Artikel 2.8 Ethnomatematics based E Module

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Journal of Positive Psychology & Wellbeing
2022, Vol. 6, No. 1, 2813 – 2823

http://journalppw.com
ISSN 2587-0130

Ethnomathematics-based E-Module Development for Improving Conjecturing Ability in Object Configuration Materials

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Abstract

Student learning activities at school have shifted from face-to-face to online learning as a result of Covid 19 pandemic. Therefore, technology-based learning gadgets are required, one of which is the use E-Module which allows students to study independently from home using a smartphone or laptop. E-Module development must be tied to the local culture in order for students to learn in a relevant and engaging manner. To the date, school-taught object configuration material has rarely been linked to woven fabric motifs, *sasak*, or traditional *sasak* games. The goal of this project is to create a legitimate, practical, and successful *Sasak* culture ethnomathematics- based E-Module to help students enhance their object configuration conjecturing abilities. This study applied a 4D development model consisting of 4 stages including 1) defining, 2) designing, 3) developing, and 4) disseminating. The e-module was validated by 2 lecturers from mathematics education and two junior high school mathematics teachers. Learning Implementation Plans (RPP), E-Modules, and conjecturing ability tests were among the validated instruments. In this study, 35 students from class VII B SMPN 6 Mataram were taken as test participants. Data was analyzed using a quasi-experimental approach with a pretest and post-test control group. The findings of the pretest and posttest utilizing the e-Module were utilized to determine the development of students' speculation abilities using the pre-test and post-test control group designs. With an average score of 3.60, the validation test reveals that the ethnomathematics-based e-Module is very practicable to utilize as a learning resource. According to the results of the student response questionnaire analysis, the e-Module fell into the practical area with an 89 percent practicality rate. The findings of data analysis using the independent sample T-Test revealed a T-test value of 0.00 0.05, indicating a significant difference in the results. To summarize, the ethnomathematics-based e-Module has proven to be valid, practical, and useful in improving students' ability to conjecture on object configuration material.

Keywords: E-Module, Ethnomathematics, Conjecturing, Konfigurasi objek

INTRODUCTION

The Covid-19 epidemic has ushered in a new normal period marked by significant shifts in human life. People are forced to employ technology to promote online learning in schools as a result of the pandemic (Papadakis, Kalogiannakis, Zaranis, 2021). Students can continue to learn online from home without needing to meet in person with technological advancements. Despite this, teachers still need to develop learning media that can be accessed through cellphones or laptops to help students learn from home, one of which is by E-Module (Handayani et al., 2021). The utilization of E-Module offers various advantages, including remote accessibility (Furenes et al., 2021).

E-Modules must be visually appealing in order for students to grasp the material's content and achieve learning objectives. Linking the module to local culture is one of the attempts done to make it engaging. The ethnomathematical approach is particularly essential in mathematics education since the content taught is linked to local culture (Nur et al., 2020), especially *Sasak*. The pattern of woven fabrics and *Sasak* tribe are examples of Sasak ethnomathematics that can be found in the object configuration material. Because students' activities in building knowledge and understanding concepts are identical to their cultural characteristics, an E-Module based on ethnomathematics, particularly on object configuration material, must be designed so that students' activities in building knowledge and understanding concepts become meaningful.

Observations and interviews with teachers in four Mataram junior high schools revealed that the mathematics learning process was still primarily centered on textbooks/students, with technology applications was infrequently used. Learning resources were rarely aligned with local cultural norms, resulting in less meaningful learning for students. According to the results of surveys distributed in four junior high schools, 60% of students struggled to understand mathematics texts. Integrating local wisdom can, in fact, result in meaningful learning. The use of local wisdom in learning activities offers an innovative and enjoyable learning environment, allowing students to realize that their everyday experiences are remarkably similar to what they learn in school. Furthermore, incorporating local wisdom into the learning process will have a great impact on student character and can help them attain academic success (Larkin & Calder, 2016). Furthermore, Lombok offers a diverse range of cultures that can be incorporated into educational materials, such as woven fabrics, traditional dwellings, specialty dishes, and traditional musical instruments.

