JIPS 6 (3) (2025)
Jurnal Inovasi Pendidikan dan Sains
E-ISSN 2721-9119
https://ejournal.unwmataram.id/JIPS

Development of an Ethnorealistic Mathematics-Based Electronic Module Integrated with Assemblr 3D in the Context of Lebak Batik to Improve Students' Conceptual Understanding

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Accepted: August 28th 2025. Approved: December 22th 2025. Published: December 31th 2025

ABSTRACT

This study aims to develop an Ethno-RME-based e-module integrated with Assemblr 3D in the context of Lebak Batik that is feasible, practical, and effective to improve students' conceptual understanding. This research is included in the research and development referring to the ADDIE development model including the stages of *Analysis, Design, Development, Implementation, Evaluation.* The testing of the *e-module media* in learning and testing the ability to understand mathematical concepts was carried out on fifth-grade students at an Elementary School in Banten Province. The trial design of this study used *a One Group Pretest-Posttest Design* . The results showed that the average percentage of *the e-module feasibility score* from both validators was 87% with very feasible criteria. The use of *the e-module* in the limited trial obtained an average score from teachers and students of 75.2% with practical criteria. Ethno-RME-based e-module integrated with Assemblr 3D in the context of Lebak Batik effective in improving students' understanding of mathematical concepts, as indicated by a difference in conceptual understanding test results from 40 to 86.5 with an N-Gain score of 0.77 in the high category. These results indicate that the e-module The developed materials have the criteria of being feasible, practical and effective in improving students' understanding of concepts.

Keywords: e-module, batik Lebak, conceptual understanding, mathematics learning

INTRODUCTION

Understanding mathematical concepts is the main foundation in learning mathematics that determines the quality of students' thinking and problem-solving abilities [1]. Conceptual understanding does not only refer to the ability to remember definitions or procedures, but includes the ability to understand the meaning, relationships, and application of mathematical concepts in various situations [2]. Students who have a good conceptual understanding will be able to connect symbolic, visual, and contextual representations, and use these concepts flexibly to solve problems [3], [4], [5]. Therefore, improving the understanding of mathematical concepts is one of the main goals of modern mathematics education.

However, various studies show that students' achievement in understanding mathematical concepts is still at an alarming level. The results of the Programme for International Student Assessment (PISA) show that Indonesian students experience difficulties in solving problems that require conceptual reasoning, mathematical modeling, and the application of concepts in real-life contexts [6]. This low achievement indicates that mathematics learning is still dominated by a procedural approach oriented towards memorization and routine practice. This finding is supported by research [7], [8] showing that most students understand mathematics as a collection of formulas without understanding the conceptual meaning behind them. This condition emphasizes the need for a transformation in the approach to mathematics learning to be more meaningful and oriented towards conceptual understanding.

One of the main factors contributing to low understanding of mathematical concepts is the dominance of conventional, teacher-centered learning. This approach generally emphasizes one-way delivery of material and the provision of routine practice problems, thus limiting students' active involvement in the knowledge construction process [9]. As a result, students tend to be passive and have less opportunity to explore, represent, and reflect on mathematical concepts in depth. Research [10] explains that mathematics learning that does not link concepts to students' real-life experiences tends to fail to build strong conceptual understanding.

In this context, the integration of digital technology in mathematics learning is a strategic solution. Digital learning media, especially e-modules, offer flexibility in presenting materials, enable independent learning, and provide various visual and interactive representations that support conceptual understanding [3], [11]. Unlike printed modules, e-modules can integrate text, images, animations, and simulations so that students can build understanding through various representational pathways. Research [12], [13] shows that the use of e-modules significantly improves students' understanding of mathematical concepts compared to conventional teaching materials.

However, the effectiveness of e-modules is highly dependent on the quality of instructional design and supporting technology used. One of the main challenges in mathematics learning is the abstract nature of mathematical concepts, particularly in geometry. To address this challenge, the use of three-dimensional visual technology and augmented reality (AR) is becoming increasingly relevant. Research [14] shows that 3D-based learning media is able to transform abstract concepts into concrete visual representations, thereby helping students build deeper conceptual understanding. Assemblr 3D as an AR-based learning platform allows students to interact directly with mathematical objects, manipulate shapes, and observe geometric properties dynamically, which is very suitable for mathematics learning in elementary schools [15].

