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Development of PDF And Video Flip-Based E-Modules to Improve Mathematics Learning Outcomes

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Abstract

The decline in national exam results for junior high school students in 2017-2019 decreased yearly, with achievement in 2019 of 46.46%, with the lowest mathematics score compared to other subjects. This research aims to produce a valid, practical, and efficient. E-module is used to create an E-module system of linear equations in two variables that meet applicable criteria. This study uses Research and Development (R&D) research using the ADDIE method, namely analysis, design, development, implementation, and evaluation; researchers develop E-modules, a system of linear equations in two variables accessed via the internet. E-modules that are created apply concepts in daily life or contextually so students can easily understand The tool used in the module is Flip pdf edition corporate. The participants of this study were 34 class VIII students of SMP N 1 Suruh for the 2021/2022 academic year. The development of the E-module system of linear equations in two variables gets a good response from students by getting an average of 88% in the excellent category, practicality average is 87,5% in the excellent category, so this E-module is feasible to use in the learning process, the resulting impact students can understand the material with interest and curiosity to learn. The use of E-modules must pay attention to the weaknesses of students who need the facilities and infrastructure to access the media E-module.

INTRODUCTION

The development of digital technology that has occurred recently has encouraged people to transform quickly in the field of digital technology. Digital transformation occurs due to changes from manual activities to information systems to gain the efficiency and effectiveness of people's daily activities research results [1]. Along with covid-19, technology is developing faster than ever; this impact is seen significantly in education. Students supposed to learn at school turn to online learning [2], [3]. Online learning makes students and teachers have to communicate using mobile phones, laptops, and computers that have access to platforms for teaching and learning activities such as e-learning, *Google Classroom, Moodle, Rumah Belajar*, and media in the form of video conferences such as *Google Meet, Zoom Meeting* [4]–[7].

The student's ability to solve problems in everyday life using SPLDV. According to Permendikbud No. 37 about KI and KD, students can explain SPLDV and solutions associated

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with contextual problems. Students can also solve issues related to the method of linear equations of two variables. The material of SPLDV has a prerequisite in which the general form of SPLDV, $ax + by = c$, with x and y as variables, so students need to understand and master the available state and application in everyday life.

Students need help separating variable terms, converting story problems into mathematical sentences, and performing operations using elimination and substitution methods [8], [5]. There are factors of mastery and varied problems. These conditions can be overcome correctly through [9], [10] several aspects of the module, such as material aspects, presentation, language, and related to contextual material. The study of SPLDV material was taken because there was a decrease in the 2017 to 2019 national mathematics exam results until 2019 reached 46.46%, a decrease compared to other subjects.

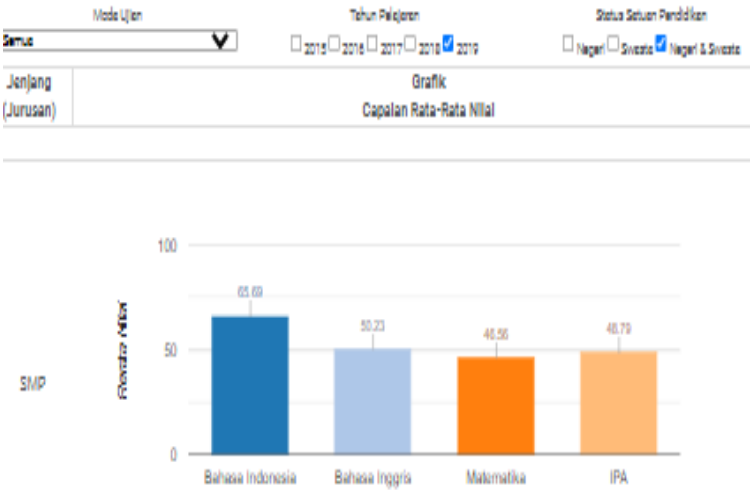

Figure 1. UN Results 2019

The decline in value affects learning delivery, and students only learn to use books to learn. Books are less efficient and cannot be used flexibly, so e-modules are presented as learning media that students use to learn flexibly.

