
DEVELOPMENT OF INTERACTIVE FLIPBOOK E-MODULE TO ENHANCE STUDENTS' MATHEMATICAL UNDERSTANDING IN VOCATIONAL HIGHER EDUCATION

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ABSTRACT

This research addresses the increasing need for innovative digital learning resources that support mathematical understanding in vocational higher education. As learning environments continue shifting toward technology-enhanced formats, e-modules offer a medium for delivering structured, interactive, and student-centered instructional materials. The purpose of this research was to develop a flipbook-based e-module for Mathematics and Statistics course in the Department of Nautical Studies in Politeknik Maritim Negeri Indonesia, and determine its feasibility, quality, and student acceptance. This research used Research and Development (R&D) method and ADDIE (Analysis, Design, Development, Implementation, and Evaluation) model to develop the e-module. But in this research was limited to the Analysis, Design, and Development only. Data were collected through questionnaires distributed to material experts, media experts, and a number of students from Department of Nautical Studies. Quantitative data were converted into interval data using Likert scale. The validation results indicated that the Mathematics and Statistics e-module achieved a highly feasible category. The material expert validation reached 91.25%, indicating excellent content accuracy and pedagogical suitability, while the media expert validation reached 98.75%, indicating the high quality of interface design, navigation, and usability. The responses from students showed the high level of satisfaction and ease of use, with an average score of 84.96%. These results conclude that the developed flipbook-based e-module is a viable and effective interactive learning tool that enhances students' conceptual understanding of mathematics and statistics, delivers more interesting learning experiences, and supports independent learning.

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INTRODUCTION

A strong understanding of mathematical concepts is essential for developing problem solving, logical reasoning, and analytical abilities that support academic and professional success. Mathematics proficiency is widely recognized as a foundational skill that enables learners to engage in quantitative decision making and interpret complex information across various fields (Fatimah, 2021). For students in vocational pathways, particularly those preparing for maritime, engineering, technology, and other industry-oriented careers, mathematical competence becomes more important, as it underpins their ability to apply quantitative reasoning in real world technical contexts.

However, challenges related to mathematical understanding remain widespread in Indonesia and globally. National and international assessments consistently show that many Indonesian students struggle with conceptual understanding, mathematical literacy, and higher-order reasoning (Sari et al., 2021). Similar trends are found among vocational education learners, who often demonstrate lower levels of mathematical proficiency due to difficulties connecting abstract concepts with real applications (Ni'mah et al., 2017). These problems are compounded by factors such as low motivation, limited learning support, and math anxiety, which significantly reduce students' ability to engage with mathematical tasks (Kharis et al., 2023; Wati et al., 2024).

Several factors contribute to these persistent difficulties experienced by vocational students in learning mathematics. One major issue is the mismatch between instructional materials and students' learning characteristics. The continued dominance of conventional teaching approaches, such as lectures and static textbooks, often makes it challenging for students to construct a deep understanding of mathematical concepts (Sari & Siregar, 2022; Wilandari et al., 2024). Some researches indicate that vocational learners generally prefer interactive, visual, and hands-on learning experiences, yet conventional materials are often unable to meet these needs effectively (Erawati et al., 2022; Wastika & Purwaningsih, 2023). Consequently, many students perceive mathematics as abstract, difficult, and disconnected from the practical demands of their vocational discipline.

To address these challenges, the integration of educational technology has been recognized as a promising solution. As technological advancement continues to transform higher education in Indonesia, there is an urgent need to shift from traditional instructional systems toward modern digital pedagogy that prioritizes adaptability, multimedia learning, and institutional redesign (Kristanto et al., 2024; Suhada et al., 2025). Digital instructional media, especially electronic modules (e-modules), provide opportunities to present material in multimodal forms that include visualizations, animations, hyperlinks, and interactive elements. These features make e-modules an effective medium for enhancing accessibility, visualization, and engagement in the learning process (Asnidar et al., 2024). Within mathematics and statistics education, such digital resources play an essential role in reducing the abstractness and conceptual difficulty that vocational higher education students often encounter.

