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USING ETHNOMATHEMATICS FROM BATIK JEMBER TO CREATE ELECTRONIC MODULES

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Abstract

The purpose of this study was to determine the process and results of developing an ethnomathematics-based e-module on Jember batik motifs for high school students. The type of research used is Research and Development (R&D) with the research model used is the ADDIE research and development model (Analyze, Design, Development, Implementation, Evaluation). Data collection instruments in the form of validation sheets, student response questionnaire sheets and question sheets. The trial subjects in this study were limited to 6 students in class XI IPA at SMA Negeri Pakusari, while for the large scale trial, the remaining limited scale trials were from students in class XI IPA at SMA Negeri Pakusari. The data analysis techniques used are product validity analysis, practicality analysis, and effectiveness analysis. Based on the results of the analysis, it is found that the ethnomathematics-based e-module on Jember batik motifs for high school students has met three categories of product quality assessment, namely validity, effectiveness, and practicality and can be declared successful or feasible to use. Thus, the product can be useful as a learning resource and to facilitate students in learning mathematics and culture.

Keywords: e-module, ethnomathematics, batik jember

1. Introduction

Cultural value education in schools can be applied through learning mathematics by utilizing the understanding gained from student insights or student information. Mathematics learning that can be completed in real terms so that students will better understand mathematical concepts with practical local wisdom in the form of ethnomathematics Nur et al. (2020). Therefore, attempts to fostering cultural values in adolescents is highly expected so that local culture does not easily forgotten by the tide of globalization. One of them is using the approach realistic about cultural values into learning, especially in math.

Ethnomathematics is a mathematical description of something based on or influenced by the culture of Utami et al. (2018). Ethnomathematics-based mathematics learning implies an approach that focuses on student activities that take advantage of cultural diversity and incorporate it into mathematics learning Wahyuni et al. (2013). Connecting mathematical concepts with teacher innovation in conveying understanding involves local culture to produce students who are more interested in mathematics and develop student learning outcomes according to expectations.

The local culture adopted in this research is Jember batik. Jember Regency is topographically a plantation area, one of the most famous being tobacco producers, besides that there are also edamame, cocoa, coffee and tea plantations (Ira, 2011). Batik Jember in this study will be a medium for developing teaching materials in ethnomathematical learning which is integrated in geometry transformation material. The results of the preliminary study show that the mathematical forms found in Jember batik when considered carefully from the motifs made have regular shapes such as dots, lines, and flat planes. The results of the analysis from previous research (Hartindya, 2019) show that ethnomathematics in tobacco motifs in Jember batik has the concept of geometric transformation. Then, the results of another study showed that they succeeded in making LKS with ethnomathematical elements on the typical batik of the Osing Banyuwangi tribe with the material of geometric transformations Khofifah et al. (2018). The results of other studies also found that the use of Pasedahan Suropati batik motifs in learning mathematics in elementary schools can be used for line recognition, point recognition, and recognition of flat shapes for elementary schools Ulum et al. (2017). Thus, the research that will be carried out by this researcher is centered on the Jember batik motif as a teaching material in the form of an e-module with geometric transformation material.

Mathematics learning in schools still uses mathematics teaching materials in printed form such as textbooks that are loaned out in limited quantities. When learning online, teachers use social media to students who then only convey material as necessary, so that the learning process is considered less effective and practical. The development of teaching materials that contain culture has also never been done, so the idea arises that mathematics and culture are two different things and are not related to each other. Submission of material using modules that are made can adapt to the needs of current learning. Modules are teaching materials that are deliberately arranged in a language that can be understood effectively and can be studied independently by students. Sintiya et al. (2021). Utilization of electronic media can be stated in the form of e-modules (electronic modules). Currently, all activities are closely related to digital, so it should be take advantage of technology in the learning process. Media utilization electronics can be poured in the form of e-modules (electronic modules). Module Electronics is the answer for teachers as teaching materials nowadays because it is effective and practical as well as assist development in learning. Therefore, the researcher hopes that the product development of teaching materials that will be obtained in this study entitled "Development of E-modules Based on Ethnomathematics in Jember Batik Motifs for High School Students" can support mathematics learning.

2. Method

The type of research used is Research and Development (R&D) with the research model used is the ADDIE research and development model “ADDIE is an acronym for Analyze, Design, Develop, Implement, and Evaluate. ADDIE is a product development concept (Branch, 2009). The ADDIE concept is being applied here for constructing performance-based learning. The educational philosophy for this application of ADDIE is that intentional learning should be student centered, innovative, authentic, and inspirational.” In other words ADDIE (Analyze, Design, Development, Implementation, Evaluation) which is essentially the result of a development paradigm that has a concept for constructing performance-based learning, the philosophy of education that is emphasized in this model, which must be student-centered, innovative, authentic , and inspirational.

