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Development of Learning Media for Ethnomathematics and Culture of Lampung with the *Powtoon* Application

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ABSTRAK

Penelitian ini bertujuan untuk mengembangkan media pembelajaran Matematika menggunakan aplikasi *Powtoon* berbasis etnomatematika. Jenis penelitian ini adalah penelitian pengembangan dengan menggunakan model pengembangan Borg and Gall. Pengembangan media dilakukan pada materi bangun datar segitiga dan segiempat SMP Kelas VII. Instrumen pengumpulan data yang digunakan dalam penelitian ini adalah angket ahli media, ahli materi yang digunakan untuk menguji kualitas media pembelajaran *Powtoon* berbasis etnomatematika, dan angket respon siswa untuk menguji ketertarikan terhadap media yang dikembangkan. Metode pengumpulan data yang digunakan dalam penelitian ini berupa wawancara, dokumentasi dan angket. Penelitian ini menghasilkan produk berupa media pembelajaran *Powtoon* berbasis etnomatematika. Hasil penilaian oleh ahli media mendapatkan skor 88% dengan kategori sangat layak, penilaian dari ahli materi memperoleh skor 87% dengan kategori sangat layak, sedangkan berdasarkan uji coba pada siswa kelas VII SMP Ma'arif 1 Metro yang berjumlah 22 siswa memperoleh skor 80% dengan kategori layak. Pengembangan media pembelajaran *Powtoon* berbasis etnomatematika tersebut layak dan dapat digunakan oleh guru dan siswa sebagai media pembelajaran.

Kata Kunci: Pengembangan, Media Pembelajaran, Etnomatematika, Budaya Lampung, *Powtoon*

ABSTRACT

This study aims to develop Mathematics learning media using ethnomathematics based Powtoon applications. This study is using the Borg and Gall development model. Media development were carried out on two-dimentional figure triangle and quadrilateral theory of Class VII Junior High School. Data collection instruments used were media expert questionnaires, theory experts were requested to test the quality of mathematics-based Powtoon learning media, and student's response questionnaires to evaluate their interest in the developed media. Data collection methods used are form of interviews, documentation and questionnaires. This research resulted in ethnomathematics based Powtoon learning media. The results of the assessment by media experts scored 88% classified in very feasible category, the assessment of the material experts obtained a score of 87% classified in very feasible category, whereas trials on VII grade students of Ma'arif 1 Metro SMP with total of 22 students obtained a score of 80% classiefied in feasible category. The development of ethnomathematics based Powtoon learning media is feasible and can be used by teachers and students as learning media.

Keywords*: Development, Learning Media, Ethnomathematics, Lampung Culture, Powtoon*

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INTRODUCTION

Learning is formulated to face the challenges of 21st-century education. For the following reason, the role of teachers is very important in supporting the implementation of more advanced education (Wahyudi et al., 2019). With the qualification possessed by teachers, it is expected that they can compete in improving the quality of education (Subandi, Choirudin, Mahmudi, Nizaruddin, & Hermanita, 2018). One of them is to develop interesting learning media.

The interview result with the Mathematics teacher of SMP Ma'arif 1 Metro, during the learning process, the teacher mostly used worksheets and other reference books as a form of their learning media. This tends to make students lose their attention to the theory explanation by the teacher. The teacher also uses a grouping method in the learning process, but this has not been able to improve the student's enthusiasm when learning. Principally, the school has already owned supporting facilities and infrastructure such as LCD projectors and computer labs. However, this facility has not been utilized optimally by teachers to teach Mathematics. In order to overcome this, solutions must be provided immediately, one of which is by using learning media that can improve student's interest and motivation, specifically in the form of audiovisual *Powtoon* media.

Powtoon Media is an online-based media that can be accessed through the internet and available for free. The final result from the *Powtoon* media is an animated video. In terms of operation, it is also not far different from video playback which is usually done on a computer or laptop in general. By utilizing *Powtoon* as a learning media, it is expected that it can provide solutions and help teachers in their teaching process as well as the optimization of school facilities. Based on research conducted by Pangestu and Wafa (2018), *Powtoon* is an interesting media to use as a learning channel. Meanwhile, Wafa (2019), stated that *Powtoon* application can be used to increase student motivation. The *Powtoon* application is considered more effective based on the assessment of media experts and material experts. The effectiveness of the media can be observed through the significant improvement in the class's control and the treatment. It shows that the experimental group performed better than the control group after getting treated. You can combine other approaches such as ethnomathematics. Ethnomathematics is utilized to explore objects that are still abstract in mathematics so that students can understand them. This is also a manifestation of growing his love for local culture (Choirudin, Ningsih, Anwar, Choirunnisa, & Maseleno, 2019; Malalina, Putri, Zulkardi, & Hartono, 2020).