Flipbook-based e-modules serve as a compelling alternative because they integrate visual, textual, and dynamic elements that enable students to explore abstract concepts through enhanced visualization and self-paced study. When designed using flipbook technology, e-modules provide a familiar book-like interface enriched with multimedia features that increase student engagement and deepen conceptual understanding. These digital resources have been shown to support independent learning and accommodate diverse learning preferences (Erdiyavita et al., 2025). Furthermore, research by Elya & Lestari (2025) demonstrated that flipbook-based e-modules significantly improve students' engagement and comprehension. Their ability to facilitate self-directed, flexible navigation encourages the development of

lifelong learning competencies, especially in the digital era. This approach is also consistent with current educational paradigms that emphasize learner autonomy, digital literacy, and multimodal engagement (Sari et al., 2025). Moreover, the integration of flipbook-based e-modules has been shown to enhance students' mathematical representation abilities, which is an important indicator of deeper conceptual understanding (Widiani et al., 2024).

The use of e-modules for mathematical learning has been widely demonstrated in various educational levels. However, their potential in vocational higher education, still remains underexplored. Existing researches tend to focus on either secondary education or academic higher education (general university). Research by Luthfi et al. (2024) discussed about the effectiveness of e-module for increasing mathematical thinking and learning motivation for high school students. Then Franita et al. (2024) discussed about the development of e-module of integration technique in Integral Calculus course for students of Mathematics Education Study Program in a university. While research by Muqtada & Nurjanah (2023) discussed about the development of hybrid learning-based e-module in Number Theory course, also for students of Mathematics Education Study Program. This gap includes the need for e-modules that incorporate conceptual explanations, interactive features, and contextually relevant examples aligned with students' academic and professional needs. The gap also highlights the need for further development and evaluation of e-modules to support effective learning in Mathematics and Statistics courses at the maritime vocational higher education level.

Considering these factors, this research aims to fill the existing research gap by developing a flipbook-based e-module for the Mathematics and Statistics course and evaluating its feasibility, content validity, and usability through expert assessment and student responses. The overarching purpose of this research is to produce a high quality interactive learning resource that enhances mathematical and statistical understanding, supports independent learning, and aligns with the learning characteristics of vocational higher education students.

METHOD

This research used Research and Development (R&D) method with ADDIE model, which includes five stages: Analysis, Design, Development, Implementation, and Evaluation. But this research was limited to the first three stages, i.e. Analysis, Design, and Development. This research did not measure the effectiveness of the e-module on learning outcomes. Instead, it focused on examining its validity and practicality, especially in the context of developing a flipbook-based e-module for Mathematics and Statistics course.

The validity aspect of the e-module was assessed by two material experts and two media experts. The material experts were one mathematics lecturer graduated from pure mathematics and one teacher graduated from mathematics education. They assessed the content alignment, depth and accuracy of material, conceptual coherence and pedagogical appropriateness. While the media experts were two information technology (IT) lecturers that assessed the visual design, usability, technical quality, and suitability to learning objectives of the e-module.

Besides that, the practicality aspect of the e-module was assessed through student response questionnaires to determine usability and user experience. All 39 first-semester students of applied bachelor program of Nautical Studies at Politeknik Maritim Negeri Indonesia were selected as the sample by purposive sampling. They gave responses about the display attractiveness, content quality, usability, and learning benefits of the e-module.

Analysis Stage

At this stage, the learning needs, curriculum requirements, student characteristics, and existing challenges in Mathematics and Statistics course were identified through observations and interviews with the students. The results showed that most students experienced difficulty in

understanding mathematics and statistics concepts presented only through lectures and printed modules. Therefore, an interactive and digital-based e-module was required to improve engagement and comprehension.

Design Stage

The design process involved creating a blueprint of the e-module, determining learning objectives, compiling material structures, designing user interface, and selecting suitable media elements such as images or illustrations to help understanding the materials. At this stage, the flipbook-based e-module was chosen to make the students more interesting in learning Mathematics and Statistics. The e-module content covered fundamental topics in mathematics and statistics relevant to the curriculum of Department of Nautical Studies.

Development Stage

The developed flipbook-based e-module allows interactive features such as page flipping effects and navigation buttons. After completing the development, the product was reviewed and validated by two material experts and two media experts. The experts evaluated content accuracy, layout design, also visual and technical quality. A limited user trial was conducted with students to gather feedback on usability, design appeal, and learning experiences. Likert scale was used to assess validity and data were analyzed descriptively to determine feasibility.