Mathematics can't stand on its own; it's influenced by the cultural components of their existence (Risdiyanti & Prahmana, 2018; Rosa et al., 2011; Utami et al., 2020). One method of merging mathematics and culture is ethnomathematics (Pathuddin et al., 2021; Prahmana et al., 2021). Ethnomathematics is a type of mathematics learning innovation that aims to make mathematics learning more relevant, motivating students, and allowing them to be more creative while solving math problems.

Indonesia is an archipelagic country consisting of various ethnic groups and cultures. This factor is an opportunity for mathematics education to take advantage of aspects of local culture so that it can foster a sense of love for the homeland and also build good character in children. Ethnomathematics-based teaching materials on object configuration materials need to be designed to provide opportunities for junior high school students to develop their potential according to the characteristics of the local area and build their knowledge, one of which is building conjecturing abilities.

Conjecturing is an expression of mental activity to solve problems based on prior knowledge, the truth of which needs to be proven. Mental activity is a process that occurs in the mind to build a conjecture. A conjecture is a statement about all possible cases based on empirical facts, but with an element of doubt (María C. Cañadas et al., 2007). Conjectures are statements based on empirical facts, which have not been validated (Maria C Cañadas & Castro, 2007). Furthermore, it is said that the process of building a conjecture is called the conjecturing process (Sutarto et al., 2020).

No previous research has focused on developing an ethnomathematical-based e-Module of Sasak culture on object configuration material and analyzing the effectiveness of an ethnomathematical-based e-Module in terms of conjecturing ability. Therefore, this study aims to develop a valid, practical, and effective E-Module based on Sasak culture to improve students' conjecturing abilities on object configuration material. The indicators of conjecturing ability in research included 1) observing cases, 2) organizing cases, 3) finding and predicting patterns, 4) finding and predicting patterns, 5) formulating conjectures, 6) validating conjectures, and 7) justifying generalizations.

METHOD

This is a development research that adopts the 4D model: define, design, develop, and disseminate (Thiagarajan, et al., 1974). In producing quality products, the E-module is made based on Nieveen's (1991) criteria including valid, practical, and effective.

Research subject

This research was conducted in August-October 2021 in one of the junior high schools in the city of Mataram, West Nusa Tenggara in class VIII 2020/2021. The number of subjects in this study were 30 students.

Research Design

The present study uses a 4D development model which consists of 4 stages including 1]) defining, 2) designing, 3) developing, and 4) disseminating.

Defining

First, the researcher analyzed the curriculum related to the Core Competencies and Basic Competencies of object configuration material. Second, the researcher analyzed the characteristics of students, the level of students' cognitive development and students' motivation through observation activities during the learning process in the classroom and interviews with teachers and students. Third, the researcher explored the content of the material in the module which will be developed through activities of detailing, identifying, and systematically compiling the material. Fourth, the researcher explored the concepts of object configuration that are relevant to be taught. Fifth, the researcher identified tasks, questions, and exercises.

Designing

At the design stage, the researcher designed and made the design of the E-Module. The content raised was object configuration material associated with the weaving pattern of *Sasak* tribe. Before designing the E-Module, the researcher needed to prepare a test to measure the level of students' initial conjecturing ability, so that the E-Module was prepared according to the characteristics of the students. After the three stages were carried out, an ethnomathematics-based e-Module design was made.

Developing

At the development stage, the researcher conducted expert validation and development testing. Expert validation aimed to validate or assess the feasibility of the e-Module, lesson plans and student conjecturing ability tests developed by people who are experts in their fields. Expert validation consisted of two mathematics education lecturers and two seventh grade mathematics teachers at SMPN 6 Mataram. After receiving an assessment and suggestions for revision from the validator, the researcher made improvements to the e-Module. The four aspects of validation included content, presentation, language, and e-Module design components validations. If the validator has stated that the e-Module is valid, then the researcher can continue at the trial stage on the research subject.

The practicality of the E-Module was measured using student response questionnaires and interviews. After the researcher implemented the E-module, students were given a response questionnaire and asked to fill out the response questionnaire. The researchers also conducted interviews with teachers and students to determine the extent of student responses after using the E-Module. E-module is practical if the results of the questionnaire analysis of student responses are at least in the attractive category (at least 61%).