The first ADDIE steps are analyze stage, analyzing needs and materials. The second stage is design, in the form of media selection, module selection, selection of basic competencies and indicators, use of learning models, design of learning media. The third stage is development, in the form of compiling e-modules. expert validation (media, material, language, instrument) and revision. If the product has been declared valid, it can be continued in the fourth stage, namely implementation, in the form of limited-scale trial activities, wide-scale trials, and revisions if necessary. Then the last stage is evaluation, in the form of practicality test and final product effectiveness test.

The trial subjects in this study were limited to 6 students in class XI IPA SMA Negeri Pakusari. Meanwhile, for the large-scale trial to 22 students of class XI IPA at SMA Negeri Pakusari. Data collection instruments in the form of validation sheets, questionnaire sheets, and questions. Data analysis techniques using a Likert scale include product validity analysis which is based on the validation results of a team of experts. The following guidelines for product validity assessment.

Table 1. E-Module Validity Assessment Guidelines

Score	Criteria
1	Not worth it
2	Less worth it
3	Worth it
4	Very worth it

After the percentage results are obtained, then the researchers group them into product validity categories (Akbar, 2013):

Table 2. Product Validity Category

Validity criteria	Level of validity
85,01% − 100%	Very Valid
70,01% − 85%	Valid
50,01% − 70%	Less Valid
1% − 50%	Not Valid

Then the practicality analysis stage is based on the results of the student response questionnaire. The following is a practical analysis guideline using a Likert scale:

Table 3. Student Questionnaire Assessment Guidelines

Score	Criteria
4	Very agreed
3	Agreed
2	disagree
1	Highly disagree

After the percentage results were obtained, then the researchers grouped them into product practicality categories (Akbar, 2013):

Table 4. Product Practicality Category

Practical Criteria	Level of Practical
81% − 100%	Very Practical
61% − 80%	Practical
41% − 60%	Quite practical
21% − 40%	Less Practical
0% − 20%	Very little practical

Then, the analysis phase of the effectiveness of teaching materials is based on student achievement in completing the learning outcomes test. The maximum score on the learning outcomes test is 100 with the Minimum Completeness Criteria (KKM) set for mathematics subjects, which is 75. Calculating the percentage of students' completeness tests who reach the KKM by using the formula:

$$Percentage\ of\ completeness\ (P) = \frac{Number\ of\ students\ who\ completed}{Total\ number\ of\ students} \times 100\%$$

After the percentage results are obtained, then categorize the percentage of completeness with the category of learning outcomes effectiveness (Widoyoko, 2009):

Table 5. Criteria For Completeness Of Student Test Results

Effective Percentage	Criteria
$P > 80\%$	Very Effective
$60\% < P \leq 80\%$	Effective
$40\% < P \leq 60\%$	Quite Effective
$20\% \leq P \leq 40\%$	Less Effective
$P \leq 20\%$	Very Little Effective

3. Result and Discussion

3.1 Result

Research and development that has been carried out at SMA Negeri Pakusari obtained results with several stages that have been carried out.

Analyze

Activities at this stage are in the form of interviews with teachers to find out the needs needed in developing learning media. The results of interviews with teachers are the need to develop teaching materials to facilitate the learning process of students in an all-digital era. Module Electronics can take advantage of technology for learning media and make it easier students in learning. The material that will be conveyed in the e-module is in the form of Jember batik motifs by observing Jember batik craftsmen. Tathematical forms which is found in Jember batik if you pay close attention to the motifs made to have regular shapes such as points, lines, and planes. Setup creative in batik is obtained through the transformation of points, lines

or areas on batik through Translation (shift), Rotation (rotation). Furthermore, conducting material analysis, the selection and preparation of material is carried out systematically so that learning objectives are achieved.

Design

The selection of the selected media is mathematics learning that integrates culture. In the selection of the selected module form, it is an electronic module which is converted into a flipbook. The selection of basic competencies and indicators is adjusted to the material to be delivered in the e-module, namely geometry transformation material. An example of the application of geomaterial transformation on Jember batik is presented in the following figure.