E-Modules are used as complete teaching materials and a series of materials during learning designed to help students achieve learning objectives, formulated in a specific and operational manner—e-Modules as a unity of teaching materials presented as self-instruction [11]–[13]. The e-module made consists of material discussion and questions; there are video and image features to attract students' interest in learning SPLDV material. E-modules are modules in digital form, consisting of text, images, or both that contain digital electronic material accompanied by simulated questions or independent exercises from students that can and should be used in learning [14]. The E-module that will be made consists of an E-module with discussions, questions, and hidden buttons, and there is a video filter to attract students to learn SPLDV material.

Contextual learning is a learning concept in which teachers present innovations by using objects or items around the classroom, especially mathematics lessons, from research results [15], [16] so that students gain knowledge and skills in completing tasks. Contextual learning can develop students' ways of learning independently, linking what they already know and what is in the community environment.

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The material of the E-Module is SPLDV which means pairs of two equivalent change values x or y; the general form has consecutive pairs (x, y). The SPLDV method uses the graphical solution, elimination, substitution, and combination methods on SPLDV material. This research is to produce an E-module on the system of linear equations of two valid, practical, and efficient variables and an E-module on learning mathematics on the material of SPLDV that meets applicable criteria.

METHOD

This study uses the research and development (R&D) research with the ADDIE method: analysis, design, development, implementation, and evaluation. The analysis stage is to analyze the development of new products in the form of (models, methods, media, and teaching materials) and the feasibility of a product. The design stage is the process of designing the concept and the content to be displayed in the product. The development stage is the stage for realizing the E-module made from the product design after and before the implementation stage is feedback from the product created/developed, and the evaluation stage is feedback from product users to make valuable revisions so that product needs are met.

Figure 2. ADDIE Model [17]

The advantages of developing a linear equation system E-module are made with applications in everyday life or contextual; e-modules have videos and pictures in the student's environment so that students understand more easily. E-modules made functioned as teaching and learning tools. Using E-modules requires digital media so that the E-modules made can be appropriately realized. E-Module SPLDV material is made with the help of Canva, which is used for making E-module designs, and the flip book corporate edition is used in making access links via the internet. Data was collected by filling out a questionnaire and implementing it in junior high schools, with data collection instruments consisting of validation sheets, practicality sheets, and student response questionnaires. The research subjects were intended for 34 8th-grade students at SMP N 1 Suruh with the implementation time in the 2021/2022 year.

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RESULTS AND DISCUSSION

The E-Module development results are as follows:

1. Analysis Stage

Analysis of learning media development includes curriculum analysis, student characteristics, and media analysis. The purpose of analyzing is to find out the development of the product (media model, method, teaching material) and to test the feasibility of the product by the requirements of product development. The development of a product begins with a problem in the product. The topic of SPLDV in class VIII is intended for students struggling to understand SPLDV material. Students' difficulty in understanding abstract story problems results in students having difficulty understanding problems that are the application of everyday life.

The rapid development of technology has resulted in the use of electronic media, especially in education. Books often used by students to learn in everyday life can be realized with E-modules that can be accessed through platforms on electronic media. This can make it easier for students to access the platform flexibly without carrying a book. E-Modules are SPLDV material made so students can easily understand. E-modules consisting of material, questions, and exciting discussions help increase student learning motivation and improve student learning outcomes with learning E-modules presented with videos and images with daily life applications.

2. Design Stage

At this stage, researchers determine the elements in the E-module to be developed. When making E-modules, researchers must pay attention to template design and material. E-modules are used when learning takes place using a handphone or computer. E-modules with SPLDV materials contain teaching materials, videos, and questions. E-Modules can be accessed through *Chrome* and *Firefox*, making E-modules using the help of Canva and flip pdf corporate edition.

Display Design

The display in this media uses colors that are not too bright but neutral; this color will be combined with bright images to become an arrangement that attracts students' interest in learning. This design uses a combination of images of application in everyday life in the material of SPLDV using Canva as a medium for creating designs. Uniqueness in the cover sheet, there is an icon to move to the next sheet. This icon is at number 8 and in writing E-Modul. This cover design uses SPLDV using objects often encountered in everyday life in Figure 2.