In addition to technological aspects, contextual and culturally relevant pedagogical approaches also play an important role in improving the understanding of mathematical concepts. The ethnomathematics approach positions mathematics as a product of culture and human activity that develops in a particular social and cultural context [16]. The integration of local cultural elements in mathematics learning has been proven to increase student engagement, motivation, and conceptual understanding because learning becomes closer to their life experiences [11], [17]. In Indonesia, cultural artifacts such as batik, traditional houses, and traditional games contain rich mathematical concepts, especially in the aspects of geometry and patterns [8], [18].

The Realistic Mathematics Education (RME) approach is also in line with the principles of contextual and meaningful learning. RME emphasizes the use of real situations as a starting point for learning, so that students can build mathematical concepts through a progressive mathematization process from informal contexts to formal concepts [11]. Various empirical studies report that RME-based learning is more effective in improving conceptual understanding and mathematical reasoning than conventional approaches [19], [20]. The integration of ethnomathematics and RME, known as Ethno-Realistic Mathematics Education (Ethno-RME), offers a comprehensive approach because it combines local cultural contexts with the realities of students' lives in the mathematics learning process.

Although various studies have examined e-modules, AR technology, ethnomathematics, and RME separately, research integrating these four components into a cohesive learning design remains limited, particularly at the elementary school level. Furthermore, the specific use of local culture, such as Lebak Batik from Banten Province, in the development of technology-based e-modules remains scarce. This is despite the fact that Lebak Batik motifs contain various geometric elements relevant to geometry and hold significant potential as authentic and meaningful contexts for student mathematics learning.

Based on the problem description, a learning innovation is needed that integrates interactive digital media, 3D visual technology, the Ethno-RME approach, and local cultural contexts in a unified learning design. The development of an Ethno-Realistic Mathematics Education-based e-module integrated with Assemblr 3D and with the context of Lebak Batik is expected to be an innovative solution to improve students' understanding of mathematical concepts. Therefore, this study aims to develop an Ethno-RME-based e-module integrated with Assemblr 3D with the context of Lebak Batik that is feasible, practical and effective to improve students' understanding of concepts.

RESEARCH METHODS

This research uses the *Research and Development (R&D) method* with the ADDIE (Analysis, Design, Development, Implementation, Evaluation) [21].

1. Feasibility Analysis Techniques

   The developed e-module product was validated by experts. Qualitative data from the validation results were analyzed as input to improve the developed product, while quantitative data from expert responses regarding product feasibility were analyzed using percentage scores [22] and then transformed into the average score of all observed aspects as in Table 1 below.

Table 1. Eligibility Criteria for e-modules [23]

Score in Percentage (%)	Category
80-100	Very Worthy
66-79	Worthy
56-65	Quite Decent
40-55	Less than worthy
30-39	Not feasible

2. Practicality Analysis Techniques

   Teacher and student responses were analyzed based on a Likert scale to measure the ease of use, engagement, and readability of the e-module using the formula [24] the average score of all aspects is explained in Table 2 below.

Table 2. Practicality Criteria of e-modules [25]

Score in Percentage (%)	Criteria
86- 100	Very Practical
71- 85	Practical
51-70	Quite Practical
1-50	Impractical

3. Effectiveness Analysis Techniques

Pretest and posttest scores were analyzed using the N-Gain Score [26], [27] . This study used a one-group pretest–posttest design [28] on fifth-grade students at an elementary school in Banten Province. The average score from the N-Gain analysis was classified based on the extent of improvement in students' understanding of mathematical concepts before and after being taught using the e-module, as per the criteria in Table 3 below;

Table 3. Classification of N-Gain values [27]

N-Gain Score	Criteria
N-gain > 0.70	Tall
0.30 ≤ N-gain ≤ 0.70	Currently
0.00 ≤ N-gain ≤ 0.30	Low

RESULT AND DISCUSSION

1. Analysis Stage

At this stage, the learning needs analysis revealed that mathematics learning in grade V of elementary school is still dominated by the use of conventional printed teaching materials that are linear and do not facilitate comprehensive visual representation. This is in line with previous studies which show that the limitations of visual and manipulative representation in geometry learning are the main obstacles in building *conceptual understanding* , especially in abstract concepts such as plane figures [4], [5]. Research [29] also confirms that the lack of interactive media support, especially those based on visual technology, contributes to students' low cognitive engagement in understanding the relationships between mathematical concepts.