Data Collection

Data collection was conducted through several instruments:

1. Expert validation questionnaires, aimed at evaluating the quality of content (by material experts) and the quality of design and functionality (by media experts).
2. Student response questionnaires, distributed after students used the e-module during limited trials. The questionnaire measured aspects of usability, visual appeal, interactivity, and learning benefits.

All questionnaires used Likert scale with five response categories, i.e. Strongly Agree, Agree, Neutral, Disagree, and Strongly Disagree.

Data Analysis

The collected quantitative data were analyzed descriptively. Scores from Likert scale were converted into interval data to determine average percentage for each criterion. Data from experts and student responses were averaged to determine the final feasibility category of the e-module. The following formula was used to calculate feasibility percentages:

$$\text{Feasibility Percentage} = \frac{\text{Total Score Obtained}}{\text{Maximum Possible Score}} \times 100\%$$

The feasibility category of the e-module was interpreted using the criteria shown in Table 1.

Table 1. The interpretation of validation results by experts and student responses

Feasibility Percentage (%)	Feasibility Category
81-100	Very Feasible
61-80	Feasible
41-60	Fairly Feasible
21-40	Less Feasible
0-20	Not Feasible

The final e-module was declared valid and feasible if both expert and student evaluations reached at least the “Feasible” category.

RESULTS AND DISCUSSION

Results

The results of this research is explained in each following stage:

1. Analysis Stage

In this stage, student learning needs, curriculum requirements, and learner characteristics were identified. Needs analysis showed that most students had difficulty understanding mathematical and statistical concepts using conventional learning materials. Curriculum analysis confirmed alignment with competency-based learning and emphasizing conceptual understanding. While learner analysis indicated that students in this era were comfortable with digital tools but preferred visual and interactive learning materials. These findings established a clear foundation for developing a digital e-module that supports independent and interactive learning.

2. Design Stage

The design stage focused on planning learning objectives, organizing materials, and creating the module layout. The learning objectives and the course materials discussed in the e-module were already appropriate with Semester Learning Plan of Mathematics and Statistics course which is based on the curriculum of Department of Nautical Studies in Politeknik Maritim Negeri Indonesia. The discussion topics for each chapter are listed in Table 2 below.

Table 2. The discussion topics in the e-module

Module	Section	Subsection
Single Variable Integral	Techniques of Integration	Integration by parts, integration using algebraic substitutions, integration using trigonometric substitutions
	Applications of Integral	Area of a sector of a circle, arc length, static moments and centers of mass
	Numerical Integration	Midpoint rule, trapezoidal rule, Simpson's rule
Functions of Two Variables	Graphs of Functions of Two Variables	-
	Partial Derivatives and Gradients	Partial derivatives, total differential, gradients
Ordinary Differential Equations	Separable First Order Differential Equations	-
	Second-Order Linear Differential Equations	-
Multiple Integrals	Double Integrals	-
	Surface Integrals	-
Series	Infinite Series and Ratio Test	Infinite series, ratio test
	Power Series and Interval of Convergence	-

Module	Section	Subsection
Probability Calculus and Statistics	Probability	Simple spaces and events, relative frequency, classical probability, probability of unions, intersections, and complements, conditional probability and independent events, Bayes' theorem
	Probability Distributions	Random variables and distributions, normal distributions
	Statistical Estimation and Hypothesis Testing	Interval estimation procedures, testing procedures

Each section or subsection consisted of introduction, course material, examples, summary, and self-assessment. The module also included the answer keys to allow learners to assess their understanding immediately after completing the exercises. The layout design was developed using the principles of readability, simplicity, consistency, and interactivity. Navigation was designed using icon-based buttons and page-flip animations to replicate the sensation of reading a real book. This design process ensured that the final e-module was learner-centered, aesthetically coherent, and technologically accessible. The structured layout, interactive components, and visual aids were developed to transform abstract mathematical concepts into meaningful digital learning experiences.