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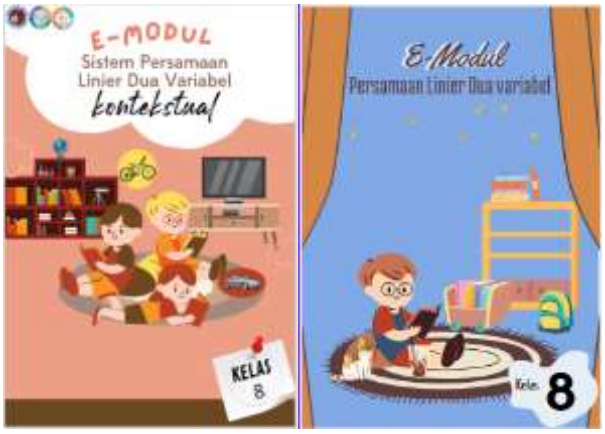

Figure 2. Cover before and after SPLDV E-Module

This learning e-module consists of several parts, namely material, discussion, and questions. The learning material explains SPLDV and its general form and solving methods. SPLDV carries a contextual concept, so in the solution step, there is an explanation of the graph method, elimination method, substitution method, and combined method. Because of the contextual concept, in the method, there is an additional video in the example problem so that students can understand clearly. In the problem section, use multiple choice and concrete images to support student understanding, and students can access it online by opening the link provided.

The design of the material was made using Canva, the beginning of making the material design using colors were not bright; the combination used in making this design must be by the material. Images are used to increase student understanding, so they must be by the material was taken, namely by using contextual models from everyday life, which are realized in the material of SPLDV. Making E-modules previously used bright colors such as blue with a combination of bright blue with dark blue, but changed to neutral colors. The selection of icons as support is needed by looking for references that match the design, so the icons used as support are fruit icons, clothes, and pencils. The use of these icons aims to make students recognize items that are around us or that exist in everyday life. The uniqueness is that in the material sheet, there are questions as explanations, such as real pictures and exciting icons, in the method section. This design is applied in the word sheet table of contents, essential competencies, and material, as seen in Figure 3.

Figure 3. Table of contents, Materials

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The design of the question sheet is made using Canva with a brighter color combination than the material. This color selection is adjusted to the images and questions worked on by students; there are pictures to explain the question being asked so that students get direction in working on the problem and provide multiple-choice answers. At the beginning of the design, the question page was in the form of sheets of paper. There were two questions, but after being combined, they did not match, then the design was changed to an exciting question page with supporting icons on each question. Students will ask This question about eight items, as seen in Figure 4. The uniqueness of the available place to upload answers via the web has been provided with an access link.

Figure 4 Problems done by students

Video Design

Making the initial background design of the video uses the help of Canva, then displaying the video with a supplemental application in the form of Flip Pdf Corporate Edition, which functions to display the video so that the video can be played. This video makes this E-module unique because it does not only contain text, but there is a complete explanation through video. The making of the E-Module can be seen in Figure 5.

Figure 5. Design before and after using Flip PDF Corporate

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3. Development Stage

The stage of making the E-module is adjusted to the design; when the design made using the help of Canva has been completed, the E-module design is saved in pdf form. Then the pdf will be applied to the Flip Pdf Corporate Edition application, which is a supporting medium to access online using a handphone or computer, as seen in Figure 6.

Figure 6. Presentation using Flip PDF Corporate edition

The next step is to conduct media validation for e-Modules completed in their manufacture. Media validation is used to determine whether the E-module is suitable for use. Media validation consists of opinions and comments from validators regarding the E-module that has been made with consideration for revision and as evidence of the E-module being suitable for use as research.

4. Implementation Stage

At this stage is the implementation of the media made. The E-Module SPLDV was declared valid because it was tested for practicality by two validators. The results of the contextual-based SPLDV practicality test can be seen in Table 1.

Table 1. Media practicality test results

Aspects	Percentage	Category
Preparation for use	96%	Very Practical
Usage	97%	Very Practical
Maintenance and storage	100%	Very Practical
Average	87.5%	

The average results obtained from the practicality test of the contextual-based E-module SPLDV fall into the practical category. The percentage results show that the E-module media is practical for students on the material of SPLDV.

5. Evaluation Stage

Evaluation is the last stage in the ADDIE development model, and this research uses the level of media effectiveness measured by a questionnaire given to students. Based on the results

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of the value of the average questionnaire that students do, there is an increase in student learning outcomes. So that the e-module learning media for SPLDV is effective, the average results of LKPD can be seen in Table 2.

