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Interactive E-Module Based on Ethnomathematics *Upakara* Bali in Geometry Subject for 2nd Grade Elementary School

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ABSTRAK

Matematika dianggap sebagai pelajaran yang sulit. Sehingga dalam proses pembelajaran guru memerlukan bahan ajar untuk membantu kesulitan siswa agar mampu memahami materi yang bersifat abstrak. Tujuan dari penelitian ini yaitu menciptakan e-modul interaktif berbasis etnomatematika pada mata pelajaran matematika materi geometri yang valid dan praktis. Jenis penelitian yang digunakan yaitu penelitian pengembangan dengan model ADDIE. Subjek uji coba dalam penelitian ini adalah dua orang dosen ahli materi, dua orang dosen ahli media, guru kelas II dan 10 orang siswa. Metode pengumpulan data berupa kuesioner dalam bentuk ratting scale. Metode analisis data menggunakan analisis kualitatif dan kuantitatif. Berdasarkan hasil analisis diperoleh bahwa hasil uji validitas menurut ahli media memperoleh persentase skor 99% dengan kualifikasi sangat baik. Hasil uji dari respon guru memperoleh persentase skor 98% dengan kualifikasi sangat baik. Hasil uji dari uji coba siswa perorangan memperoleh persentase skor 99% dengan kualifikasi sangat baik. Hasil uji dari kelompok kecil siswa memperoleh persentase skor 98% dengan kualifikasi sangat baik. Berdasarkan hal tersebut, maka e-modul yang dikembangkan, valid dan layak digunakan dalam kegiatan pembelajaran. Implikasi dari penelitian ini adalah guru dapat menggunakan e-modul berbasis etnomatematika upakara Bali sebagai referensi atau alat pembelajaran khusus pada materi geometri kelas 2 SD. Melalui penggunaan e-modul ini siswa akan memperoleh pengalaman belajar baru. Selain itu dengan pemanfaatan perkembangan teknologi, dan tampilan visual, audio dan video yang menarik akan mengakomodasi gaya belajar siswa, baik dengan gaya belajar auditori maupun visual.

ABSTRACT

Mathematics is considered a difficult subject. So in the learning process teachers need teaching materials to help students with difficulties in understanding abstract material. The aim of this research is to create an interactive e-module based on ethnomathematics in mathematics subjects with valid and practical geometry material. The type of research used is development research with the ADDIE model. The test subjects in this research were two material expert lecturers, two media expert lecturers, a class II teacher and 10 students. The data collection method is a questionnaire in the form of a rating scale. The data analysis method uses qualitative and quantitative analysis. Based on the analysis results, it was found that the validity test results according to media experts obtained a score percentage of 99% with very good qualifications. The test results from the teacher's responses obtained a score percentage of 98% with very good qualifications. The test results from individual student trials obtained a score percentage of 99% with very good qualifications. The test results from a small group of students obtained a score percentage of 98% with very good qualifications. Based on this, the e-module developed is valid and suitable for use in learning activities. The implication of this research is that teachers can use e-modules based on Balinese *upakara* ethnomathematics as a reference or special learning tool for grade 2 elementary school geometry material. Through the use of this e-module, students will gain new learning experiences. Apart from that, the use of technological developments and attractive visual, audio and video displays will accommodate students' learning styles, both auditory and visual learning styles.

1. INTRODUCTION

Learning mathematics in elementary school is one of the important studies to be given to all students starting from elementary school to equip students with the ability to calculate and process data.

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(Mulyatna et al., 2020; Zainal, 2022; Hasanah et al., 2023). Mathematics is said to be a science that has abstract objects of study including facts, concepts, operations and principles, until now students still consider mathematics to be a difficult subject. (Isrok'atun & Rosmala, 2021). Viewed in terms of its developmental phase, elementary school students are in the concrete operational phase, which, in the learning process, requires varied concrete objects that are close to students' lives to facilitate their understanding of the material and provide meaningful learning.(Efryanty et al., 2023; Fahma & Purwaningrum, 2021; Arimbi et al., 2023). Certainly, learning will be meaningful if teachers can motivate students through diverse teaching methods, including the development of instructional materials that are not solely focused on textbooks. (Nuryasana & Desiningrum, 2020).

