Available online athttps://journal.rescollacomm.com/index.php/ijqrm/index

International Journal of Quantitative Research and Modeling

e-ISSN 2721-477X
p-ISSN 2722-5046

Vol. 4, No. 2, pp. 76-81, 2023

The Ethnomathematical Concept of Sundanese Local Wisdom through Building Space for the Earth Alit Kabuyutan West Java Site as the Development of Mathematics Learning Media

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Abstract

This research is motivated by the preservation of Sundanese culture in West Java which must be instilled in students through learning mathematics and students' mathematical understanding abilities. Based on this problem, an ethnomathematical-oriented learning media device for Sundanese local wisdom was developed through the spatial construction of the Bumi Alit Kabuyutan Site. The purpose of this study was to find out what types of buildings can be used as learning media for mathematics in Geometri and produce valid, practical, and effective mathematics learning media tools for the preservation of Sundanese culture as well as students' mathematical understanding abilities. The research method used is a mixed, namely the Plomp development method and the experimental method. The subjects in this study were class VIII Junior High School Bakti Nusantara in Bandung, West Java, with the sample consisting of 3 classes, namely the limited trial class, the control class, and the experimental class. The research instruments used include validation sheets, student activity observation sheets, implementation sheets of learning media devices, and student response questionnaires, and data collection techniques used include observation, interviews, and questionnaires. The ability of students' mathematical understanding of the geometrical material was measured using a student's mathematical understanding ability test. Data were analyzed by normality, homogeneity, and One Way ANOVA using SPSS. The results showed that (1) the resulting learning tools were valid, practical and effective, (2) the results of the One Way ANOVA test obtained a p-value 0.003 (sig < 0.05) value which indicates that the implementation of the developed learning tools has a significant effect. significant to the preservation of Sundanese culture and the ability of students' mathematical understanding.

Keywords: Ethnomathematical, Plomp development method, Learning media

1. Introduction

Local wisdom is the original knowledge of a community that comes from noble cultural values in the environment where they live for generations (Tilaar et al., 2011; Purba et al., 2020). Various matters regarding local wisdom are applied in mathematics learning with the aim of preserving the culture that students have in accordance with the environment in which they live, and strengthening students' character towards the cultural values that belong to the Indonesian nation. Someone who studies local wisdom in their education will raise the quality of the human resources themselves to be virtuous, civilized, and knowledgeable in science who are qualified in various scientific fields. From the application of local wisdom to learning mathematics, the character that is generated is that someone will have the ability to distinguish between good and bad actions in solving various life problems (Lawanda, 2008).

Learning that applies human activity to cultural values contained in their respective environments or local wisdom in terms of learning Mathematics is known as Ethnomathematics (Anisa et al., 2023; Marlina, 2020; Narulita et al., 2019). Ethnomathematics in the application of mathematics learning can take advantage of the natural environment in Indonesia, one of which is the traditional englek game which is a game that is widely known by many people, this game can be applied to flat shape material (Marlina et al., 2022; Marlina &, 2018). Utilization of culture as a context or learning media will provide messages, and character values to students in solving problems well in everyday life (Pirie & Kieren, 1994). This is supported by the results of previous research regarding the use of ethnomathematics-based mathematics teaching materials is better than learning that does not use ethnomathematics- based mathematics teaching materials (Marlina, 2019; Anisa at el., 2023). Ethnomathematics-based learning is in accordance with the current Mathematics learning curriculum, namely the independent learning curriculum. The implementation of the independent learning curriculum has learning objectives that uphold character education, and apply Pancasila values

(Marlina et al., 2022). Thus the concept of local wisdom ethnomathematics learning needs to be developed in mathematics learning. The local wisdom that will be discussed in this article is the development of a Mathematics learning media using Sunda culture located at the Bumi Alit Kabuyutan Site, Bandung Regency with the material being developed is material for class 7 junior high school classrooms.

The Alit Kabuyutan Earth Site is located in Lebakwangi Village, Arjasari District, Bandung Regency, West Java, Indonesia. Within this site area there are two buildings namely Bale Panglawungan, which is a place commonly used for organizational gatherings, and the Bumi Alit Kabuyutan traditional house which is the main building, this traditional house is one of the legacies of their ancestors whose authenticity is continuously maintained. Then, from the shape of the Bale Panglawung building, and the Bumi Alit Kabuyutan traditional house, it was analyzed and observed by grade VIII junior high school students as teaching material on geometric shapes. This learning is a contextual learning model in the process of learning mathematics in schools. The competence or achievement of the expected learning objectives is to improve students' mathematical understanding abilities.