The results of the analysis of materials and curriculum show that Lebak Batik motifs have many plane elements that are relevant to indicators of understanding geometric concepts such as symmetry, angles, and relationships between sides. The choice of this cultural context is supported by ethnomathematics research which shows that linking mathematical concepts to local cultural contexts helps students build connections between formal knowledge and their real experiences, thereby increasing student engagement and understanding [17], [18]. Similar cross-cultural research also found that the use of cultural artifacts in mathematics learning stimulates conceptual meaning connections, thereby enriching students' learning experiences compared to conventional approaches [30].

2. Design Stage

Based on the analysis results, the design phase focused on designing the conceptual and technical structure of the e-module. The theoretical design integrates three main components: the Ethno-Realistic Mathematics Education approach, the cultural context of Lebak Batik, and Assemblr 3D visualization technology. This integration is designed to support the principles of RME, specifically the use of real contexts (*contextual problems*), visual models, and the *guided reinvention process.* [31]. This pattern is consistent with the RME literature which shows the effectiveness of this approach in helping students construct conceptual meaning through a progressive thinking process from everyday contexts to formal abstractions [32], [33].

The use of 3D visualization allows students to manipulate geometric objects interactively, thus helping the transition from concrete to abstract representations. This finding is in line with the results of *a scoping review* which stated that 3D visualization and AR are effective in supporting students' understanding of geometric concepts and spatial reasoning [34]. In terms of product design, the e-module is designed with a consistent layout, communicative language, and the integration of images and 3D objects that are relevant to indicators of mathematical concept understanding. This kind of design is in accordance with international research recommendations which emphasize that the quality of instructional and visual design greatly influences the effectiveness of e-modules in improving conceptual understanding [35].

3. Development Stage

This stage is the development stage for the e-module, which includes a cover page, materials, sample questions, and quizzes, incorporating Lebak batik relevant to the learning material. The characteristics of the mathematical concepts in this e-module are explained through videos and animations, aimed at improving students' understanding of mathematical concepts.

Furthermore, the integration of 3D visualization technology through the Assemblr platform allows students to interactively manipulate geometric objects, significantly improving their spatial understanding and representation skills. This finding is consistent with studies that have observed that 3D/AR media is effective in helping students visualize and understand abstract geometric concepts, even at the elementary school level [14], [36].

Validation conducted by experts revealed that the e-module has a very appropriate level of feasibility with an average score of 87%. This is important because the feasibility of a product is a key factor in the effectiveness of e-modules in improving students' conceptual understanding. Research [3], [13] states that learning media that are systematically designed with expert validation show a greater positive impact on student learning achievement than media that are not appropriate . Research [26] explains that learning devices with an appropriate category can be used in the learning process. In addition, expert assessments on cultural effects show that the use of the Lebak Batik context is not only culturally relevant but also able to strengthen meaningful learning experiences, in line with the principles of ethnomathematics that place cultural practices as a means to construct mathematics [16], [37]. Examples of e-module pages are as follows;