Table 2. Average Results of LKPD

Number of Learners	Class	Class Average
34	VIII D	86

The average result obtained is 86 on a scale of 100, where students who reach the KKM are 86%, so it can be concluded that the E-module of SPLDV can foster student learning outcomes.

The effectiveness of the E-module of SPLDV from the average student response to the response is in Table 3.

Table 3. Student response results

Aspects	Percentage	Category
E-module display of SPLDV	87%	Very good
Pelaksanaan E-modul SPLDV	88%	Very good
Media E-module SPLDV	90%	Very good
Average	88%	

The average results of student responses showed 88% in the excellent category. Judging from the assessment of questions and responses from students, it can be concluded that the E-module of SPLDV is effective for use in the learning process.

DISCUSSION

Based on the research results through the ADDIE development method, learning media products in the E-Modules of SPLDV are valid, practical, and effective in improving student learning. The following is relevant to the research of [18], [19], namely developing an SPLDV module for junior high school students in class VIII to produce a valid and practical feasible module.

This study uses the E-Module media linear equation system. The advantages of this study compared to existing learning media at school. Teachers use modules in learning which is in line with [20] and [21] that there are no attractive learning media used by educators and still think math is complicated and tedious using curriculum analysis, needs analysis, and analysis of learner characteristics. E-modules are made for learning so that they can be accessed using the internet so that students can learn flexibly; students can easily access them without students bringing books to study; e-modules of linear equation systems also have some exciting filters and have explanatory media in the form of images, videos, and practice problems. In e-modules of linear equation systems, students experience increased learning outcomes and reduced errors in working on problems by paying attention to module assessment aspects, including material, presentation, language, and material linkage to the real world.

Data can be expressed in the value before the e-module from the analysis. The value after the e module, average value before using the e module of 49%, has increased with the e module with an average of 81%; this analysis also uses the value of student completeness before the e

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module gets an average of 22% completeness value while after using the e module the completeness value increases with an average of 85% so that this e module can be used to improve student learning outcomes in Table 4.

Table 4. Average before and after

Descriptions	Before the existence of e-modules	After the e-module
Average Value	49%	81%
Completion Rate	22%	85%

Based on the table, it can be concluded that this SPLDV e-module can improve student learning outcomes. So that e-modules can be used as a new alternative to improve students' achievement results. The benefits for teachers can be motivated to develop learning tools that suit the needs of students.

Referring to the study result, developing a mathematics e-module to introduce teaching materials with innovations in learning. E-module is one of the digital teaching materials that are effective and efficient and prioritizes student independence because the series of activities are arranged systematically and clearly according to the student's situation so that it can help students achieve learning goals. E-modules for learning mathematics are user-friendly, open-source digital teaching materials, so they are made offline. This e-module also has many advantages. Namely, it is more attractive, equipped with various devices to insert videos, animations, pictures, and quizzes with feedback, which are not generally found in printed teaching materials. In addition, e-modules can increase students' enthusiasm for learning, be participatory in understanding mathematics material during learning activities at school, and eliminate the notion that mathematics is complex. Current technology and information are to be used as a container that can assist in the ongoing process of achieving goals in learning.

Development of appropriate interactive e-modules as learning media in terms of appearance, text, images, video, and operation aspects based on product feasibility validation, student response questionnaires, and test results. This is in line with the opinion of Hasanah [22]; learning supported by a contextual approach to learning mathematics is in harmony with existing school regulations. Marsigit [23] also stated that learning mathematics based on a contextual approach is in harmony with the nature of students learning mathematics. This means that the existence of a contextual approach has provided real examples to students about mathematics contained in everyday life. Therefore, students will more easily understand mathematical concepts. In addition, students also get more knowledge about everyday life. As a result, this learning e-module is appropriate for use as learning media in schools. The development of appropriate interactive e-modules as learning media supports the results of [24] that the development of interactive graphic design e-modules is appropriate for use and can help increase student motivation and interest in learning. This is also in line with research conducted by Maulana [25], which shows that the electronic assembly and computer installation modules that have been developed are suitable for use as learning resources in the learning process. The development of e-modules effectively increases student achievement in mathematics learning outcomes.