However, nowadays, there are still teachers who face difficulties in developing instructional materials. In the initial observation activity carried out on July 17-18, 2023 at Elementary School Cluster IV Sukasada District, it was found that the mathematics book for 2nd grade elementary school Volume 2 on pages 58 to 79 contained a description of activities that were still poorly explored. This is in line with the results of the distribution of questionnaires that have been carried out, namely: (1) 80% of teachers stated that the geometry material on the page was still not extensive; (2) 60% of teachers stated that the geometry material on the page was incomplete. This shows that geometry material in student books is still less varied and lower grade students tend to get bored quickly. Based on the analysis of student scores through teacher interviews, it is indeed seen that learning without the development of materials and teaching materials is one of the triggers for low understanding of concepts and student learning motivation (Rahmawati & Marsigit, 2017; Hamisah et al., 2022). If the teacher does not develop learning materials, then students' insights will also be limited to only student books.

Mathematics learning will be meaningful if given a variety of development in teaching materials that are adapted to student life. As the results of observations and interviews conducted on July 17-18, 2023 in Mathematics learning will be meaningful if given a variety of development in teaching materials that are adapted to student life. As the results of observations and interviews conducted on July 17-18, 2023 at Elementary School Cluster IV Sukasada Sub-district show that all 2nd grade teachers in the cluster are still lacking in developing teaching materials for various reasons such as limited time, many demands that must be met in the implementation of the Independent Curriculum and readiness to conduct learning. As the results of a questionnaire given to 5 2nd grade teachers at Elementary School Cluster IV Sukasada Sub-district showed that 20% of teachers stated that they occasionally developed geometry material to build flat and build space in 2nd grade elementary school student books and 80% of teachers stated that they had never developed geometry material to build flat and build space in 2nd grade elementary school student books. Cluster IV of Sukasada District shows that all 2nd grade teachers in the cluster are still lacking in developing teaching materials for various reasons such as limited time, many demands that must be met in the implementation of the Independent Curriculum and readiness to conduct learning. As the results of a questionnaire given to 5 2nd grade teachers at elementary school Cluster IV Sukasada Sub-district showed that 20% of teachers stated that they occasionally developed geometry material to build flat and build space in 2nd grade elementary school student books and 80% of teachers stated that they had never developed geometry material to build flat and build space in 2nd grade elementary school student books. The limited material in student books triggers low student insight. Therefore, it is important for 2nd grade elementary school teachers to be able to develop learning materials in it. This is supported by the results of questionnaires on 5 2nd grade teachers at Elementary School Cluster IV Sukasada Sub-district which stated that 60% of teachers chose the need to develop learning materials in mathematics subjects and the remaining 40% stated that it was very necessary to develop material in mathematics subjects. Based on the results of the analysis of the learning styles of 2nd grade elementary school students in Cluster IV of Sukasada District, it was found that 24% of students were easier to understand learning with audio learning styles, 20% of students stated it was easier to understand learning with visual learning styles, 12% of students stated it was easier to understand learning with kinesthetic learning styles and 44% of students chose to prefer audio-visual learning styles.

Adjusted to the results of the analysis of 2nd grade elementary school students in Cluster IV of Sukasada District, the development that can be done to be able to bridge all these learning styles is to develop interactive e-modules. Electronic Module (e-Module) as an electronic form of self-study material that is arranged systematically to achieve learning outcomes (Diantari et al., 2018). E-module, defined as a learning medium using a computer that displays text, images, graphics, audio, animation and video in the learning process (Wanabuliandari et al., 2021; Turnip et al., 2021).Based on this definition, e-modules do not only display two-dimensional media as well as print-based modules. E-modules are also referred to as interactive multimedia because various learning media can be presented into them. E-module is a learning tool or means that contains material, methods, limitations and ways of evaluating that are designed

systematically and interestingly to achieve the expected competencies according to the level of complexity electronically (Netofa & Japa, 2022; Imansari & Sunaryantiningsih, 2017).

This is based on current technological advances that have affected various aspects of life both in the fields of politics, economics, culture, art and also in the field of education globally (Rahadian, 2017). The world of education needs to improve the progress of schools and education by making positive innovations. Schools are expected not to be left behind by technological developments by providing electronic devices that are able to support and support the learning process. Good and complete facilities and infrastructure will make learning activities run effectively and efficiently (Perdani & Azka, 2019). Interactive activities will provide new learning experiences, moreover teachers can package mathematics learning with concrete things that students usually encounter in everyday life.