3. Development Stage

The development stage focused on transforming the design blueprints into a functional and interactive flipbook-based e-module. This stage consisted of the processes of media creation, integration of learning materials, expert validation, and collection of student responses. The creation of the flipbook-based e-module used a web-based online flipbook maker. The learning materials planned in the previous stage were integrated into an e-modul file. Then the completed e-module file was converted into pdf-formatted file first before converted into flipbook-based e-module.

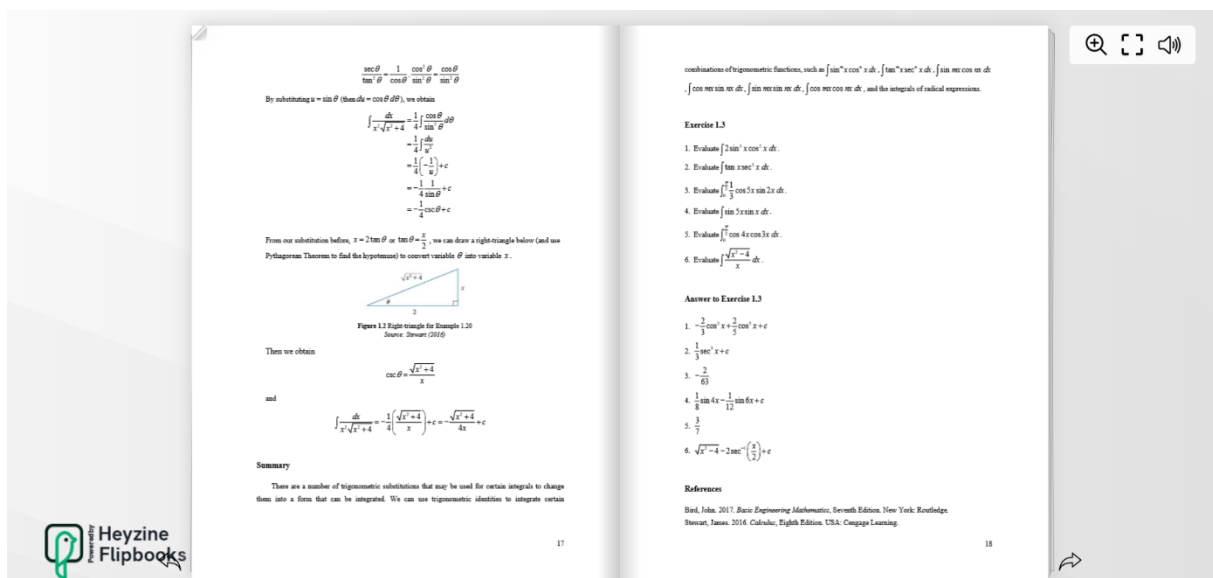


Figure 1. The appearance of Mathematics and Statistics flipbook-based e-module

After the creation process, the e-module was validated by two material experts and two media experts. The experts provided structured evaluations using Likert-scale instruments.

Table 3. The result of material expert validation

Aspect	Number of Indicators	Average Score (%)	Category
A. Content and Competency Alignment	4	90	Very Feasible
B. Depth and Completeness of Material	8	91.25	Very Feasible
C. Accuracy of Material	3	90	Very Feasible
D. Integration and Conceptual Coherence	2	95	Very Feasible
E. Learning and Evaluation	3	90	Very Feasible
Overall Score	20	91.25	Very Feasible

The validation of material experts resulted in the final average of overall score was 91.25% that fell under the “very feasible” category. This result indicated that the Mathematics and Statistics e-module provided relevant content and the material in it met the learning objectives. The e-module also fulfilled the pedagogical and instructional standards that suitable for higher education learners to support conceptual understanding and independent study.

Table 4. The result of media expert validation

Aspect	Number of Indicators	Average Score (%)	Category
A. Display and Visual Design	4	100	Very Feasible
B. Ease of Use	2	100	Very Feasible
C. Technical Quality	8	100	Very Feasible
D. Media Suitability to Learning Objectives	6	95	Very Feasible
Overall Score	20	98.75	Very Feasible

The validation of media experts resulted in the final average of overall score was 98.75% that classified as “very feasible”. This result indicated that the e-module fulfilled the standards of digital educational media development, including usability, accessibility, and visual communication to increase learner motivation. This result also showed that integrating pedagogical design with digital interactivity enabled to enhance both cognitive understanding and user engagement.