The effectiveness of the E-Module was measured from the results of the analysis of students' conjecturing abilities on the use of electronic modules which are measured using a test/problem in the form of a description of the object configuration material, totaling 5 questions. The effectiveness of the e-Module was seen from the paired sample T test to compare the results of the pretest and post-test.

Dissemination

At the dissemination stage, researchers conducted socialization through the e-Module link. They are distributed via Whatsapp Groups and youtube. The dissemination stage aims to disseminate the e-Module.

Data analysis technique

E-module Validity Analysis

The questionnaire instrument was used for expert validation in order to get a valid e-Module based on the description of the experts. Expert validation consists of two mathematics learning experts and two practitioners.

Table 2. Validity of E-Module

No	Score	Validation Criteria
1	$3 \leq x \leq 4$	Very valid
2	$2 \leq x < 3$	Valid
3	$1 \leq x < 2$	Fairly valid
4	$0 \leq x < 1$	Invalid

The average score obtained from the validity assessment was then calculated using the following formula:

$$\bar{X} = \frac{\sum x}{n}$$

Where:

$\bar{X}$: Average of score

$\sum x$: Total of each statement

n : Number of validators

Practicality of e-module

The practicality of the e-module is determined from the students' responses in answering the questionnaire. E-module is said to be practical if the student's response in answering agrees and strongly agrees is more than equal to 60%.

Table 2. Practicality of e-Modules

No	Score	Validation Criteria
1	$R \geq 80\%$	Very Practical
2	$60\% \leq R < 80\%$	Practical
3	$40\% \leq R < 60\%$	Fairly Practical
4	$20\% \leq R < 40\%$	Impractical
5	$R \leq 20\%$	Very impractical

E-module effectiveness

Data analysis in this study used a quasi-experimental design with a pretest and post-test control group design. The pre-test and post-test control group designs were used to determine the development of students' conjecture abilities through the results of the pretest and posttest in the use of the e-Module.

Problem solving tests were used to obtain data about students' conjecturing abilities. Assessment of students' conjecturing abilities using the indicators in Table 1.

Table 1. Conjecturing capability indicators

Stages of Conjecturing Process	**Indicator**
Observing the case	Initial activities carried out on certain cases of the proposed problem
Organizing cases	Activities that involve the use of strategies to organize objects systematically and facilitate work in certain cases
Finding and predicting patterns	Activity when observing a recurring and regular situation and imagining that the pattern might hold for subsequent unknown cases
Formulating the Conjecture	The activity of making statements based on empirical facts, but with an element of doubt
Validating the conjecture	Activities undertaken to justify conjectures generated on a specific case basis but not in general
Generalizing the conjecture	Activities about changes in belief related to the resulting conjecture, that the conjecture holds in general
Justifying generalizations	Activities carried out to convince others that the resulting conjecture is true

The effect of using e-Module on conjecturing ability was measured by analyzing student scores. The instrument used to assess the conjecturing ability is a pretest and posttest which consists of one descriptive question. The effect of using e-Module on conjecturing ability was obtained through a paired sample T-Test with SPSS 17.00 for windows. For the paired sample T test, the data used must be normally distributed to analyze the data obtained. This value determines the decisions taken in the study.

RESULTS AND DISCUSSION

The results of this study are presented in each stage of the 4D development model.

1.1 Defining Stage

At the definition stage, the researcher determines the Core Competencies and Basic Competencies that will be developed related to the object configuration material. Based on the results of the initial analysis, the researcher found that the students' conjecturing ability when solving object configuration problems was low. So far, especially on motorcycle taxi configuration, students are only involved with routine questions in textbooks with assessments that emphasize cognitive aspects only.

1.2 Designing Stage

At the designing stage, the researcher carried out several design stages including 1) test preparation, 2) media selection, and 3) format selection. At the test preparation stage, the researcher arranged a test in the form of 3 problem solving object configuration questions, such as determining the nth sasak weaving pattern. E-Module material based on ethnomathematics is integrated with elements of Sasak culture which includes Sasak weaving motifs. The integration of Sasak culture aims to motivate the rest in learning mathematics, make learning more meaningful, and make students aware of the benefits of learning mathematics in real life.