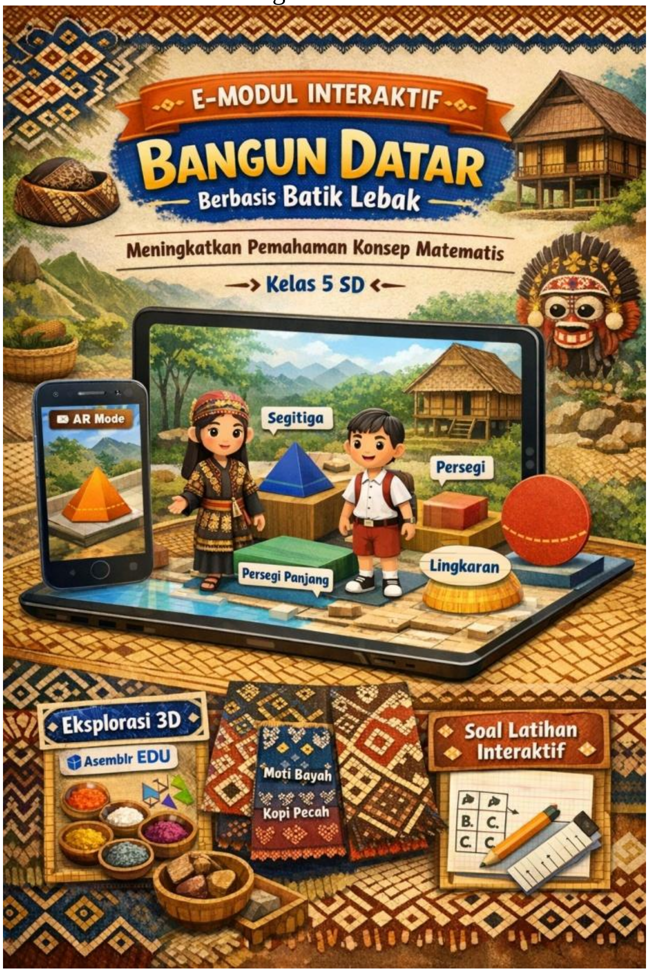

Figure I. View of the e-module front page

4. Implementation Stage

This stage is where the e-module is implemented in the learning process for fifth-grade students at an elementary school in Banten Province, with both limited and large-scale trials. The limited trial was conducted to determine the practicality and readability of the developed e-module . This test was conducted by teachers and students because both are users of the developed e-module. The results of the practicality test on the implementation of learning with the e-module for teachers and students are listed in Table 4 below:

Table 4. Results of teacher and student responses

Respondents	Average (%)	Criteria
Implementation of learning	73.7	Practical
Teacher	74.6	Practical
Student	77.5	Practical
Average	75.2	Practical

Based on table 3, it shows that the average percentage of the results of the practicality of using e-modules is 75.2% with a practical category. The practicality of using e-modules is inseparable because e-modules are designed to make it easier for students to understand abstract mathematics learning materials, in line with research [38], a practical interactive media can be used easily by students in the learning process. Findings [3], [11] show that interactive learning media based on digital technology tends to increase student engagement and positive perceptions of learning, which in turn contributes to better learning outcomes.

Next, a large-scale test was conducted to determine the effectiveness of the e-module on students' understanding of mathematical concepts. Based on post-test data, it was found that students' conceptual understanding abilities before and after being taught using the e-module showed quite significant differences. A comparison of the results of the student conceptual understanding test is shown in Table 5 below.

Table 5. Average scores

Sample	Average		Score N-Gain	Criteria
	Pre-test	*Post test*		
Elementary School X	40	86.5	0.77	Tall

Based on Table x, e-modules are effective in improving students' conceptual understanding, as evidenced by the increase before and after being taught using e-modules with an average N-gain of 0.77 in the High category. This increase indicates that the e-module intervention was empirically successful in helping students understand the relationships between geometric concepts more deeply than before the use of the media. This finding is in line with research [4] explaining that learning media that combine *hands-on* and digital activities can significantly improve students' conceptual understanding and mathematical reasoning abilities. In addition, research [29] found that AR provides better spatial visualization capabilities than traditional media, so that students can grasp complex geometric relationships more easily. Students explicitly stated that manipulating 3D objects in the context of batik motifs made it easier for them to visualize the shapes, sizes, and relationships of the plane shapes being studied. This phenomenon shows that media that are able to combine visual representations, manipulatives, and cultural contexts can strengthen *meaningful learning* , as explained in constructivism theory which states that knowledge is built through students' active experiences in meaningful contexts [39].

5. Evaluation Stage

At this stage, a comprehensive evaluation was conducted, revealing several aspects that could still be improved. These include adapting content to a wider variety of student learning characteristics and developing more dynamic formative evaluation features within the e-module. This is in line with research findings [7], [40] suggesting that personalization and adaptation of digital content can improve learning effectiveness, especially across diverse student populations. Further research using a quasi-experimental design with a control group is recommended to strengthen the external validity of these findings, as well as to assess the long-term impact of media use on students' mathematical abilities.