The validation step by the experts also gave some recommendations to improve the e-module performance. The material experts suggested to simplify language in sections considered too theoretical for vocational students. While media experts suggested to optimize the image resolution for illustrations and add flip transitions as interactive feature to strengthen student engagement. After implementing the recommendations from the experts, the revised e-module was then used for collecting student response.

Table 5. The result of student response

Aspect	Number of Indicators	Average Score (%)	Category
A. Design and Appearance	2	84.62	Very Feasible
B. Content Quality	3	86.15	Very Feasible
C. Ease of Use	4	86.15	Very Feasible
D. Learning Benefits	3	82.91	Very Feasible
Overall Score	12	84.96	Very Feasible

The overall average student response score of 84.96% placed the e-module in the “Very Feasible” category. This result reflected the students’ positive perceptions toward the e-module’s visual and content quality, usability, and contribution to understanding mathematical and statistical concepts. The inclusion of examples, exercises, and answer keys in each section or subsection enabled the students to explore the material independently. Overall, the developed flipbook-based e-module met the students’ learning needs.

Discussions

The findings of this research demonstrate that the flipbook-based e-module developed through ADDIE model successfully meets the research objective of providing an effective, interactive, and accessible digital learning resource for Mathematics and Statistics course in Department of Nautical Studies, Politeknik Maritim Negeri Indonesia. The high validation scores obtained from both material experts (91.25%) and media experts (98.75%), along with student responses (84.96%), collectively indicate that the e-module fulfills the need of improving students’ conceptual understanding, engagement, and independent learning through technology-enhanced instructional materials.

The high expert validation scores suggest that the instructional content, structure, and media design adhere to established principles of multimedia learning and digital pedagogy. The material expert score of 91.25% indicates that the explanations, examples, and exercises in the e-module align with curricular standards and are pedagogically appropriate. It shows that the content is presented with clarity, logical sequencing, and appropriate for undergraduate learners. This high score aligns with recent research by Aliana et al. (2024) showing that contextual and interactive e-modules are feasible to be one of learning resources to increase conceptual understanding in mathematics learning. Beside that, the interesting e-modules also can improve student motivation to learn mathematics.

The media expert evaluation of 98.75% shows strong usability, navigation design, and technical functionality, which are essential in promoting cognitive efficiency. The high media expert score in this research is consistent with research by Cholilah et al. (2024), which found that the e-modules with flipbook media are very valid and suitable for use, in terms of media, design, interactivity, and ease of use, as learning and teaching materials to improve student engagement.

The student response score of 84.96% indicates the e-module’s simplicity, accessibility, and seamless functionality of flipbook technology used here. Besides that, the e-module’s elements, such as page-flipping animations and structured self-assessments, provide learning affordances that enhance engagement and support deeper comprehension. Students also responded positively to the e-module’s flexibility for self-paced learning and the practical effectiveness from the learner’s perspective. This aligns with research by Erawati et al. (2022) indicating that interactive e-modules equipped with self-assessment features make the learning material easier

and more practical to use. Therefore, students can study anytime and anywhere without carrying physical books.

The overall results are in line with the research by Safrida et al. (2023) emphasizing that the interactive flipbook-based e-module is very feasible to be used as a learning material for vocational students. Beside that, it is also capable of increasing student learning motivation that plays a vital role in learning to achieve the desired goals, especially within vocational education.

These findings align with recent research by Heldawati et al. (2023) demonstrating that e-modules can be used as effective learning media in students' learning processes, especially in mathematics. Teachers also can implement e-modules that are relevant to current learning characteristics in this digital era.

CONCLUSION

The development of a flipbook-based e-module for Mathematics and Statistics course using ADDIE model has produced a learning medium that is highly feasible, engaging, and effective. Validation from material and media experts confirmed excellent feasibility (91.25% and 98.75%, respectively), and student responses (84.96%) confirmed strong satisfaction with its usability and learning impact. The e-module successfully enhances students' understanding of mathematical and statistical concepts, creates more interactive learning experience, and supports independent learning. It can be adopted as a supplementary digital resource to improve learning quality in vocational higher education.