Figure 1. The application of geomaterial transformation on Jember batik

The use of learning models that are in accordance with the developed e-modules are based on ethnomathematics and a realistic approach. Furthermore, in planning the learning media, several designs were carried out, such as the results of the needs and material analysis, the arrangement of the outline of the media content and the description of the material, and the writing of the script in the form of flowcharts and storyboards. An e-module designed using the Canva application in PDF format, then converted into a flipbook online via the https://online.flippingbook.com/view/17627767 website. The final step is to copy the e-module link obtained from the conversion. Here's the e-module in flipbook view:

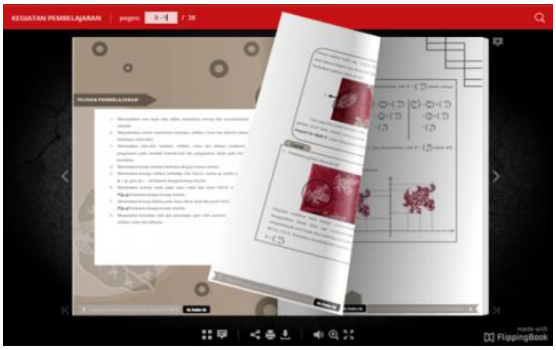

Figure 2. E-module view

Development

The product was validated by three lecturers and one mathematics teacher with a validation sheet to test the level of product validity. The validation in question is in the form of media validation, material, language, and student response questionnaire instruments. The following are the results of expert research data analysis:

Table 6. Results of Expert Research Data Analysis

No	Expert	Total Score	Percentage	Criteria
1.	Media Savvy	34	94,44%	Very Valid
2.	A materially sophisticated	48	92,31%	Very Valid
3.	Linguist	43	89,58%	Very Valid
4.	Instrument	18	90%	Very Valid
Average Validity			**91,6%**	**Very Valid**

From the table above, it can be concluded that the product developed in the form of an e-module is declared very valid with the total average value given by the validator is 91.6%. Then for the revision stage that needs to be improved to improve the e-module, namely the content and design of the e-module.

Implementation

The activity stage in the form of a limited-scale trial was carried out on 6 students of class XI IPA 5 SMA Negeri Pakusari. The following are the results of the limited-scale trial data analysis:

Table 7. Results of limited-scale trial data analysis

No	Criteria	Frequency	Percentage
1.	Thorough	6	100%
2.	Not Thorough	0	0%

From the table above, it can be concluded that the completeness achieved is 100% of 6 students. Thus, the e-module on a limited scale trial can be categorized as very effective. Then it can be continued on a large-scale trial with 22 students of class XI IPA 5 SMA Negeri Pakusari. The following are the results of the wide-scale trial data analysis:

Table 8. Results of Wide-Scale Trial Data Analysis

No	Criteria	Frequency	Percentage
1.	Thorough	19	86,36%
2.	Not Thorough	3	13,64%

The table above shows that the completeness achieved is 86.36% of the 22 students. Thus, the e-module on a large scale trial can be categorized as very effective. After the trial activity was completed, students were asked to fill out a student

response questionnaire to determine the level of practicality of the e-module. The following are the results of student response questionnaire data analysis:

Table 9. Results of Student Response Questionnaire Data Analysis

Item	Score Number for item	Percentage	Criteria
1	89	79,46%	Practical
2	90	80,36%	Practical
3	89	79,46%	Practical
4	91	81,25%	Very Practical
5	91	81,25%	Very Practical
6	89	79,46%	Practical
7	88	78,57%	Practical
8	85	75,89%	Practical
9	94	83,93%	Very Practical
10	90	80,36%	Practical
11	87	77,68%	Practical
12	94	83,93%	Very Practical
Average percentage of practicality		**80,13%**	**Practical**

Evaluation

At this stage the researchers conducted a practicality test and a test of the effectiveness of the research product development. After going through several stages of research and development, the quality of the developed e-module has been declared very valid with an average percentage of expert assessment of 91.6%, very effective with an average percentage of learning outcomes tests of 93.18%, and practical with the average percentage of student response questionnaires is 80.13%. Thus, the product in the form of an ethnomathematics-based e-module on Jember batik motifs for high school students has met the three product quality categories stated by Nieveen, namely validity, effectiveness, and practicality.

3.2 Discussion

The results of expert validation have met three product quality categories of validity, effectiveness, and practicality of quality. The developed e-module has been declared very valid with an average percentage of expert assessment of 91.6%, very effective with an average percentage of learning outcomes tests of 93.18%, and practical with an average percentage of student response questionnaires of 80.13%. This is reinforced by the results of previous studies, namely:

Opinion 1

Ethnomathematics has the concept of geometric transformation. The developed e-module is based on ethnomathematics and contains the concept of geometric transformation in Jember batik motifs in the form of translation, reflection, rotation, and dilation. That is, this e-module is in accordance with the opinion (Hartindya, 2019).