The ability to understand mathematics is the ability of students who need knowledge to understand the meaning of a mathematical concept, increase the capacity of inductive and deductive reasoning, so that they can solve mathematical problems smoothly (Pirie & Kieren, 1994). Mathematical understanding skills obtained from geometric material through ethnomathematics based on local wisdom at the Bumi Alit Kabuyutan site can be obtained from an understanding of the shapes of a Bale Panglawung building and the Bumi Alit Kabuyutan traditional house into the concept of building space taught in class VIII junior high school.

2. Literature Review

2.1. History of the Alit Kabuyutan Earth Site

The Bumi Alit site is a place on the edge of a lake which is sacred to the local community because there are several unsolved mysteries. The Bumi Alit Kabuyutan site means a small house left by the ancestors. This site is located in Lebakwangi Village, the meaning of this place comes from the Sundanese language which consists of two words Lebak which means lower and Wangi means fragrant. This place is a lowland which is famous for its fragrant services of a figure from Embah Panggung Jayadikusumah who has various skills, supernatural powers and leadership along with four of his confidants, namely Embah Suta. Apart from that, Lebakwangi comes from Tanjungwangi, consisting of two words namely Tanjung which means land that juts into the ancient Bandung lake due to the damming of the Ancient Citarum river by the material of the second devastating eruption of Mount Sunda, and Wangi means fragrant.

2.2. Local Wisdom in the Region of the Alit Kabuyutan Earth Site

Local wisdom from the Alit Kabuyutan Earth Site has Sundanese cultural values that were handed down from generation to generation by their ancestors in the area of Lebakwangi Village, Bandung, West Java. Within this site area there are two buildings, namely Bale Panglawung, and the Bumi Alit Kabuyutan traditional house. Bale Panglawung, which is a place usually used for organizational gatherings with a building area of 10 x 10 square meters, is in the form of a pavilion which was built in 2010 with assistance from the West Java Provincial Government. Meanwhile, the traditional house of Bumi Alit Kabuyutan with a building area of 5 x 6 square meters is in the form of a stilt house, as was the case with Sundanese houses in ancient times. The building faces North, and most of the materials are made of bamboo, and wood. On the front there are three ladder, and on the inside it consists of three rooms. The buildings on the Bumi alit Kabuyutan Site are shown in Figure 1, and Figure 2 below.

Figure 1: Bale Panglawungan

Figure 2: The Bumi Alit Kabuyutan Traditional House

2.3. The Ethnomathematics Concept of Sundanese Local Wisdom at the Bumi Alit Kabuyutan Site as a Media for Learning Mathematics

Ethnomathematics is mathematics that arises from human activity in an environment that is influenced by culture (Anisa et al., 2023). Ethnomathematics emerges as a new concept which is a reciprocal influence between mathematics, education, culture, and politics. Ethnomathematics is stated as a study of the mathematical ideas that exist in every culture, how they express the specific contexts of a culture will be different (Anisa et al., 2023). The difference is not in the ability to think abstractly logically, but in the subject's thinking, the basic cultural assumptions, and what situations arise during the thinking process learning. The abilities learned in this geometric material are contextual or realistic mathematical concepts obtained from concrete learning at the Bumi Alit Kabuyutan Site.

3. Materials And Methods

This type of research is mixed methods research which combines developmental research and experimental research. Research using mixed methods is a research approach that combines qualitative research and quantitative research (Creswell, 2012). Developmental research and experimental research were carried out at Bakti Nusantara Middle School at the beginning of 2021/2022 even semester. The subjects in this study were class VIII students of junior high school in Bandung, West Java, with the sample consisting of 3 classes, namely the limited trial class, the control class, and the experimental class. The research instruments used included validation sheets, observation sheets of student activities, implementation sheets of learning media devices, and student response questionnaires as well as data collection techniques used including observation, interviews, and questionnaires. The ability of students' mathematical understanding of geometric material was measured using a test of students' mathematical understanding ability. Data were analyzed by testing normality, homogeneity, and One Way ANOVA using SPSS.