1.3 Developing Stage

At the development stage, the researchers conducted validation tests and e-Module testing. At this stage the researchers also produced a draft module based in revision after receiving input from experts and data obtained through small-scale trials. Expert validation was carried out by two mathematics education lecturers and two class VIII teachers (see Table 2). Practicality and effectiveness of the e-Module was obtained from the results of testing activities. The researchers provided a questionnaire and interviews regarding their responses after using the E-Module.

E-module validity

Table 2. E-module validity

No	Validator	Score	Validation Criteria	Information
1	X-1	3.55	Very Valid	No revision
2	X-2	3.58	Very Valid	No revision
3	X-3	3.63	Very Valid	No revision
4	X-4	3.65	Very Valid	No revision
	Average	3.60	Very Valid	No revision

Table 2 shows that the average value of the e-module validation is 3.60, in other words the e-module is very valid (mean score $3 \leq x \leq 4$).

Practicality of e-module

Based on the results of interviews and questionnaires, the module is in the very practical category with a score of 89.66% (the number of students who answered strongly agree and agree). Table 3 is the result of the analysis of the questionnaire.

Tabel 3. Indicators of the e-Module Usage Questionnaire

No	Indicators	Percentage of Student Responses in Each Category (%)			
		Strongly agree	Agree	Disagree	Strongly Disagree
Content Aspect					
1.	The material presented is following the learning objectives	76.67	16.67	3.33	3.33
2.	The learning steps in the E-Module are easy to follow	70.00	20.00	6.67	3.33
3.	The activities in the module are fun because they relate to the life around students.	73.33	16.67	3.33	6.67

Language Aspect					
4.	The e-Module can be read clearly	73.33	20.00	3.33	3.33
5.	The material presented is in easy-to-understand	60.00	26.67	10.00	3.33
6.	The language used is communicative	56.67	33.33	6.67	3.33
7.	Instructions for use, learning objectives, and learning activities in the E-Module are pretty clear	60.00	30.00	3.33	6.67
Benefit Aspect					
8.	Easy-to-use	66.67	23.33	6.67	3.33
9.	It triggers me to study harder	56.67	33.33	6.67	3.33
10.	The availability of pictures in the module makes it easier for me to do practical activities	60.00	23.33	10.00	6.67
Average		**65.33**	**24.33**	**6.00**	**4.33**

Based on Table 2, students gave a positive response to the presence of the e-Module. Students find it easy to understand the material after the e-module. The competency test at the end of the module can measure students' conjecturing abilities. Activities on e-modules are always associated with the local culture of the Sasak tribe, such as patterns on woven fabrics, special foods, and traditional houses. The following are the results of interviews between researchers and students and researchers with teachers. From the results of interviews with students and teachers, the existence of E-Modules can stimulate pupils to learn.

Interviews between researchers and students

R : *Do you understand the material easily after learning activities are associated with Sasak culture?*

S1 : *Yes, it's easier for me to understand, ma'am. I often see the examples and pictures shown on E-Modules.*

R : *What was your first impression when the teacher linked learning activities with Sasak culture?*

S1 : *It's fun, because honestly, I've never studied mathematics before when it comes to traditional Sasak houses, Sasak food, and Sasak handicrafts. It's different from the textbooks we've studied so far.*

R : *What was your first impression when working on the E-module?*

S1 : *I am more motivated to do ma'am because of curiosity. The pictures are good, the design is also good. It is also easier for me to understand this material after working on the E-Modul*

Interviews between researchers and teachers

R : *Do you think this E-Module can help students understand object configuration material?*

T1 : *Yes, because the integration of E-Modul and Sasak culture makes learning more meaningful, it turns out that mathematics is close to their daily lives.*

R : *After this lesson, will you use this E-Module for further learning?*

T1 : *Yes, I will use this E-Module*

E-Module Effectiveness

The effectiveness of the e-module was carried out with the Independent sample T-Test. This study used two classes; experiment and control. The experimental class utilized an ethnomathematics-based e-Module for learning, while the control class used a print module.