This study makes an important contribution to the mathematics education literature by presenting empirical evidence that integrating local cultural context and interactive visual technology can be an effective learning strategy in an elementary school context. This contribution is relevant to global trends that emphasize student-centered, contextual learning and leveraging digital technology to achieve meaningful learning outcomes [17], [29].

CONCLUSION

Based on the results of data analysis and discussion, it can be concluded that the Ethno-RME-based e-module integrated with Assemblr 3D in the context of Lebak Batik is feasible to use, the use of e-module in limited trials received responses from teachers and students with practical categories. The e-module is effective in improving students' conceptual understanding with an average N-gain score of 0.77 with High criteria. So it can be concluded that the Ethno-RME-based e-module integrated with Assemblr 3D in the context of Lebak Batik is feasible, practical and effective in improving students' conceptual understanding in Mathematics learning.

ACKNOWLEDGMENTS

The authors would like to thank all parties who supported and participated in the implementation of this research, especially the teachers and students of SDN 2 Alaswangi 2, Pandeglang Regency, who actively participated in the *e-module development process.* based on Ethno-Realistic Mathematics Education integrated with *Assemblr 3D* in the context of Lebak Batik. Thank you to the expert validators for their constructive input and suggestions, and to all our friends who have provided facilities, motivation, and contributions at every stage of this research.

REFERENCES

[1] S. A. Akbar, D. V. Sigit, and R. Komala, “Improving concept understanding and identifiability using interactive e-modules,” *J. Edutech Undiksha*, vol. 12, no. 1, pp. 101–111, 2024.

[2] National Council of Teachers of Mathematics, *Principles and standards for school mathematics*. NCTM, 2000.

[3] M. N. Maulana, S. Muslim, and M. Sukardjo, “The effectiveness of using electronic modules in mathematics subjects in the material of constructing flat sided space,” *J. Educ. Res. Eval.*, vol. 6, no. 1, pp. 80–87, 2022, doi: 10.23887/jere.v6i1.38785.

[4] J. A. Nurjanah, J. A. Dahlan, and Y. Wibisono, “The effect of hands-on and computer-based learning activities on conceptual understanding and mathematical reasoning,” *Int. J. Instr.*, vol. 14, no. 1, pp. 143–160, 2020, doi: 10.29333/IJI.2021.1419A.

[5] Y. E. Ndani and S. Erita, “Describing students' understanding of mathematical concepts in junior

