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Development of Ethnomathematics-Based Learning Media Material Two-Variable Linear Equation System

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Abstract

This study intends to investigate the impact of ethnomathematics on students' comprehension of a system of linear equations with two variables. Ethnomathematics is a way of learning mathematics that involves adapting mathematical concepts to the customs or culture of a particular population. The regional cuisine of Wonogiri serves as an example of the ethnomathematics culture studied in this study. The raw materials used to make food are used in research on regional cuisine from Wonogiri since the food composition varies depending on the region. The ADDIE (Analysis, Design, Development, Implementation, and Evaluation) method is employed in this study. The subject of this study is presented in PowerPoint as a two-variable linear equation system made up of ethnomathematics. SMPN 2 Giriwoyo pupils in grade VIII served as the study's subjects. Learners, media experts, material specialists, and math education professionals all paid close attention to this study. The information was gathered via a questionnaire and practice questions completed by 23 students and the validation of experts and learning practitioners. Students' comprehension of the subject matter of two-variable linear equations is improved, and their motivation to learn is raised by using PowerPoint learning materials based on ethnomathematics. Additionally, the creation of ethnomathematics-based PowerPoint teaching resources contributes to the preservation of local culture.

INTRODUCTION

As scientific and technological advancements have recently accelerated globally, inspiring the population to stay up with new advances is essential. This generation will need many abilities in the twenty-first century, including literacy, morality, and skills. According to the Big Indonesian Dictionary, education alters one's or a group's attitudes and behaviour to that of adult humans through teaching and training efforts, educational procedures, ways, and acts. Education is one way to improve human resources.

According to [1], teachers are at the frontline of education, where teachers need to have exciting learning strategies so that students can enjoy and understand the material. Five materials can be applied in the Industrial Revolution Era 4.0, namely: 1) helping students in learning, 2) students to develop and excel, 3) providing Strengthening Character Education, 4) being literate

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in technology, and 5) being an effective teacher.

The Erlangga Team focuses on AKM SMA [2] said that mathematics can be formed through the results of human thought that relate to ideas, processes, and reasoning. Mathematics can be formed from one's experience and daily activities. According to Rokhim [3], one way to develop mathematical creativity in students is by integrating mathematical and cultural content into meaningful education. Learning by combining mathematics and culture can help students' creativity and create the culture that exists in an area.

According to the Directorate of Primary Schools [4], ethnomathematics is a learning method that can combine mathematics and culture. So ethnomathematics can be said to be mathematics learning that is learned using the surrounding culture. The culture in question can be in the form of traditional food, traditional houses, patterns on batik cloth or woven cloth, and so on. Mathematics learning can also be integrated with social values unique to an area, such as children's games, activities carried out by the community daily, the environment, and the use of regional language [5]. In line with this opinion, [6] said that ethnomathematics is a mathematics found in a culture. Culture is the form of community habits found in an environment. The groups in question are working groups, students, professional classes, rural or urban communities, and others. Based on this statement, it can be seen that ethnomathematics is a culture and activity in an area carried out daily to form a pattern of mathematical calculations.

Learning on the two-variable Linear Equation System material in schools usually only focuses on the learner's handbook. The material contained in the book is still mostly not related to the area where students live. This results in students being less able to imagine or understand the material provided by the teacher. When solving problems involving two-variable linear equation systems, students frequently make the following five mistakes: errors in reading, errors in understanding, errors in transforming, errors in process skills, and errors in writing responses [7]. Realizing that for pupils to readily comprehend the system of two-variable linear equations, this statement needs to be integrated with the local culture and mathematics.

According to [8][8], the errors committed by students in problem-solving include their inability to translate problem sentences into mathematical sentences, their lack of correctness, their lack of experience solving mathematical problems in the form of tales, and their lack of comprehension of the questions. Juwita and Zahra also said that the factor causing the mistakes of the students mentioned the most is not understanding the questions given. This statement is in line with the opinion of [9][9], saying that ethnomathematics aims to know how learners can understand, connect, process data, and finally solve problems using concepts and practices related to daily activities.