People in Bali are accustomed to their cultural customs, without realizing it mathematics can also be wrapped in the development of cultural-based teaching materials in the area where students live. So that students are able to understand real concepts known as ethnomathematics. Ethnomathematics that has often been found by most elementary school students in Bali in particular is Balinese *upakara* in the form of prayer facilities that are already close to students' daily lives. Teachers and 2nd grade students at Elementary School Cluster IV Sukasada District have a high interest in the development of Balinese *upakara* ethnomathematics teaching materials. This can be proven by the results of the distribution of questionnaires on July 17-18, 2023 at Elementary School Cluster IV Sukasada District. Of the 5 2nd grade teachers, 60% of teachers agreed that the Geometry material in the student book was developed in the form of Balinese *upakara* ethnomathematics e-module, while 40% of other teachers said they strongly agreed. Of the 25 2nd grade students, as many as 80% of students stated that Geometry material needs to be developed in e-modules, while 20% stated that it is very necessary. Judging from the above problems, it is necessary to develop a teaching material with the development of geometry material for 2nd grade elementary school students in Cluster IV of Sukasada District in the form of interactive e-modules based on Balinese *upakara* ethnomathematics to assist teachers in the learning process. In it there are learning activities that can be connected with links in the form of navigation that will lead students to get new interactive things through the *upakara* Balinese ethnomathematical approach. These interactive activities are complemented by the presentation of video, animation and audio to enrich the learning experience and can be done flexibly.

There are several previous studies that are in line with the research to be conducted. The first is research on the development of teaching modules based on Kuansing Malay ethnomathematics, the results of the research show that the Kuansing Malay ethnomathematics-based flat building material module meets valid and practical criteria with a validator percentage of material experts of 94.45%, media experts of 90.17%, language experts amounted to 91.67%, and the percentage of practicality by teachers was 96.25% and students was 92.5%. This can be interpreted as saying that the Kuansing Malay ethnomathematics-based flat shape material module meets the valid and practical criteria so that it is suitable for use in mathematics learning in elementary schools (Putri et al., 2023). The second research concerns the development of a Dayak culture-based ethnomathematics module with a Joyfull Learning approach, the results of which show that the Dayak culture-based ethnomathematics module with a joyfull learning approach obtains good results, so it can be used to teach mathematics concepts to students (Priyani, 2021).

Based on a review of previous research, the novelty of this research is an ethnomathematics-based module which will be developed using the culture that exists around us, namely the Balinese *Upakara* culture. The purpose of using these cultural elements is so that students become more familiar with the culture around them and make learning more concrete and meaningful so that the flat material discussed will be better remembered by students. This is in line with the opinion which states that culture is an important and fundamental part of education which can be used as a vehicle for expressing and communicating ideas, a place for the development of knowledge, an arena for exploration, and a context in which knowledge is learned and applied in life. The presence of cultural elements in learning encourages imaginative, metaphorical processes, creative thinking, and also cultural awareness (Budiningsih, 2019). The aim of this research is to develop an interactive e-module based on ethnomathematics on geometry material for grade 2 elementary school that is valid and practical for use in the learning process so that it can help students understand abstract mathematical material and eliminate the assumption that Mathematics is a difficult subject.

2. METHOD

The type of research used is development research with the ADDIE model which consists of five stages, namely analysis, design, development, implementation, and evaluation. The reason for choosing this model is because in its application this model is detailed, systematic and more in accordance with the development of interactive e-modules based on *Upakara* Bali ethnomathematics because each stage always

goes through an evaluation stage which can help maximize the results of the products developed. The first research procedure carried out is the analysis stage to find out the analysis of student characteristics, curriculum analysis, needs analysis, and product analysis. The second stage is planning carried out by designing e-modules based on Balinese *upakara* ethnomathematics, which will be developed by determining the material and making story boards. The third stage is development carried out by developing products in accordance with the design that has been made and validating products. The fourth stage is the implementation carried out by applying the completed *Upakara* Bali ethnomathematics-based e-module designed to determine the development of learning outcomes and media quality which includes material completeness, effectiveness, and media efficiency. However, this research was not carried out until the implementation stage looking at the limited time, energy, and financial situation. The trial of this development research product was carried out by reviewing the e-modules that had been developed. Of course, the review involves experts to find out about the feasibility of learning tools, e-modules based on Balinese *upakara* ethnomathematics. The test subjects in this study are two material expert lecturers, two media expert lecturers, 2nd grade teachers and 10 students who will later use inpreactive teaching materials based on Balinese *upakara* ethnomathematics in 2nd grade elementary school geometry material while the object of trial in this study is the validity, response of teachers and students to the e-module developed. The data collection method in this study used observation, interview and questionnaire methods with questionnaire distribution. The instrument used in this study is in the form of a ratting scale which is an assessment technique that uses a certain scale from the lowest level to the highest level as the basis for assessment. The grids of research instruments can be seen in Table 1, Table 2, Table 3, and Table 4.