3.1. Development Method

This study uses 4 stages of the Plomp model, namely the initial investigation phase, the design phase, the realization or construction phase, and the test, evaluation, and revision phase. At the implementation stage, it was carried out in schools that were very limited in the scope of the research implementation, namely during a limited trial to determine the validity, practicality, and effectiveness of the developed learning tools. This development method produces a learning tool in the form of a lesson plan, student worksheets, and tests of mathematical understanding of geometric material.

3.2. Data and Data Sources

Data sources in qualitative research to measure the validity, practicality, and effectiveness of learning tools that have been developed through research instruments include validation sheets, observation sheets of student activities, learning tools sheets, and student response questionnaires. Data collection techniques used include observation, interviews, and questionnaires. After the learning device developed was declared valid, it was continued to the experimental research method with the research subject being class VIII of SMP Bakti Nusantara.

3.3. Experimental Method

In this study, the design used was a non-equivalent control group design using two experimental classes with 30 students and one control class with the same number of students. The two classes are taught by the same teacher but with different treatments. The experimental class used an ethnomathematics-oriented learning tool for the local wisdom of Sunda Bumi Alit Kabuyutan and the control class used a conventional learning tool. This study provides an overview of the comparison between improving students' mathematical understanding skills in the experimental class and the control class. The design of the research scheme for the experimental class and control class can be seen in Table 1.

Table 1: Experiment Class and Control Class Research Design

Experiment Class	O_1	X_1
Control Class	O_2	X_2

Information:
O_1, O_2: Pretest
O_3, O_4: Postest
X_1: The use of ethnomathematics-oriented learning tools for the local wisdom of Sunda Bumi Alit Kabuyutan.
X_2: Use of conventional learning devices.

The data obtained from this study were analyzed by carrying out normality tests, homogeneity tests, and hypothesis testing on the data that had been obtained. The normality test is used to determine whether the research data is normally distributed or not. The homogeneity test is used to determine whether the variance of the two research samples is homogeneous or not. The One Way ANOVA test is used to test the hypotheses that have been previously proposed.

4. Results And Discussion

The process of developing learning tools with the ethnomathematics concept of local wisdom of Sundanese culture through spatial construction on the Alit Kabuyutan Earth Site goes through the following stages:

4.1. Initial Investigation Phase

The first stage, the initial investigative activities carried out were collecting information about Sundanese local wisdom at the Alit Kabuyutan Earth Site and analyzing its use in learning Mathematics in geometrical material. Analyzing any building forms that can be applied to the learning of flat-sided shapes taught in grade VIII junior high schools.

4.2. Design Phase

In the second stage is to make a learning design with the ethnomathematics concept of Sundanese local wisdom obtained from the initial phase regarding the Alit Kabuyutan Earth Site with any form of building that can be realized into Mathematics learning with geometric material.

4.3. Realization or Construction Phase

At this stage, realizing ethnomathematics-oriented learning tools with Sundanese local wisdom contained in the Alit Kabuyutan Earth Site into geometrical learning. An example of the results of this phase is shown in Figure 3 below.