Powerpoint learning media makes the subject more engaging, encouraging students to learn more actively. This makes it easier for students to comprehend the material. This claim is consistent with studies from Budasi [10], which found that using PowerPoint as a learning tool can boost students' motivation and performance.

Research on ethnomathematics has been carried out by several researchers, such as [4], [11], [12], [13], [14], and The Integration of Community Culture In Mathematics Learning: Examples In Learning Two-Variable Linear Equation Systems [5]. Based on the description, researchers will develop learning tools, particularly on the Two-Variable Linear Equation System material with Wonogiri area food. The creation of learning resources attempts to facilitate

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students' comprehension of the subject matter in practical terms. It can also encourage students to acquire a sense of nationalism and learn more about local customs.

METHODS

This study falls under the category of research and development. The Research and Development method, according to Sulistiyoningsih [15] in his book, is a method where a study will result in a product in a particular field of research that is effective in the product being developed. According to Nur Rohma [16], who agreed with this viewpoint, development research is creating and validating products for use in education.

The ADDIE development model was employed in this study. Analyse, Design, Development, Implementation, and Evaluation is the acronym for ADDIE. Acronyms also denote the ADDIE model's steps. Sanvi and Diana [17], created the ADDIE model, which was utilized to develop educational systems. The ADDIE paradigm can generate various products, including learning models, instructional resources, learning strategies, and learning media [18].

The study aimed to identify the function and impact of ethnomathematics in the teaching and learning of systems of two-variable linear equations in mathematics. Twenty-three students completed surveys and practice questions to collect the data. Before being tested on students, specialists and learning practitioners evaluate the two-variable linear equation system in PowerPoint learning media.

RESULTS AND DISCUSSION

Five stages make up the ADDIE method research process: analysis, design, development, implementation, and evaluation. The investigation's findings were as follows.

Analyze stage

1. Analysis of learner needs

   This stage gathers information about how students struggle to solve issues because they don't understand the concepts involved in the two-variable linear equation system. Learning motivation is also one of the problems students have; they lack the motivation to learn due to the mindset they have instilled in them that mathematics is a complex subject. One of the reasons students do not comprehend the information of the two-variable linear equation system is that they have not had enough practice answering the questions.

2. Material analysis

   The material for the System of Two-Variable Linear Equations will be developed in this study. The preparation of the material is based on the applicable 2013 curriculum and the teacher's handbook. The material discussed in this learning media is the understanding, form, characteristics, elements, requirements, and operations of a system of two-variable linear equations, explanations of ethnomathematics, examples of problems, and practice problems in everyday life.

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Design stage

The learning media developed is ethnomathematics-based *PowerPoints, an approach to preserving* regional culture. The stages of designing the module are carried out as follows:

1. Preliminary design

   The basic design is done by deciding why learning material should be created. Developing educational media aims to improve students' comprehension of the Two-Variable Linear Equation System content by making engaging educational media that will keep students interested and motivated to learn more. Based on this, researchers created learning media with PowerPoint media that would better interest students. Learning media using PowerPoint and meters that have been designed require a storyboard so that when compiling PowerPoint, it will be easier and more efficient. The ethnomathematics-based learning media storyboard is presented in Figure 1 below:

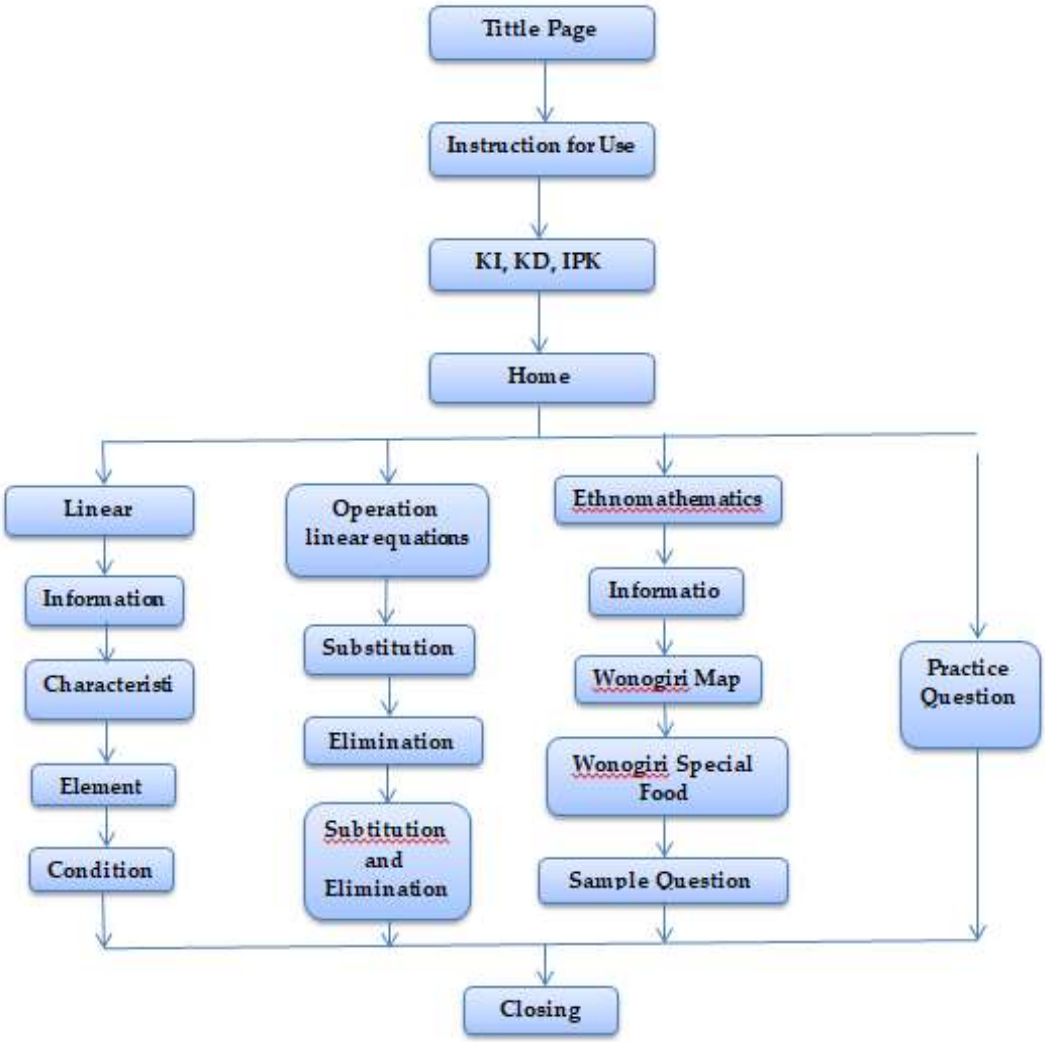

Figure 1. Storyboard PowerPoint

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2. Instrument design

   Questionnaires and question exercises are the study tools used to assess the effectiveness of the learning resources created. Instruments will be given to material experts, media experts, and mathematics subject teachers to determine whether learning media is worth testing for learners. The questionnaire will be given to students after the product is declared suitable for use.

Development

Learning media was developed to help students understand the material and preserve Wonogiri regional food. This phase entails creating, revising, and validating the product with the help of learning specialists, media experts, and material specialists.

1. Product Manufacturing

   a. Frontpage reaction

      The front page contains information on the primary material to be studied

Figure 2. PowerPoint title page

   b. Instruction for the use of PowerPoint

      This page shows the buttons available on the PowerPoint that will be used when applying learning media.