Before further analysis, normality test was performed. The number of samples in this study was 50 students. After the analysis, the results of the pretest both the experimental class and the control class showed that there were no significant similarities or differences as shown in Table 4 and Table 5.

Tabel 4. The results of pretest data analysis

Group	N	Mean	Std. Deviation	Std. Error Mean
Experiment Class	25	1.5875	.78385	.14127
Control Class	25	1.5442	.69145	.12443

Based on Table 4, the average score of the experimental class students was 1.5875 with a standard deviation of 0.78385, while the average score of the control class students is 1.5442 with a standard deviation of 0.68145. Table 5 shows that the data obtained from the pretest score between the two groups is [t(25) = 0.368, p>0.05], which means that there is no significant difference. The results of data analysis using the independent sample T-Test showed that the experimental class and control class students had the same ability before being given treatment.

Table 5. The comparison of pretest score using independent sample T-Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	Df	Sig. (2-tailed)	Mean Difference	Std. Error Di ference	95% Confdence Interval of the Difference	
									Lower	Upper
Pre-test	Equal variances assumed	.827	.368	.177	58	.860	.03333	.188327	.34350	.41017
	Equal variances not assumed			.177	57.097	.860	.03333	.18826	.34363	.41030

Table 6. The results of post-test data analysis

Group	N	Mean	Std. Deviation	Std. Error Mean

Experiment Class	25	4.3557	1.37653	.25145
Control Class	25	2.7567	1.07272	.19573

From table 6, the average score of the experimental class students was 4.3557 with a standard deviation of 1.37653, while the average score of the control class students was 2.7567 with a standard deviation of 1.07272. Table 7 shows that the post-test value between the experimental and control classes was 0.00 (p = <0.05), meaning that there was a significant difference. Based on the results of the independent sample T-Test analysis, it was concluded that after treatment using the E-Module there was a significant effect.

Table 7. The comparison of the post-test score using independent sample T-Test

		Levene Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Post-test	Equal variances assumed	3.437	.069	5.021	58	.000	1.60000	.31864	.96217	2.23783
	Equal variances not assumed			5.021	54.728	.000	1.60000	.31864	.96136	2.23864

Students' conjecturing abilities were improved because to the creation of an ethnomathematical-based e-Module. They gave a favourable response to the use of e-Module based on the findings of interviews with teachers and students. Because children's lifestyles during the COVID-19 epidemic are very similar to that of smartphone users, the employment of E-Modules in education is a good fit. E-Module is used as a learning tool to overcome the drawbacks of utilizing ineffective textbooks, in which students are less motivated to study because they merely read books rather than absorbing more relevant information (Larkin & Calder, 2016). The use of information and communication technology (ICT) can help students learn mathematics by increasing their engagement, motivation, persistence, and curiosity, as well as overcoming hurdles (Papadakis et al., 2021). The tasks in this e-module are related to the stages of conjecture, which include: 1) seeing cases, 2) organizing cases, 3) detecting and forecasting patterns, 4) writing conjectures, 5) validating conjectures, and 6) generalizing patterns. Students were given illustrations/cases relating to the pattern on the sasak woven fabric and requested to observe the case in the first stage. Students are instructed to find and predict the third, fourth, and fifth patterns, and then to develop the n-th pattern. The goal of this stage of speculation is to strengthen students' reasoning skills so that they can formulate the n-th pattern or generalize patterns, and are actively involved in finding and solving problems.

CONCLUSION

According to the validity test, ethnomathematics-based e-Module is very viable to use in learning resources with an average score of 3.60 (valid). According to student questionnaire responses e-Module has a practicality rate of 89 percent. The paired sample T test, which compares the results of the pretest and post-test with an outcome of 0.00 (p = 0.05) indicating that there was a significant difference and the effectiveness of the e-Module. In short, adopting an ethnomathematics-based e-Module had a significant impact on students' metacognitive skills in solving spatial issues.