Table 1. Material Expert Validation Instrument Grid

No.	Aspects	Indicators	Number of Items	Item Number
1.	Curriculum	Suitability of the material with Learning Outcomes (CP)	1	1
		Suitability of the material to the Learning Objectives (TP)	1	2
		Compatibility of the material with the Indicators of Achievement of Learning Objectives (IKTP)	1	3
2.	Language	Language use according to student development	1	4
		Use of language according to applicable spelling	1	5
3.	Material	The material enhances students' understanding of concepts	1	6
		The material contains concepts that need to be known	1	7
		Suitability of the material to the scope of the learning material	1	8
		The material is easy to understand	1	9
		Attractiveness of presentation	1	10
4.	Evaluation	Compatibility of the questions with the material	1	11
		Availability of instructions for working on the questions	1	12

Table 2. Media Expert Validation Instrument Grid

No.	Aspects	Indicators	Number of Items	Item Number
1.	Appearance / Design	Attractiveness of media appearance/design	1	1
		Font usage and font size are easy to read	1	2
		Compatibility of composition and color combinations	1	3
		Image Interest	1	4
		Image and text layout fit	1	5
2.	Feasibility	Compliance with Learning Objectives (TP)	1	6
		Compliance with student characteristics	1	7
		The material presented is appropriate	1	8
3.	Operation	Ease of operation	1	9
		Clarity of operation	1	10

Table 3. Teacher Assessment Instrument Grid

No.	Aspects	Indicators	Number of Items	Item Number
1.	Material	Completeness of information	1	1
		Suitability of the material with Learning Outcomes (CP)	1	2
		Suitability of Learning Objectives material (TP)	1	3
		Compatibility of the material with the Indicators of Achievement of Learning Objectives (IKTP)	1	4
		Suitability of the material presented with the learning material	1	5
2.	Language	Language use according to student development	1	6
		Coherent and systematic material	1	7
		Attractiveness of the presentation of the material	1	8
3.	Appearance/ Design	Clarity of presentation of text	1	9
		Image Interest	1	10
		Color combination alignment	1	11
4.	Operation	Ease of operation	1	12
		Clarity of operation	1	13

Table 4. Student Instrument Grille

No	Aspects	Indicators	Number of Items	Item Number
1.	Appearence	Attractiveness of the display	1	1
		Font usage and font size are easy to read	1	2
		Image Interest	1	3
		Color combination alignment	1	4
2.	Material	Clarity of the material	1	5
		The material can increase student motivation	1	6
		The material is easy to understand	1	7
		Media fascination	1	8
3.	Operation	Ease of Use	1	9
4.	Evaluation	Suitability of the question to the material	1	10

The data analysis method in this study uses two methods, namely quantitative descriptive analysis methods and qualitative descriptive. Quantitative descriptive analysis is used to process scores in the form of scores obtained through assessment sheets from experts, teachers and students. The scores obtained from each indicator are then calculated on the average of the subjects to obtain the results of expert validity, as well as the responses of teachers and students of e-modules based on Balinese *upakara* ethnomathematics, using a percentage formula. While the qualitative descriptive analysis method is used for data processing both in the form of suggestions and input based on reviews from media experts and mathematics learning on e-modules based on *upakara* Bali ethnomathematics which was developed through the provision of e-module assessment sheets based on *upakara* Bali ethnomathematics. The results of the analysis are then used in revising the product.

3. RESULT AND DISCUSSION

Result

This development research resulted in a product in the form of an e-module based on Balinese *upakara* ethnomathematics on 2nd grade elementary school geometry material. The implementation of this research activity uses the ADDIE research model which consists of five stages, namely analysis, design, development, implementation and evaluation. However, this study did not carry out the implementation stage looking at the limited time, energy and financial situation. So, this research only comes to the validity test and knows the responses of teachers and students related to the products developed.