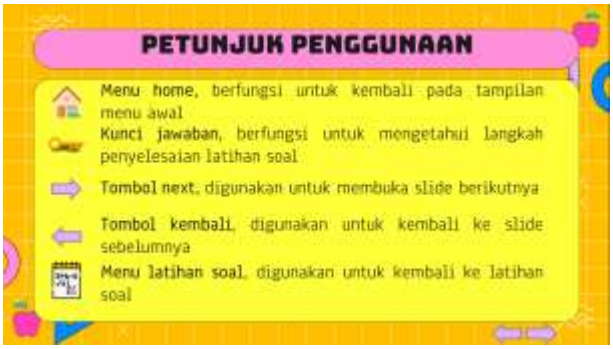

Figure 3. Instructions for use

   c. Main page

      Discussion points for the Two-Variable Linear Equation System are included on the

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main page.

Figure 4 Main page

d. Content page

This page contains the discussion on the main page, which will be explained in more detail. In addition, on the content page are examples of problems, practice questions, and answer keys from practice questions.

The topics covered on the first page are the comprehension of a system of two-variable linear equations, as well as its properties, components, and needs. When a point is clicked, it will take you to the page corresponding to the desired title.

Figure 5. Two-variable linear equation system explanation

This page serves as the entry point for a system of linear equations with two variables and several forms of solutions or operations. Substitution, elimination, and mixture are the operations in question.

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Figure 6 Two-variable linear equation system count operations

This page is the first page of the explanation of what ethnomathematics is. In addition to the explanation of ethnomathematics, there are various Wonogiri specialties, ingredients for making Wonogiri specialties, and illustrations of systems of two-variable linear equations coupled with Indonesian culture.

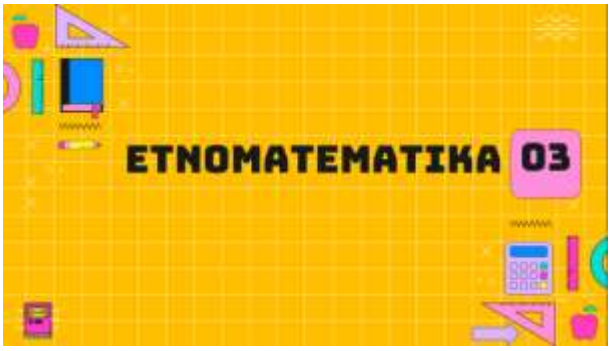

Figure 7. Explanation of Ethnomathematics

This page shows some Wonogiri specialties. Typical food is one of the cultures or customs of a region, so it can be stated that regional food is included in ethnomathematics.

Figure 8. Wonogiri area food

On the page of examples of problems and practice questions, it can be said that the problem is ethnomathematics because of the issue of using the food of the Wonogiri area, which is the culture of the area itself.

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Figure 9 Examples of problems

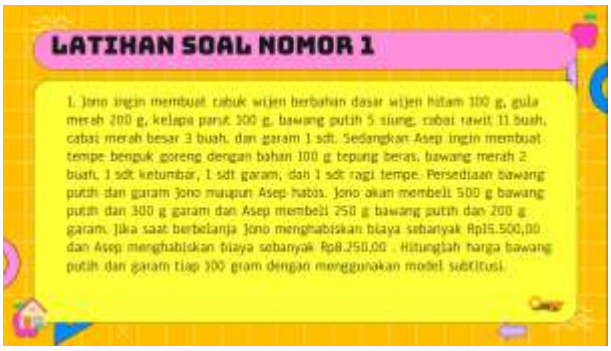

Figure 10 Practice Questions

e. Final words

The closing page is a thank you to the students and educators using this PowerPoint.