RECOMMENDATION

There are still some gaps in the exercise or variation of test questions. For further research, it is required to look into cultural characteristics that may be raised as issues in the object configuration material.

ACKNOWLEDGMENT

I would like to convey my heartfelt gratitude to the Ministry of Education, Research, and Technology for their cooperation through the applied research grant No. 314/E4.1/AK.04.PT/2021.

REFERENCES

[1] Cañadas, María C., Deulofeu, J., Figueiras, L., Reid, D., & Yevdokimov, O. (2007). The Conjecturing Process: Perspectives in Theory and Implications in Practice. *Journal of Teaching and Learning*, *5*(1). https://doi.org/10.22329/jtl.v5i1.82

[2] Cañadas, Maria C, & Castro, E. (2007). A proposal of categorisation for analysing inductive reasoning. *Pna*, *1*(2), 67–78.

[3] Furenes, M. I., Kucirkova, N., & Bus, A. G. (2021). A Comparison of Children's Reading on Paper Versus Screen: A Meta-Analysis. In *Review of Educational Research* (Vol. 91, Issue 4). https://doi.org/10.3102/0034654321998074

[4] Handayani, D., Elvinawati, Isnaeni, & Alperi, M. (2021). Development Of Guided Discovery Based Electronic Module For Chemical Lessons In Redox Reaction Materials. *International Journal of Interactive Mobile Technologies*, *15*(7), 94–106. https://doi.org/10.3991/ijim.v15i07.21559

[5] Larkin, K., & Calder, N. (2016). Mathematics education and mobile technologies. *Mathematics Education Research Journal*, *28*(1), 1–7. https://doi.org/10.1007/s13394-015-0167-6

[6] Nur, A. S., Waluya, S. B., Rochmad, R., & Wardono, W. (2020). Contextual learning with Ethnomathematics in enhancing the problem solving based on thinking levels. *JRAMathEdu (Journal of Research and Advances in Mathematics Education)*, *5*(3), 331–344. https://doi.org/10.23917/jramathedu.v5i3.11679

[7] Papadakis, S., Kalogiannakis, M., & Zaranis, N. (2021). Teaching mathematics with mobile devices and the Realistic Mathematical Education (RME) approach in kindergarten. *Advances in Mobile Learning Educational Research*, *1*(1), 5–18. https://doi.org/10.25082/amler.2021.01.002

[8] Pathuddin, H., Kamariah, & Ichsan Nawawi,

M. (2021). Buginese ethnomathematics: Barongko cake explorations as mathematics learning resources. *Journal on Mathematics Education*, *12*(2), 295–312. https://doi.org/10.22342/jme.12.2.12695.295-312

[9] Prahmana, R. C. I., Yunianto, W., Rosa, M., & Orey, D. C. (2021). Ethnomathematics: Pranatamangsa system and the birth-death ceremonial in yogyakarta. *Journal on Mathematics Education*, *12*(1), 93–112. https://doi.org/10.22342/JME.12.1.11745.93-112

[10] Risdiyanti, I., & Prahmana, R. C. I. (2018). Etnomatematika: Eksplorasi dalam Permainan Tradisional Jawa. *Journal of Medives : Journal of Mathematics Education IKIP Veteran Semarang*, *2*(1), 1. https://doi.org/10.31331/medives.v2i1.562

[11] Rosa, M., D'Ambrósio, U., Orey, D. C., Shirley, L., Alangui, W. V., Palhares, P., & Gavarrete, M. E. (2011). *Current and future perspectives of ethnomathematics as a program*.

[12] Sutarto, Dafik, Hastuti, I. D., & Surahmat. (2020). An analysis of students' difficulties in conjecturing process of block paving problems. *Journal of Physics: Conference Series*, *1465*(1). https://doi.org/10.1088/1742-6596/1465/1/012073

[13] Utami, N. W., Sayuti, S. A., & Jailani. (2020). An ethnomathematics study of the days on the javanese calendar for learning mathematics in elementary school. *Elementary Education Online*, *19*(3), 1295–1305. https://doi.org/10.17051/ilkonline.2020.728063

Artikel 2.8 Ethnomatematics based E Module

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