., Fitriyari, P., & Isroqmi, A. (2022). Inovasi media pembelajaran matematika interaktif berbasis google sites pada materi statistika VIII SMP. *AKSIOMA: Jurnal Matematika Dan Pendidikan Matematika*, 13(2), 301–314. <https://doi.org/10.26877/aks.v13i2.12018>

DOI: <https://doi.org/10.24127/ajpm.v14i3.12766>

- Wiedbusch, M. D., Kite, V., Yang, X., Park, S., Chi, M., Taub, M., & Azevedo, R. (2021). A Theoretical and Evidence-Based Conceptual Design of MetaDash: An Intelligent Teacher Dashboard to Support Teachers' Decision Making and Students' Self-Regulated Learning. *Frontiers in Education*, 6, 1–13. <https://doi.org/10.3389/educ.2021.570229>
- Wulandari, M., Salsabila, N. H., & Ah Ramadhani, A. '. (2025). Analisis Efektivitas Penggunaan Teknologi Digital Dalam Pembelajaran Matematika. *JURNAL MEDIA AKADEMIK (JMA)*, 3(1), 3031–5220. <https://doi.org/10.62281>
- Yenti, I. N., Putri, M. V., & Maris, I. M. (2022). Pengembangan Media Interaktif Berbasis Etnomatematika Menggunakan Lectora Inspire untuk Materi Segitiga dan Segiempat. *AKSIOMA: Jurnal Program Studi Pendidikan Matematika*, 11(4), 2847–2856. <https://doi.org/10.24127/ajpm.v11i4.6030>
- Yuniarti, A., Safarini, F., Rahmadia, I., & Putri, S. (2023). Media Konvensional Dan Media Digital Dalam Pembelajaran. *Journal Education and Technology*, 4(2), 84–95. <https://doi.org/10.31932/jutech.v4i2.2920>