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CONCLUSION AND SUGGESTION

The product produced in this study is an E-module for learning SPLDV for VIII students of SMP N 1 SURUH. E-modules can be used when learning takes place; e-modules developed with the help of Canva and flip pdf corporate edition can be completed properly. This research uses the ADDIE development model, which consists of five research steps, namely analysis, design, development, implementation, and evaluation. E-module media that has been validated and implemented gets an average LKPD of 86% and for responses from students of 88%, including an excellent category, an increase in the average value to 81% so that this E-module is suitable for use in the learning process. The resulting impact is that students have an interest and curiosity in learning. It is recommended to pay attention to the weaknesses of students who do not have the means to access the media, and it is recommended to use worksheets**.**

REFERENCES

[1] M. Danuri, "Perkembangan Dan Transformasi Teknologi Digital," *Infokam*, vol. pp. No.2, no. March, 2019.

[2] M. Arridho, N. Sari, R. W. Ilham, and W. Amini, "Perkembangan Teknologi Dibidang Pendidikan," vol. 2, no. 5, pp. 468–475, 2022, doi: 10.36418/comserva.v2i5.345.

[3] A. Sadikin *et al.*, "Pembelajaran Daring di Tengah Wabah Covid-19 (Online Learning in the Middle of the Covid-19 Pandemic)," vol. 6, no. 1, pp. 214–224, 2020.

[4] L. Hakim, "Pemilihan Platform Media Pembelajaran Online Pada Masa New Normal," *Justek : Jurnal Sains dan Teknologi*, vol. 3, no. 2, p. 27, 2020, doi: 10.31764/justek.v3i2.3516.

[5] M. M. D. H. K. T. Hasan, *Media Pembelajaran*, no. Mei. 2021.

[6] A. Suastika, I Ketut & Rahmawati, "P Engembangan M Odul P Embelajaran M Atematika Dengan P Endekatan K Ontekstual," no. September, pp. 58–61, 2019.

[7] Subandi, Choirudin, Mahmudi, Nizaruddin, and Hermanita, "Building Interactive Communication with Google Classroom," *International Journal of Engineering & Technology*, vol. 7, no. 2.13, Art. no. 2.13, 2018.

[8] E. Puspitasari, E. Yusuf, and A. Nugraha, "Analisis Kesulitan Siswa Menyelesaikan Soal Cerita Materi Sistem Persamaan Linear Dua Variabel di SMP Echy Puspitasari, Edy Y, Asep N Program Studi Pendidikan Matematika FKIP Untan, Pontianak," *Universitas Tanjungpura*, pp. 1–9, 2017.

[9] R. E. N. Afrianti and Abd. Qohar, "Pengembangan E-Modul Berbasis Kontekstual pada Materi Program Linear Kelas XI," *Jurnal Edukasi Matematika dan Sains*, vol. 7, no. 1, p. 22, 2019, doi: 10.25273/jems.v7i1.5288.

[10] K. R. Winatha, "Pengembangan E-modul Interaktif Berbasis Proyek Mata Pelajaran Simulasi Digital," *Jurnal Pendidikan Teknologi dan Kejuruan*, vol. 15, no. 2, pp. 188–199, 2018, doi: 10.23887/jptk-undiksha.v15i2.14021.

[11] Inanna, Nurjannah, A. T. Ampa, and Nurdiana, "Modul Elektronik (E-Modul) Sebagai Media Pembelajaran Jarak Jauh," *Seminar Nasional Lembaga Penelitian dan Pengabdian Kepada Masyarakat Universitas Negeri Makassar*, pp. 1232–1241, 2021.

Print ISSN: 2580-3573, Online ISSN: 2580-2437

[12] D. Wahyudi, "Pengembangan E-Modul dalam Pembelajaran Matematika SMA Berbasis Android," *GAUSS: Jurnal Pendidikan Matematika*, vol. 2, no. 2, p. 1, 2019, doi: 10.30656/gauss.v2i2.1739.