At the analysis stage, it is carried out by analyzing student characteristics, curriculum, needs, and product analysis. From the results of the analysis of student characteristics, it was obtained that the average age of 2nd grade elementary school students was 7 to 8 years old. Children between the ages of 6 and 12 are at a stage of concrete operational cognitive development. The characteristics of children at that age are different from the views of parents or adults, so educators must be able to encourage children to form

appropriate concepts, especially in mathematics learning. The curriculum analysis carried out here is by analyzing the learning outcomes of the Merdeka Curriculum as a basis for developing e-modules based on *Upakara* Bali ethnomathematics. The learning outcomes used by Mathematics Subjects on Geometry Material Build Flat and Build Classrooms II Elementary School.

Based on the needs analysis, it is known that: (1) The geometry material in 2nd grade elementary school mathematics subjects in student books is still less extensive, less deep and less complete. (2) The teacher has not developed teaching materials in mathematics subjects, geometry materials, build flat, and build space in 2nd grade elementary school. (3) There are no teaching materials based on Balinese *upakara* ethnomathematics that are integrated with technology. Based on this, modules that meet standards, are easy to use and have practical value are needed. In addition, based on questionnaires that have been distributed related to the need for e-modules, where the results from the student side show as many as 80% who state that learning tools in the form of e-modules based on Balinese *upakara* ethnomathematics in mathematics subjects geometry material 2nd grade elementary school needs to be developed and 20% of students say it is very necessary to develop these learning tools. In addition, the results of the questionnaire on the teacher's side showed results, namely as many as 40% who agreed if the development of learning tools in the form of e-modules based on Balinese *upakara* ethnomathematics in mathematics subjects geometry material 2nd grade elementary school, and as many as 60% of teachers expressed strong agreement regarding the development.

Product analysis related to this *upakara* Bali ethnomathematics-based e-module product is carried out by finding out the essence of a good e-module. E-module is a learning tool or means that contains material, methods, limitations and ways of evaluating that are designed systematically and interestingly to achieve the expected competencies according to the level of complexity electronically (Imansari & Sunaryantiningsih, 2017). Secara konsep, tidak ada perbedaan yang signifikan antara modul berbasis cetak dan modul elektronik (e-modul). The e-modules developed in Indonesia mostly have components, namely: 1) The formulation of teaching objectives contains the expected teaching objectives after studying or using the module. 2) Instructions for using the module, contains an explanation of the efficient use of the module for both teachers and students. 3) Activity sheets, containing subject matter that must be mastered by students are arranged step by step regularly and systematically so that students can follow it easily and quickly, 4) E-modules that can be done online and flexibly are listed in the e-Module. 5) Teacher assessment evaluation sheet on the achievement or failure of the objectives formulated in the module by students, 6) Navigation menu, to make it easier for students to move from one page to another. 7) Interactive features such as animations or actions that can be used to go to certain pages, show / hide objects and even able to create variables.

After the analysis stage, proceed with the product design stage. At this stage, the design of e-modules based on Balinese *upakara* ethnomathematics will be carried out, which will be developed. The first thing to do is the determination of the material. The material chosen based on the analysis that has been done is the geometry material of building flat and building space at the 2nd grade level of elementary school which is adjusted to the Learning Outcomes (CP) in the Independent Curriculum. Then continued with the creation of e-module storyboards based on Balinese *upakara* ethnomathematics, in order to get an initial overview of product design. At the development stage, there is an activity to develop an e-module based on Balinese *upakara* ethnomathematics, the development of which has been adjusted with input from the supervisor. The first process carried out is to visualize the storyboard into the desired e-module display using the Canva application with a size equivalent to the size of A4 paper, which is 21 cm x 29.7 cm. The storyboard has been successfully visualized into the desired e-module display. The next activity is by developing interactive features in the form of adding interactive features to the e-module by uploading it to the heyzine.com platform.

Products developed are tested for validity and practicality. The results of the validity test according to material experts obtained a percentage score of 97% with very good qualifications. The results of the validity test according to media experts obtained a percentage score of 99% with very good qualifications. Based on the test results of the response, the teacher obtained a percentage score of 98% with very good qualifications. Based on the test results from the trial, individual students obtained a score percentage of 99% with excellent qualifications. Based on test results from small groups, students obtained a score percentage of 98% with excellent qualifications.

Based on the results of the analysis, it is known that the e-module based on Balinese *upakara* ethnomathematics developed, according to assessments from material experts, media experts, teacher responses and student responses which include individual trials and small group trials have scores with very good qualifications. Based on this, the e-module based on Balinese *upakara* ethnomathematics is valid and suitable for use in learning activities.