Opinion 2

Creating learning resources with ethnomathematical elements. This research and development resulted in learning resources in the form of e-modules based on ethnomathematics on Jember batik motifs for high school students who had gone through various stages of development so that they could be said to be feasible to use. That is, this learning resource is in accordance with the opinion Khofifah et al. (2018).

Opinion 3

Utilization of batik motifs in learning mathematics. The e-module that was developed based on ethnomathematics using the Jember batik motif was integrated from the material in mathematics learning in the form of geometric transformations and introduced that Jember batik motifs could be used as learning materials for mathematics. That is, this e-module is in accordance with the opinion Ulum et al. (2017).

4. Conclusion

The product in the form of an ethnomathematics-based e-module on Jember batik motifs for high school students has met three product quality categories of validity, effectiveness, and practicality of quality. The developed e-module has been declared very valid with an average percentage of expert assessment of 91.6%, very effective with an average percentage of learning outcomes tests of 93.18%, and practical with an average percentage of student response questionnaires of 80.13%.

References

Abi, Alfonsa M. (2016). Integrasi Etnomatematika dalam Kurikulum Matematika Sekolah. Jurnal Pendidikan Matematika Indonesia, 1(1): 1-6

Afriliziana, L.A, Maimunah, M., Roza, Y. (2021). Analisis Kebutuhan Pengembangan E-Modul Etnomatematika Berbasis Budaya Melayu Kepulauan Riau. Jurnal Analisa, 7 (2): 135-145.

Akbar, S. (2013). Instrumen Perangkat Pembelajaran. Bandung: PT Remaja Rosdakarya.

Branch, R.M. (2009). Instructional Design: The ADDIE Approach. New York: Springer.

Fadila, Abi. (2017). Penerapan Geometri Transformasi

pada Motif Batik Lampung. Prosiding Seminar Nasional Pendidikan "Membangun Generasi Berpendidikan dan Religius Menuju Indonesia Berkemajuan". 365-370.

Hartindya. (2019). Etnomatematika pada Motif Batik Jember Sebagai Bahan Pembelajaran Geometri Siswa. Skripsi. Universitas Jember.

Hobri. (2010). Metode Penelitian Pengembangan (Aplikasi pada Penelitian Matematika). Jember: Pena Salsabila.

Ira, Agnes. (2011). Eksotisme Batik Jember. Jember: Penerbit Buku Utama.

Khofifah, L; Sugiarti, T; Setiawan, T. B. (2018). Etnomatematika Karya Seni Batik Khas Suku Osing Banyuwangi sebagai Bahan Lembar Kerja Siswa Materi Geometri Transformasi. Kadikma. 9(3): 148-159.

Nur, A.S et al. (2020). Contextual learning with Ethnomathematics in enhancing the problem solving based on thinking levels. Jurnal of Research and Advances in Mathematics Education, 5(3): 331-344.

Normina. (2017). Pendidikan dalam Kebudayaan. Ittihad Jurnal Kopertais Wilayah XI Kaliamantan, 15(28): 17-28.

Rosa, M. & Orey, D.C. (2011). Ethnomathematics: the cultural of mathematics. Revista Latinoamericana de Etnomatemática, 4(2): 32-54.

Sintiya, M.W; Astuti, E.P; Purwoko, R.Y. (2021). Pengembangan E-modul Berbasis Etnomatematika Motif Batik Adi Purwo untuk Siswa SMP. Jurnal Pendidikan Matematika Raflesia, 6 (1): 1-15.

Ulum, B; Budiarto, M.T; Ekawati, R. (2017). Etnomatematika Pasuruan: Eksplorasi Geometri untuk Sekolah Dasar pada Motif Batik Pasedahan Suropati. Prosiding Si Manis (Seminar Nasional Integrasi Matematika dan Nilai Islami), 1(1):70-78.

Utami, R.E; Nugroho, A.A; Dwijayanti, I; Sukarno, A. (2018). Pengembangan E-modul Berbasis Kemampuan Pemecahan Masalah. JNPM (Jurnal Nasional Pendidikan Mate matika, 2 (2): 268-283.

Wahyuni, A; Tias, A.A.W; Sani, B. (2013). Peran Etnomatematika dalam Membangun Karakter Bangsa. Prosiding Seminar Nasional Matematika dan Pendidikan Matematika "Penguatan Peran Matematika dan Pendidikan Matematika untuk Indonesia yang Lebih Baik". Yogyakarta: 9 November 2013. 114-118.

Widoyoko, S.E.P. (2009). Evaluasi Program Pembelajaran. Yogyakarta: Pustaka Pelajar.