Figure 11 The closing page

2. Product revision

This lesson has to be adjusted again in light of some feedback from material experts, media experts, and media learning practitioners. Product revision aims to improve the products made in the manufacturing process so that the product is worth testing for students.

a. Change the button icon so that it is easier to understand
b. Adding KI, KD, and IPK

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c. Change the title of the main page
d. Adding Wonogiri map
e. Changing the problem to match ethnomathematics
f. Simplify the practice page of the questions

3. The validation results of experts state that the learning media is valid and worth testing for students.

Implementation

Table 1 below provides information on the outcomes of the questionnaire that students completed:

Table 1. Student questionnaire results

	Mean	Information	N
Language	4.025	Valid	4
Compatibility	3.971	Valid	7
Material conformity	4.4	Highly valid	2
Media display	4.3	Highly valid	2
Suitable practice question	4.087	Valid	16
Total			

Table 1 shows that students typically complete a questionnaire in its entirety and receive a score of 4.087, where the value is found in the vulnerable value $3.4 < X \leq 4.2$. The X score is the total validation score of the student questionnaire results. Therefore, it can be argued that the two-variable linear equation system based on ethnomathematics is a legitimate or practicable teaching tool. According to Dahlan [5] research, ethnomathematics allows pupils to develop motivation, knowledge, and mathematical skills.

Evaluation

The findings of the evaluation of PowerPoint learning media content for an ethnomathematics-based two-variable linear equation system by material experts, media experts, learning practitioners, and student questionnaires are appropriate for use in education. The learning media is expected to help educators describe the details of a system of two linear equations.

This research takes the form of creating PowerPoint learning resources based on ethnomathematics. According to Zulkardi's [19] study, PowerPoint media can boost students' academic achievement and learning motivation more than traditional teaching techniques. In agreement with this viewpoint, Sundayana [20] claimed that using PowerPoint can boost student enthusiasm since it allows for active participation, preventing students from becoming quickly bored while learning. Additionally, teachers' use of electronic media will make it simpler for them to set up the classroom so that learning can go effectively and efficiently [21]. Based on this assertion, it can be concluded that using PowerPoint media can boost student knowledge by allowing for active participation in the learning process. The claim is consistent with research that has been done.

A mathematical idea that exists in a society is called ethnomathematics. According to

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Andiani [5], in the Lebak community, traditional foods, kid's games, mother tongue, and daily activities are examples of ethnomathematics. Regional specializations can be applied to one-variable linear equations and equations, statistics and probability, as well as arithmetic [22]. Brazil-based scholar D'Ambrosio created and developed ethnomathematics. Because the issues are more realistic and relevant to local culture, using ethnomathematics in mathematics education aids students in understanding mathematical ideas [23]. From some of these viewpoints, it is clear that using ethnomathematics makes it simpler for pupils to comprehend mathematical ideas. The application of ethnomathematics can aid in the preservation of regional culture in addition to making mathematical concepts more straightforward to understand. This study used the customary meal from the Wonogiri region as the culture. Experts claim that while using regional meals may seem simple, doing so can be challenging because many foods are the same in different areas. Researchers must conduct a further examination to confirm that the dish is a staple of the Wonogiri region. Using traditional meals and activities to incorporate mathematical ideas into students' minds makes ethnomathematics attractive and relevant [24].

According to [25], students' difficulties in addressing problems involving two-variable linear equation systems are due to their usage of justifications for the issues, the creation of mathematical models, and computation processes (addition, subtraction, multiplication, and division). According to research by [7], formulating conclusions and justifications for questions makes solving a system of two-variable linear equations challenging. However, it can be observed in one of the students' assignments in Figure 12, where they can provide justifications, convert linguistic problems into mathematical equations, employ the procedures of substitution and elimination, and write conclusions. They can finish the task because it is the same as other students' work.

CONCLUSION

The study's results on learning media include that the students will more readily comprehend the information when mixed with local culture, and ethnomathematics plays a role in studying mathematics material system two-variable linear equations. Ethnomathematics in Wonogiri regional food can be seen based on its composition, where each region has different food ingredients. The PowerPoint learning media has been designed with valid findings that allow the learning media to be used by students, according to the evaluation of subject matter experts, media specialists, and learning practitioners.

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