high school," *Didakt. J. Kependidikan*, vol. 17, no. 2, pp. 64–72, 2023, doi: 10.30863/didaktika.v17i2.5751.
[6] Organisation for Economic Co-operation and Development, "PISA 2018 results: What students know and can do," *OECD Publ.*, 2019.
[7] H. Chen, Y. Wen, and J. Jin, "Computer-aided teaching and learning of basic elementary functions," *Heliyon*, vol. 9, no. 5, p. e15987, 2023, doi: 10.1016/j.heliyon.2023.e15987.
[8] S. Prabha, "Students' views on difficulties in conceptual understanding of science at secondary stage," *Eurasia Proc. Educ. Soc. Sci.*, vol. 16, pp. 1–10, 2020.
[9] A. Alam and A. Mohanty, "Cultural beliefs and equity in educational institutions: Exploring the social and philosophical notions of ability groupings in teaching and learning of mathematics," *Int. J. Adolesc. Youth*, vol. 28, no. 1, 2023, doi: 10.1080/02673843.2023.2270662.
[10] C. Utami, R. Anitra, and U. R. Moseki, "Understanding of mathematical concepts and students' self-regulated learning in RME learning," *J. Educ. Teach. Learn.*, vol. 5, no. 2, pp. 229–237, 2020, doi: 10.26737/jetl.v5i2.2045.
[11] E. T. Aulia and R. C. I. Prahmana, "Developing interactive e-module based on realistic mathematics education approach and mathematical literacy ability," *J. Elem. Educ.*, vol. 8, no. 1, pp. 231–249, 2022, doi: 10.29408/jel.v8i1.4569.
[12] F. D. Lestari, A. Syahbana, and A. M. Retta, "E-module development of linear programs based on students' conceptual understanding," *Kreano*, vol. 13, no. 2, pp. 234–245, 2022, doi: 10.15294/kreano.v13i2.34322.
[13] S. A. Akbar, D. V. Sigit, and R. Komala, "Improving concept understanding and identifiability using interactive e-modules," *J. Edutech Undiksha*, vol. 12, no. 1, pp. 101–111, 2024, doi: 10.23887/jeu.v12i1.68147.
[14] D. T. K. Ng, M. F. Tsui, and M. Yuen, "Exploring the use of 3D printing in mathematics education: A scoping review," *Asian J. Math. Educ.*, vol. 1, no. 3, pp. 338–358, 2022, doi: 10.1177/27527263221129357.
[15] E. Fadilasari and N. Nugraheni, "Development of Assemblr Edu learning media based on augmented reality to improve elementary school students' mathematics problem-solving ability," *J. Kependidikan*, vol. 11, no. 1, pp. 248–258, 2025, doi: 10.33394/jk.v11i1.14831.
[16] U. D'Ambrosio, *Ethnomathematics: Link between traditions and modernity*. Sense Publishers, 2001.
[17] J. D. Johnson, L. Smail, D. Corey, and A. M. Jarrah, "Using mobile learning and ethnomathematics to improve sustainability in mathematics education," *Sustainability*, vol. 14, no. 10, p. 5897, 2022, doi: 10.3390/su14105897.
[18] R. C. I. Prahmana and A. Istiandaru, "Learning set theory using shadow puppet: A study of Javanese ethnomathematics," *Mathematics*, vol. 9, no. 22, p. 2938, 2021, doi: 10.3390/math9222938.
[19] E. M. Imron, F. S. A. Nugraheni, B. Utami, Z. Nursalsabila, L. Mahardiani, and A. B. Tanghal, "Effectiveness of Ethno-STEM-based science teaching with the project-based learning model on students' scientific literacy," *J. Inov. Pendidik. IPA*, vol. 11, no. 2, pp. 145–158, 2024.
[20] M. L. Rahmadani, Z. Zulfah, and Z. Zulhendri, "The effect of Ethno-RME approach on students' mathematical conceptual understanding," *J. Pendidik. MIPA*, vol. 13, no. 4, pp. 1162–1170, 2023, doi: 10.37630/jpm.v13i4.1350.
[21] Sugiyono, *Metode Penelitian Kuantitatif, Kualitatif dan R&D*. Penerbit Alfabeta, Bandung, 2013.
[22] M. S. Ihsan, A. Ramdani, and S. Hadisaputra, "PENGEMBANGAN E-LEARNING PADA PEMBELAJARAN KIMIA UNTUK MENINGKATKAN KEMAMPUAN BERPIKIR KRITIS PESERTA DIDIK," vol. 14, no. 2.
[23] I. Ernawati, "UJI KELAYAKAN MEDIA PEMBELAJARAN INTERAKTIF PADA MATA PELAJARAN ADMINISTRASI SERVER," *Elinvo Electron. Inform. Vocat. Educ.*, vol. 2, no. 2, pp. 204–210, Dec. 2017, doi: 10.21831/elinvo.v2i2.17315.
[24] S. Prayogı, L. Yuanıta, and WASIS, "Critical ınquiry based learning: A model of learning to promote critical thinking among prospective teachers of physic," *J. Turk. Sci. Educ.*, vol. 15, no. 1, pp. 43–56, Mar. 2018.
[25] R.- Ramadhani and H. Rais, "Pengembangan Modul Matematika Berbasis Pendekatan Saintifik pada Materi Pola Bilangan," *J. Inov. Pendidik. Dan Sains*, vol. 6, no. 1, pp. 1–9, Feb. 2025, doi: 10.51673/jips.v6i1.2349.
[26] T. Aaia, A. W. Jufri, and A. Ramdani, "PENGEMBANGAN MODEL PRAKTIKUM BERBASIS SOFTWARE MOST PROBABLE NUMBER (MP-BSMPN) PADA MATA KULIAH MIKROBIOLOGI AIR," *J. Pijar Mipa*, vol. 12, no. 2, pp. 44–50, Oct. 2017, doi: 10.29303/jpm.v12i2.340.
[27] R. R. Hake, "Interactive-engagement versus traditional methods: A six-thousand-student survey of mechanics test data for introductory physics courses," *Am. J. Phys.*, vol. 66, no. 1, pp. 64–74, Jan. 1998, doi: 10.1119/1.18809.
[28] A. Asmar* and I. G. P. Suryadarma, "Pengembangan Perangkat Pembelajaran IPA Terpadu Model Nested Berbasis Perahu Phinisi untuk Meningkatkan Keterampilan Komunikasi dan Pengetahuan Konseptual," *J. Pendidik. Sains Indones.*, vol. 9, no. 4, pp. 565–578, Oct. 2021, doi: 10.24815/jpsi.v9i4.20994.
[29] W. Tarng, J.-K. Huang, and K.-L. Ou, "Improving elementary students' geometric understanding through augmented reality and its performance evaluation," *Systems*, vol. 12, no. 11, p. 493, 2024, doi: 10.3390/systems12110493.
[30] I. A. P. Wulandari, R. Pratama, and S. Saelee, "The significance of ethnomathematics learning: A cross-cultural perspective between Indonesian and