Discussion

The final product resulting from this development is an interactive e-module based on Balinese *upakara* ethnomathematics on 2nd grade elementary geometry that is valid and practical to be used in the learning process. The results of this study are in line with several previous studies, namely first, research on the development of geometry transformation teaching materials based on discovery learning through an ethnomathematical approach. Based on the research, expert validation results were obtained with a percentage of 83% (very valid), student respondents 84.50% (very practical), and effectiveness 85.71% (high). So that the teaching materials developed are declared valid, practical and effectively used in the learning process (Fitriyah et al., 2018). The second research on the development of ethnomathematics-based elementary geometry modules obtained the results that the ethnomathematics-based elementary geometry module was feasible to use (Sriwanti & Sukmawarti, 2022).

The validity of the developed teaching materials is influenced by several factors. First, teaching materials have fulfilled aspects of the applicable curriculum including the suitability of the material with learning outcomes (CP), the suitability of the material with learning objectives (TP), and the suitability of the material with the Learning Objectives Achievement Indicators (IKTP). Viewed from the linguistic aspect, the language used in teaching materials is in accordance with student development so that it can be easily understood by students and according to applicable spelling. From the material aspect, the material contains concepts that need to be known, the suitability of the material with the scope of learning material, the material is easy to understand, and the material presented is very interesting. Furthermore, the validity of the teaching materials developed is also supported by the ease of use of teaching materials by students.

The delivery of material in this teaching material uses many illustration images and text, which can help students make it easier to understand the material explained (Krisnawati et al, 2021). In accordance with the stage of development of elementary school students, which is at the concrete operational stage, where students still need the help of a medium to better understand the material described. Electronic Module (e-Module) as an electronic form of self-study material that is arranged systematically to achieve learning outcomes (Diantari et al., 2018). E-module, defined as a learning medium using a computer that displays text, images, graphics, audio, animation and video in the learning process (Wanabuliandari et al., 2021; Turnip et al., 2021).Based on this definition, e-modules do not only display two-dimensional media as well as print-based modules. E-modules are also referred to as interactive multimedia because various learning media can be presented into them. E-module is a learning tool or means that contains material, methods, limitations and ways of evaluating that are designed systematically and interestingly to achieve the expected competencies according to the level of complexity electronically (Netofa & Japa, 2022; Imansari & Sunaryantiningsih, 2017).

4. CONCLUSION

Interactive e-module based on Balinese *upakara* ethnomathematics in geometry 2nd grade elementary school that is valid and practical to be used in the learning process. The implication of this research is that teachers can use this Balinese *upakara* ethnomathematics-based e-module as a reference or special learning tool on 2nd grade elementary school geometry material. Through the use of this e-module students will gain new learning experiences. In addition, with the use of technological developments, and attractive visual displays, audio and video, it will accommodate students' learning styles, both with auditory and visual learning styles. This e-module based on Balinese *upakara* ethnomathematics requires devices and cellular networks as well as data packages in use. Teachers as guides and supervisors of learning in the classroom should pay attention to students in the use of this e-module so that it is focused only on working on e-modules.

5. REFERENCES

Alhakiki, A., & Taufina, T. (2020). Pengaruh Quantum Teaching Kerangka TANDUR Terhadap Hasil Belajar Matematika di Sekolah Dasar. *JURNAL BASICEDU*, *4*(3), 534–540. https://doi.org/10.31004/basicedu.v4i3.395.

Arimbi, E. P. A., Kasiyun, S., Romadhona, N., & Machbul, C. (2023). Peningkatan Hasil Belajar Matematika Siswa SD Melalui Model Pembelajaran Berbasis Masalah Berbantuan Media Konkret. *Prosiding National Conference For Ummah*, *2*(1). https://conferences.unusa.ac.id/index.php/NCU2020/article/view/1103.

Budiningsih, C. A. (2019). Strategi Pembelajaran Berpijak Pada Budaya Siswa. In *Jurnal Dinamika Pendidikan* (Vol. 1, Issue 12, pp. 60–70). https://media.neliti.com/media/publications/59407-ID-strategi-pembelajaran-berpijak-pada-buda.pdf.

Cahyadi, R. A. H. (2019). Pengembangan Bahan Ajar Berbasis Addie Model. *Islamic Education Journal*, *3*(1). https://doi.org/10.21070/halaqa.v3i1.2124.