However, this research was limited to analysis, design, and development stages of the ADDIE model and focused solely on the Mathematics and Statistics course in Department of Nautical Studies at Politeknik Maritim Negeri Indonesia. Future research is encouraged to extend the process into the implementation and evaluation stages to examine the e-module's long-term impact on students' learning outcomes. Subsequent researches may also compare flipbook-based e-modules with other digital learning formats to identify the most effective technological approach for supporting vocational mathematics learning.

REFERENCES

- Aliana, W. S., Basir, A., & Kukuh, K. (2024). Pengembangan e-modul matematika berbasis EXE untuk meningkatkan motivasi belajar siswa pada materi program linear dua variabel. *Primatika: Jurnal Pendidikan Matematika*, 13(1), 25–34. <https://doi.org/10.30872/primatika.v13i1.3672>
- Asnidar, A., Safriana, S., Jalil, S. M., Sakdiah, H., & Zahara, S. R. (2024). Development of E-Modules on Problem-Based Learning to Enhance Students Science Literacy. *Asian Journal of Science Education*, 6(1), 134–144. <https://doi.org/10.24815/ajse.v6i1.35887>
- Cholilah, M., Noor Fatirul, A., & Harwanto. (2024). Development of a Flipbook-based E-module Integrated with GeoGebra and Genially on Similarity. *JTP - Jurnal Teknologi Pendidikan*, 26(2), 492–506. <https://doi.org/10.21009/JTP2001.6>
- Elya, E., & Lestari, P. (2025). Pengembangan modul digital berbasis canva dan heyzine flipbook untuk pembelajaran matematika siswa SMP. *Jurnal Inovasi Pembelajaran Matematika: PowerMathEdu*, 4(2), 331–344. <https://doi.org/10.31980/pme.v4i2.2874>
- Erawati, N. K., Purwati, N. K. R., & Saraswati, I. D. A. P. D. (2022). Pengembangan E-modul Logika Matematika dengan Heyzine untuk Menunjang Pembelajaran di SMK. *Jurnal Pendidikan Matematika (JPM)*, 8(2), 71–80. <https://doi.org/10.33474/jpm.v8i2.16245>
- Erdiyavita, N. Z., Rusmawati, R. D., & Rohman, U. (2025). Development of Flipbook-Based Interactive Media in Science and Science Subjects, Story Materials about My Region.

Jurnal Teknologi Pendidikan : Jurnal Penelitian Dan Pengembangan Pembelajaran, 10(3), 453–464. <https://doi.org/10.33394/jtp.v10i3.15318>