Thailand educators," *Int. J. Ethnomathematics Stud.*, 2024.
[31] E. T. Aulia and R. C. I. Prahmana, "Developing interactive e-module based on realistic mathematics education approach and mathematical literacy ability," *J. Elem.*, vol. 8, no. 1, pp. 231–249, Jan. 2022, doi: 10.29408/jel.v8i1.4569.
[32] K. Gravemeijer and M. Doorman, "Contexts, goals, and learning environments in realistic mathematics education," in *Learning Mathematics for a New Century*, 1999, pp. 51–76.
[33] A. N. Rangkuti and M. Nasution, "The effect of realistic mathematics education approach on students' conceptual understanding," *Ta'dib J.*, 2023.
[34] D. T. Kit Ng, M. F. Tsui, and M. Yuen, "Exploring the use of 3D printing in mathematics education: A scoping review," *Asian J. Math. Educ.*, vol. 1, no. 3, pp. 338–358, Sep. 2022, doi: 10.1177/27527263221129357.
[35] M. N. Maulana, S. Muslim, and M. Sukardjo, "The Effectiveness of Using Electronic Modules in Mathematics Subjects in the Material of Constructing Flat Sided Space," *J. Educ. Res. Eval.*, vol. 6, no. 1, pp. 80–87, Feb. 2022, doi: 10.23887/jere.v6i1.38785.
[36] J. Bacca, S. Baldiris, R. Fabregat, S. Graf, and Kinshuk, "Augmented reality trends in education: A systematic review of research and applications," *Educ. Technol. Soc.*, vol. 24, no. 2, pp. 60–78, 2021.
[37] A. I. Permita, T.-T. Nguyen, and R. C. I. Prahmana, "Ethnomathematics on the Gringsing batik motifs in Javanese culture," *J. Honai Math*, vol. 5, no. 2, pp. 95–108, 2022.
[38] M. S. Ihsan and M. Z. Pahmi, "DEVELOPMENT OF ETNOSCIENCE BASED INTERACTIVE SCIENCE MODULE TO IMPROVE STUDENT'S CRITICAL THINKING ABILITY," *J. Inov. Pendidik. Dan Sains*, vol. 3, no. 3, pp. 83–88, Dec. 2022, doi: 10.51673/jips.v3i3.1151.
[39] D. H. Jonassen, "Designing constructivist learning environments," in *Instructional-design theories and models: A new paradigm of instructional theory*, vol. 2, C. M. Reigeluth, Ed., Lawrence Erlbaum Associates, 1999, pp. 215–239.
[40] R. C. Clark and R. E. Mayer, *E-learning and the science of instruction: Proven guidelines for consumers and designers of multimedia learning*, 4th ed. Wiley, 2016.