Diantari, L. P. E., Damayanthi, L. P. E., Sugihartini, N., & Wirawan, I. M. A. (2018). Pengembangan E-Modul Berbasis Mastery Learning Untuk Mata Pelajaran KKPI Kelas XI. *JANAPATI: Jurnal Nasional Pendidikan Teknik Informatika*, *7*(1). https://doi.org/10.23887/janapati.v7i1.12166.

Efryanty, Somakim, & Mulyono, B. (2023). Etnomatematika Cagar Budaya Rumah Kampung Kapitan dan Pengintegrasiannya Dalam Pembelajaran Matematika. *Jurnal Erivat: Jurnal Matematika Dan Pendidikan Matematika*, *10*(3). https://doi.org/10.31316/jderivat.v10i3.5567.

Fahma, M. A., & Purwaningrum, J. P. (2021). Teori Piaget Dalam Pembelajaran Matematika. *MUST: Jurnal of Mathematics Education, Science & Technology*, *6*(1). https://doi.org/10.30651/must.v6i1.6966.

Fitriyah, D. N., Santoso, H., & Suryadinata, N. (2018). Bahan Ajar Transformasi Geometri Berbasis Discovery Learning Melalui Pendekatan Etnomatematika. *Jurnal Elemen: Program Studi Pendididkan Matematika*, *4*(2). https://doi.org/10.29408/jel.v4i2.705.

Giarti, S. (2014). Peningkatan Keterampilan Proses Pemecahan Masalah Dan Hasil Belajar Matematika Menggunakan Model Pbl Terintegrasi Penilaian Autentik Pada Siswa Kelas Vi Sdn 2 Bengle, Wonosegoro. *Scholaria: Jurnal Pendidikan Dan Kebudayaan*, *4*(3), 13. https://doi.org/10.24246/j.scholaria.2014.v4.i3.p13-27.

Hamisah, S., Caksa, & Kartikowati, S. (2022). Pengembangan Bahan Ajar Multimedia Interaktif Berbantu Anyflip dan Quizizz Untuk Meningkatkan Motivasi Belajar Siswa. *Jurnal PAJAR: Pendidikan Dan Pengajaran*, *6*(6). https://doi.org/10.33578/pjr.v6i6.8880.

Hasanah, U., Fajrie, N., & Kurniati, D. (2023). Peningkatan Pemahaman Konsep Matematika Siswa SD Melalui Pendidikan Matematika Realistik Berbantuan Ular Tangga. *PENDASI: Jurnal Pendidikan Dasar Indonesia*, *7*(2). https://doi.org/10.23887/jurnal_pendas.v7i2.2441.

Hulu, B. A. A., & Mendrofa, R. N. (2023). Pengembangan Modul Berbasis Etnomatematika Menggunakan Metode Discovery Learning pada Materi Matematika SMP. *Jurnal Review Pendidikan Dan Pengajaran*, *6*(3), 283–291. https://doi.org/10.31004/jrpp.v6i3.18925.

Imansari, N., & Sunaryantiningsih, I. (2017). Pengaruh Penggunaan E-Modul Interaktif terhadap Hasil Belajar Mahasiswa pada Materi Kesehatan dan Keselamatan Kerja. *VOLT: Jurnal Ilmiah Pendidikan Teknik Elektro*, *2*(1). https://doi.org/10.30870/volt.v2i1.1478.

Indrawati, D., Wahyudi, W., & Ratu, N. (2014). Peningkatan Kemampuan Pemecahan Masalah Matematika Melalui Penerapan Problem Based Learning Untuk Siswa Kelas V SD. *Jurnal Penelitian Pengembangan Kependidikan*, *30*(1). https://doi.org/10.24246/j.sw.2014.v30.i1.

Isrok'atun, & Rosmala, A. (2021). *Model-Model Pembelajaran Matematika*. Jakarta: Bumi Aksara.

Jaya, H. N. (2017). Keterampilan Dasar Guru untuk Menciptakan Suasana Belajar yang Menyenangkan. *Didaktis: Pendidikan Dan Ilmu Pengetahuan*, *17*(1), 23–35. http://journal.um-surabaya.ac.id/index.php/didaktis/article/view/1555/1275.