- Fatimah, A. T. (2021). Mathematical Reasoning of Vocational High School Students on Mathematical Tasks in the Law of Demand Context. *AlphaMath Journal of Mathematics Education*, 7(2), 101–113. <https://doi.org/10.30595/alphamath.v7i2.10585>
- Franita, Y., Ratih Hendrastuti, Z., Kurniawan, A. D., & Widianingrum, A. A. (2024). Pengembangan e-modul teknik pengintegralan bermuatan video pembelajaran untuk mahasiswa pendidikan matematika. *AKSIOMA: Jurnal Matematika Dan Pendidikan Matematika*, 15(2), 150–162.
- Heldawati, H., Yulianti, D., & Nurhanurawati, N. (2023). Pengembangan E-Modul Dengan Pendekatan Pendidikan Matematika Realistik (PMR) Untuk Meningkatkan Kemampuan Pemecahan Masalah Matematis. *Jurnal Teknologi Pendidikan : Jurnal Penelitian Dan Pengembangan Pembelajaran*, 8(2), 356–363. <https://doi.org/10.33394/jtp.v8i2.6461>
- Kharis, S. A. A., Mahin, N., Lubis, H., Zili, A. H. A., & Robiansyah, A. (2023). Kecemasan Matematika dan Permasalahannya dalam Pembelajaran Jarak Jauh. *Edukatif: Jurnal Ilmu Pendidikan*, 5(1), 508–518. <https://doi.org/10.31004/edukatif.v5i1.4735>
- Kristanto, A., Aisyah, S., Febrianti, F., Dewi, U., Hidayati, A., Budi, U. L., & Susarno, L. H. (2024). Standardization in Digital Teaching and Learning in Higher Education: Indonesia Evidence. *Journal of Education Technology*, 8(2), 257–263. <https://doi.org/10.23887/jet.v>
- Luthfi, K., Surya, E., & Mukhtar. (2024). Pengembangan Media Pembelajaran E-Modul dengan Model Pembelajaran Realistic Mathematic Education Berbantuan Flip PDF Professional untuk Meningkatkan Kemampuan Penalaran Matematis dan Motivasi Belajar Siswa SMA. *JIPMat (Jurnal Ilmiah Pendidikan Matematika)*, 9(1), 51–61. <https://doi.org/10.26877/jipmat.v9i1.368>
- Muqtada, M. R., & Nurjanah, A. (2023). Pengembangan E-Modul Android Berbasis Hybrid Learning pada Mata Kuliah Teori Bilangan. *Jurnal Pendidikan Dan Pembelajaran Matematika Indonesia*, 12(2), 100–112. <https://doi.org/10.23887/jppmi.v12i2.2722>
- Ni'mah, L., Junaedi, I., & Mariani, S. (2017). Mathematical Literacy's Vocational Students Based on Logical and Numerical Reasoning. *Infinity*, 6(2), 95–110. <https://doi.org/10.22460/infinity.v6i2.p95-110>
- Safrida, N. F., Ramadhani, F., & Agusty, A. I. (2023). Interactive E-Modules with Discovery Learning: Increase Informatics Motivation for Vocational Students. *Letters in Information Technology Education (LITE)*, 6(2), 70–75. <https://doi.org/10.17977/um010v6i22023p70-75>
- Sari, D. M., & Siregar, N. (2022). Pengembangan Modul Digital Menggunakan Desain Pembelajaran ELPSA untuk Meningkatkan Pemahaman Konsep Siswa. *JKPM (Jurnal Kajian Pendidikan Matematika)*, 7(2), 321. <https://doi.org/10.30998/jkpm.v7i2.13606>
- Sari, I. K., Nasriadi, A., Agustiani, R., Nursalim, R., & Jarudin. (2021). Analysis of Students' Mathematical Problem-Solving Skills. *Journal of Hunan University (Natural Sciences)*, 48(9), 280–289.
- Sari, P. M., Aswardi, A., Ta'ali, T., Candra, O., & Giatman, M. (2025). The Influence of Digital Literacy, Independence, and Learning Motivation on Student Learning Effectiveness Through Self-Efficacy. *Journal of Education, Teaching, and Learning*, 10(2), 151–158. <https://doi.org/10.26737/jetl.v10i2.7715>

- Suhada, S., Khafidoh, K., Rosyid, R., Mudzofir, M., & Faiz, A. R. (2025). The Role of Technology in Redesigning the Modern Education System. *JTP - Jurnal Teknologi Pendidikan*, 27(2), 420–431. <https://doi.org/10.21009/jtp.v27i2.55142>
- Wastika, P., & Purwaningsih, D. (2023). Pengembangan E-Modul Menggunakan Flip PDF Professional pada Materi Logika Matematika. *Dialektika Pendidikan Matematika*, 10(1), 785–800.
- Wati, I. F., Jannah, Y. M., & Wulanningtyas, M. E. (2024). Studi Eksploratif Kecemasan Matematis dan Determinannya pada Mahasiswa Baru Calon Guru Sekolah Dasar. *Pedagogik Journal of Islamic Elementary School*, 8, 382–397. <https://doi.org/10.24256/pijies.v8i1.6915>
- Widiani, T., Tutut Widiastuti A, T., & Kariadinata, R. (2024). Improving Students' Mathematical Representation Ability with E-learning Modules Using the Kvisoft Flipbook Maker Application. *KnE Social Sciences*, 505–518. <https://doi.org/10.18502/kss.v9i8.15590>
- Wilandari, P. A. D., Parwati, N. N., & Warpala, I. W. S. (2024). E-Modul Matematika Berbantuan Augmented Reality melalui Problem Based Learning untuk Meningkatkan Kemampuan Pemecahan Masalah. *Indonesian Journal of Instruction*, 5(2), 216–227. <https://doi.org/10.23887/iji.v5i2.82400>