Ethnomathematics itself was first coined by Brazilian mathematician Ubiratan D'Amborsio in 1977. Ethnomathematics can be defined as mathematics in culture. Or ethnomathematics language comes from the word "ethno" which refers to cultural aspects that include language, ethnicity, customs, behavior, and certain symbols in the culture of society. While the word "mathema" can be defined as the activity of counting, counting, measuring, and concluding. And the word "tics" comes from the word techne which means technique. Rosa et al. (2016) also stated that "On the other hand, there is a reasonable number of pieces of literature on these

anthropologists. Creating a bridge between anthropologists and historians of culture and mathematicians is an important step to recognize the various modes of thought which may lead to a different form of mathematics; this is the field which we may call ethnomathematics."

Based on several previous recent studies on the development of learning media and ethnomathematics (Astika, Anggoro, & Andriani, 2019; Choirudin, Ningsih, Anwar, Sari, & Amalia, 2020; Hardiarti, 2017; Malalina et al., 2020; Pangestu & Wafa, 2018; Wafa, 2019), this study focuses on utilizing *Powtoon* application learning media in describing the ethnomathematical values of a two-dimensional subject.

According to Putri (2017), student's learning activities ultimately depend on the culture of each individual. Likewise, mathematics as a part of a culture is the reason to integrate culture into learning. It is proven by the existence of objects in Mathematics that have socio-cultural-historical values (Pratami, Pratiwi, & Muhassin, 2018).

This is an innovative way of creating learning environments as well as learning experiences. The writer then uses an ethnomatic approach by using the audio-visual *Powtoon* application, therefore it can form a solution in delivering interesting information in mathematics learning media. At the same time, being able to introduce local culture in the surrounding environment.

RESEARCH METHODS

This type of study uses the Borg and Gall research model that has ten stages. However, this research method is limited to seven stages, namely potentials and problems, data collection, product design, design validation, design revision, product testing, product revision. The data collection techniques used were interviews, questionnaires, and documentation. While the data analysis in this development research uses a quantitative descriptive analysis technique. The data obtained came from the results of the needs analysis and validation questionnaire analysis of material experts, media experts, and student responses. The validation percentage of experts, the average of each section, is calculated using the formula (Herwati, 2016):

$$p = \frac{f}{N} \times 100\%$$

P = Percentage of validators (results are rounded up to an integer)

f = Total score for each selected criterion

N = Total maximum score

The data from the expert validation questionnaire were analyzed using a Likert scale, as follows:

Table 1. Qualification level of achievement (Novianti & Susilowibowo, 2015)

Assessment	Interpretation Criteria
$81\% < x \leq 100\%$	Very feasible
$61\% < x \leq 80\%$	feasible it
$41\% < x \leq 60\%$	Pretty decent
$21\% < x \leq 40\%$	Unfeasible
$0\% < x \leq 20\%$	Very Unfeasible

The criteria for response behavior toward product results from development and research are as follows:

Table 2. Likert Scale (Sugiyono, 2016)

Assessment	Score
Very interesting	5
Interesting	4
Quite interesting	3
Less attractive	2
Very Less Attractive	1

RESEARCH RESULTS AND DISCUSSION

1. Potentials and Problems

a. Potential in Ethnomathematics

Lampung culture has several potentials heritage that can be correlated with learning mathematics, including the Lampung authentic traditional fabric (filter) with a silver star pattern which has the concept of kite geometry (Maskar & Anderha, 2019), geometry transformation in a form of rotation, and reflection on traditional "intestines" embroidery (Isnawati & Putra, 2017), dimensional geometry three in the traditional house of Lampung (Pratami et al., 2018), the concept of numbers in the determination of Lampung traditional money (Nurhasanah, 2019).