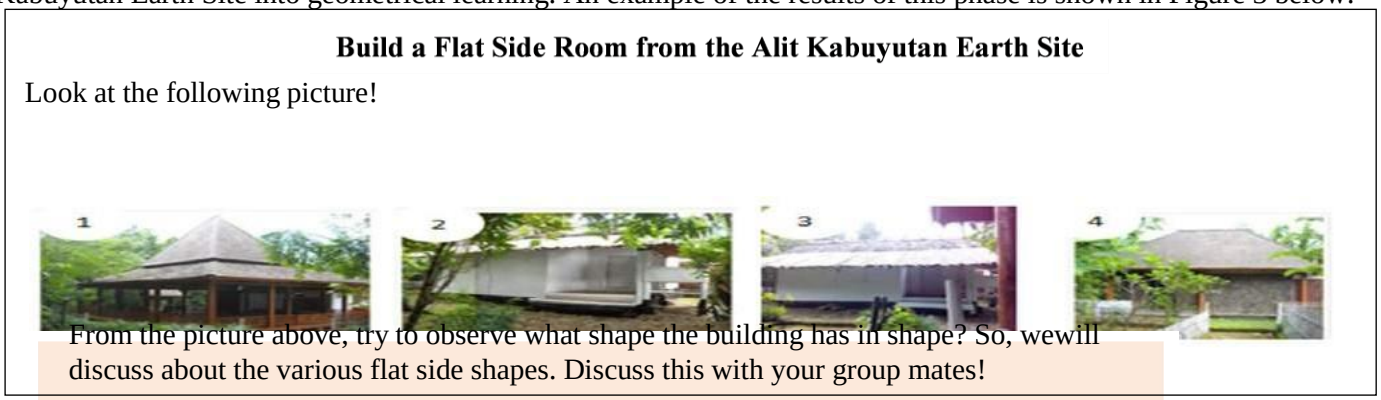

Figure 3: Ethnomathematics-Oriented Learning Tools with Sundanese Local Wisdom

5. Test, Evaluation, and Revision Phase

At this stage, the activities to be carried out include evaluation, product validation by several experts, revision of product validation results, and limited trials to determine the practicality and effectiveness of the product. Validation is carried out by providing learning tools that have been developed by experts and practitioners. The validation results are used to conduct limited trials to determine practicality and effectiveness.

The results of the validation of learning tools with the ethnomathematics concept of local wisdom at the Alit Kabuyutan Earth Site are presented in Table 2 below.

Table 2: Validation Test Results

No.	Learning Media	Validation Results	Criteria
1	Spatial Building Competency Achievement Indicator	3.84	Valid
2	Lesson plan	3.81	Valid
3	Building Space Teaching Materials	3.75	Valid
4	Student worksheet	3.79	Valid
5	Student Learning Evaluation Test	3.76	Valid

Based on the validation results of Table 2 above, it can be concluded that the learning tools developed are categorized as valid so that their practicality and effectiveness can be known.

Table 3: Practicality Test Results

No.	**Activity**	**Aspect Value**	**Kategori**
1.	Meeting 1	98. 6 %	Very good
2.	Meeting 2	95. 8 %	Very good
3.	Meeting 3	98. 2 %	Very good
4.	Meeting 4	100 %	Very good
	Aspect Average	98.15 %	Very good

Table 4: Effectiveness Test Results Based on Student Responses

No	Activity	Aspect Value
1	Strongly agree	0.89
2	Agree	8.5 %
3	Disagree	2.5 %
4	Don't agree	0
	Average Response	98.15 %

Based on the results of the validation test, practicality test, and effectiveness test (Table 2 to Table 4), it was concluded that the results of developing learning tools with the ethnomathematics concept of Sundanese local wisdom through the construction of Earth Site Space Alit Kabuyutan meet the valid, practical and effective criteria. Quantitative research was obtained from the results of a one-way ANOVA test. The prerequisite test that was carried out previously was to carry out a normality test with normally distributed data results and a homogeneity test with homogeneous data results. Analysis of the post-test data normality test showed that the p-value of the experimental class was 0.10 and that of the control class was 0.10, while the homogeneity test of the experimental class and the control class was 0.34. Based on these results indicate that the significance value of the two classes is more than 0.05 (Sig > 0.05). So that the data of the two classes are normally distributed and homogeneous. After knowing the results of the prerequisite test, the next step is to carry out a one-way ANOVA test. Based on the results of a one-way ANOVA test with a p-value of 0.003 (Sig < 0.05). So it can be concluded that after being given treatment there is a significant difference in the ability to understand mathematics between the experimental, and control classes.

6. Conclusion

Based on the results of the study it can be concluded that learning tools with the concept of local wisdom of Sundanese culture through the spatial structure of the Alit Kabuyutan Earth Site are valid, practical, and effective. The implementation of learning tools that have been developed has a significant influence on the preservation of Sundanese culture and students' mathematical understanding of geometric material. Student responses to the use of learning tools that use the concept of local wisdom of Sundanese culture through the geometry of the Alit Kabuyutan Earth Site.

Acknowledgments

We would like to thank the Chancellor of Bale University, Bandung, who has motivated us to be active in the International Conference on Engineering, Technology, Economics, Social Affairs, and Health Sciences (ICOETESAH 2022), Bandung, December 17, 2022.

Our thanks also go to the principal of Bakti Nusantara Junior High School who has allowed us to research Mathematics learning in class VIII with learning media using local wisdom located at the Bumi Alit Kabuyutan Site. As well as thanks to the Head of Lebakwangi Village who has allowed us to research on Mathematics learning at the Alit Kabuyutan Earth Site which is located in the area.

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