[13] C. Choirudin, A. Setiawan, M. S. Anwar, E. Riyana, M. S. Abrori, and W. Wahyudi, "Development of Qur'an and Hadith-Based Mathematics Module for Students' Mathematical Understanding and Religious Character," *Jurnal Tatsqif*, vol. 19, no. 2, Art. no. 2, Dec. 2021, doi: 10.20414/jtq.v19i2.4086.

[14] N. S. Herawati and A. Muhtadi, "Pengembangan modul elektronik (e-modul) interaktif pada mata pelajaran Kimia kelas XI SMA," *Jurnal Inovasi Teknologi Pendidikan*, vol. 5, no. 2, pp. 180–191, 2018, doi: 10.21831/jitp.v5i2.15424.

[15] S. I. Masrura, R. A. AR, and M. A, "Meta Analysis Penggunaan Pendekatan Kontekstual dalam Pembelajaran Matematika," *J-HEST Journal of Health Education Economics Science and Technology*, vol. 3, no. 2, pp. 69–80, 2022, doi: 10.36339/jhest.v3i2.52.

[16] R. I. Nastiti, W. I. Purwaningsih, and P. B. Darmono, "Pengembangan E-Modul Berbasis Matematika Realistik Guna Menstimulasi Berpikir Kreatif pada Siswa SMP," vol. 4, no. 2, pp. 1–12, 2022.

[17] R. M. Branch, *Instructional Design: The ADDIE Approach*. Springer Science & Business Media, 2009.

[18] A. H. Malo, M. Ambarawati, and S. Napfiah, "Pengembangan Modul Matematika dengan Pendekatan Kontekstual pada Materi Sistem Persamaan Linear Dua Variabel," *Laplace : Jurnal Pendidikan Matematika*, vol. 3, no. 2, pp. 109–118, 2020, doi: 10.31537/laplace.v3i2.377.

[19] Diana, Ne. Fitiani, and R. Amelia, "Sistem Persamaan Linear Dua Variabel: Ditinjau Dari Analisis Kesalahan Siswa Mts Kelas VIII Pada Pembelajaran Daring," *Jurnal Pembelajaran Matematika Inovatif*, vol. 4, no. 4, pp. 985–992, 2021, doi: 10.22460/jpmi.v4i4.985-992.

[20] M. Maryam, R. Masykur, and S. Andriani, "Pengembangan e-modul matematika berbasis Open Ended pada materi sistem persamaan linear dua variabel kelas VIII," *AKSIOMA : Jurnal Matematika dan Pendidikan Matematika*, vol. 10, no. 1, pp. 1–12, 2019, doi: 10.26877/aks.v10i1.3059.

[21] K. Rahmianum, "Media tak-tik koper untuk meningkatkan keterampilan menyelesaikan masalah SPLDV kelas VIII-A SMPN 4 Aceh Tamiang," *Didaktika Pendidikan Dasar*, vol. 3, no. 2, pp. 569–590, 2019.

[22] N. Hasanah, A. In'am, R. Darmayanti, C. Choirudin, D. Nurmalitasari, and U. Usmiyatun, "Development Of Al-Qur'an Context Math E-Module On Invers Function Materials Using Book Creator Application. Aksioma," *AKSIOMA: Jurnal Program Studi Pendidikan Matematika*, vol. 11, no. 4, pp. 3502–3513, Dec. 2022, doi: 10.24127/ajpm.v11i4.5647.

[23] M. Marsigit, D. S. Setiana, and S. Hardiarti, "Pengembangan Pembelajaran Matematika Berbasis Etnomatematika," *Prosiding Seminar Nasional Pendidikan Matematika Etnomatnesia*, vol. 0, no. 0, Art. no. 0, Feb. 2018, Accessed: Oct. 29, 2020. [Online]. Available: https://jurnal.ustjogja.ac.id/index.php/etnomatnesia/article/view/2291

[24] S. F. D. Patri and S. Heswari, "Development of ethnomathematics-based on mathematics e-module to improve students' logical thinking skills," *AIP Conference Proceedings*, vol. 2330, no. 1, p. 040005, Mar. 2021, doi: 10.1063/5.0043250.

[25] 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," *Journal of*

Print ISSN: 2580-3573, Online ISSN: 2580-2437

Education Research and Evaluation, vol. 6, no. 1, Art. no. 1, Feb. 2022, doi: 10.23887/jere.v6i1.38785.

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