Krisnawati, A., Listiawan, T., & Hairunisya, N. (2021). Pengembangan Media Sparkol Videoscribe Berbasis Problem Based Learning Kelas 2 Di Sd Negeri Tenggong. *Jurnal Media Bina*, *15*(10). https://doi.org/10.33758/mbi.v15i10.1214.

Mulyatna, F., Nurrahmah, A., & Seruni. (2020). Pembelajaran Matematika SD/MI Yang Inovatif Melalui Permainan Tradisional Bekel dan Kelereng. *Jurnal Pengabdian*, *2*(2). http://ejournal.ft.unsri.ac.id/index.php/community/article/view/704.

Netofa, N. P. D. Z., & Japa, I. G. N. (2022). E-Modul Pembelajaran Pecahan di Kelas IV Sekolah Dasar. *MIMBAR PGSD Undiksha*, *10*(3). https://doi.org/10.23887/jjpgsd.v10i3.49531.

Nuryasana, E., & Desiningrum, N. (2020). Pengembangan Bahan Ajar Strategi Belajar Mengajar Untuk Meningkatkan Motivasi Belajar Mahasiswa. *Jurnal Inovasi Penelitian*, *1*(5). https://doi.org/10.47492/jip.v1i5.177.

Perdani, H. N., & Azka, R. (2019). Teknologi dan Pembelajaran Matematika Generasi Milenial. *Prosiding Sendika*, *5*(1). http://eproceedings.umpwr.ac.id/index.php/sendika/article/view/778.

Priyani, N. E. (2021). Pengembangan Modul Etnomatematika Berbasis Budaya Dayak dalam Pembelajaran Matematika dengan Pendekatan Joyfull Learning. *Jurnal Didaktika Pendidikan Dasar*, *5*(1), 109–124. https://doi.org/10.26811/didaktika.v5i1.226.

Putri, S. A. M., Putra, Z. H., & Alpurasi, 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.

Rahadian, D. (2017). Teknologi Informasi dan Komunikasi (TIK) dan Kompetensi Teknologi Pembelajaran Untuk Pengajaran Yang Berkualitas. *JTEP: Jurnal Teknologi Pendidikan Dan Pembelajaran*, *2*(1). https://doi.org/10.31980/tp.v2i1.114.

Rahmawati, F. D., & Marsigit. (2017). Pengembangan Bahan Ajar Berbasis Etnomatematika Untuk Meningkatkan Prestasi dan Motivasi Belajar Siswa SMP. *Jurnal Pedagogi Matematika*, *6*(6). https://doi.org/10.21831/jpm.v6i6.7842.

Salim Nahdi, D., & Cahyaningsih, U. (2018). Pengembangan Perangkat Pembelajaran Matematika Sd Kelas V Dengan Berbasis Pendekatan Saintifik Yang Berorientasi Pada Kemampuan Pemecahan Masalah Siswa. *Jurnal Cakrawala Pendas*, *5*(1), 1–7. https://doi.org/10.31949/jcp.v5i1.1119.

Sriwanti, P. U., & Sukmawarti. (2022). Pengembangan Modul Geometri SD Berbasis Etnomatematika. *Pedagogi: Jurnal Ilmiah Pendidikan*, *8*(1). https://doi.org/10.47662/pedagogi.v8i1.240.

Tri A, Harjanta J, Agus Herlambang B. (2018). Rancang Bangun Game Edukasi Pemilihan Gubernur Jateng Berbasis Android Dengan Model ADDIE. *Jurnal RANSFORMTIKA,* 16(1) 91-97. http://dx.doi.org/10.26623/transformatika.v16i1.894.

Turnip, R. F., Rufi'i, & Karyono, H. (2021). Pengembangan E-Modul Matematika Dalam Meningkatkan Keterampilan Berpikir Kritis. *JEMS: Jurnal Edukasi Matematika Dan Sains*, *9*(210.25273/). https://doi.org/10.25273/jems.v9i2.11057.

Wanabuliandari, S., Ristiyani, & Nuning Kurniasih. (2021). E-Modul Matematika Berbasis Santun Berbahasa Bagi Siswa Slow Learner. *AKSIOMA: Jurnal Program Studi Pendidikan Matematika*, *10*(2). https://doi.org/10.24127/ajpm.v10i2.3574.

Zainal, N. F. (2022). Problem Based Learning Pada Pembelajaran Matematika di Sekolah Dasar/Madrasah Ibtidaiyah. *Jurnal Basicedu*, *6*(3). https://doi.org/10.31004/basicedu.v6i3.2650.