The ethnomathematics concept contained in these parts of the culture shows that Lampung heritage has great potential for mathematics learning which includes counting, measuring, designing, and grouping activities.

b. Needs Analysis

The research result in the field includes problems that often occur, which are obtained from needs analysis data. The results percentage of the needs analysis regarding students' enthusiasm for Mathematics.

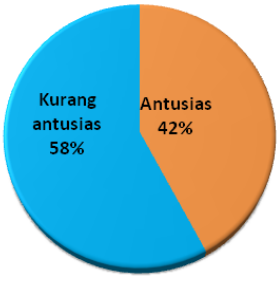

Figure 1. Student Needs Analysis Results

Essentially the learning process applied by the teacher uses a scientific learning model adapted to the 2013 curriculum. The scientific learning model is a student-centered learning process. The learning method applied by the teacher does not use interactive media and only uses the group learning method. The media used by the teacher during the learning process are worksheets and printed books. These two media has not shown optimum results. Based on Figure 1, the results obtained are 42% of students who are interested in learning Mathematics. There are various challenges experienced by students. Among them are easy to feel bored, too many formulas to memorize, dislike calculating, and did not understand the subjects.

The availability of facilities and infrastructure in schools is yet to overcome the low enthusiasm of students towards learning mathematics. Thus, it is necessary to develop new learning media to broaden students' insights such as audio-visual *Powtoon* animation. Therefore, the learning process is more effective and varied.

2. Data Collection

At this stage, the researcher collected several references that were considered relevant for developing learning media. Such as pictures and animations related to ethnomathematics, as well as other accompanying music that are used to complement the needs in developing ethnomathematics-based *Powtoon* learning media. The sources obtained came from the internet, research journals such as Numerical, Algebra, and related Axiom journals, ethnomathematics or learning media, reference books on instructional media, and books on *Powtoon* design.

3. Product Design

a. The Initial Look of The Powtoon Media

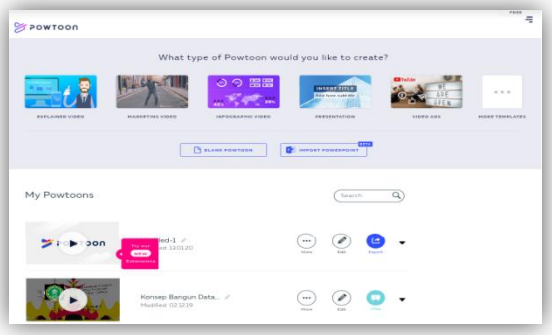

Figure 2. The *Powtoon* Initial Look

b. Create A Powtoon Design

On this page, the *Powtoon* design is made with an attractive background and variety of characters so that students do not get bored while enjoying the explanation of the subjects. The following is a *Powtoon* design with an ethnomathematical approach:

1) Display design and subjects beginning

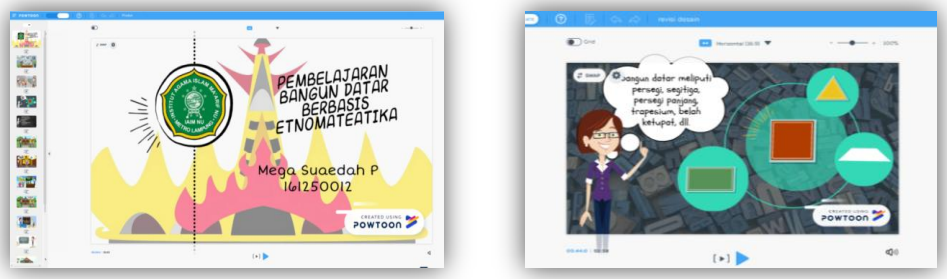

Figure 3. Title and Material Display

The design of the beginning section of the media consists of the title of the material, the creator's name, and the agency logo which is presented with the background of Siger Lampung as one of Lampung's cultural identities. Figure 3 contains the definition of the two-dimensional subjects and examples of two-dimensional shapes such as levels, squares, triangles, and rectangles which are equipped with the animation of a female teacher.

2) Ethnomathematics Design on *Powtoon*

The design in *Powtoon* media is correlating the two-dimensional subjects into the ethnomathematical concept. In this section, the subject is presented by exploring Lampung heritage and mathematics. The researcher used Lampung's traditional house and Lampung filter as an ethnomathematical exploration.

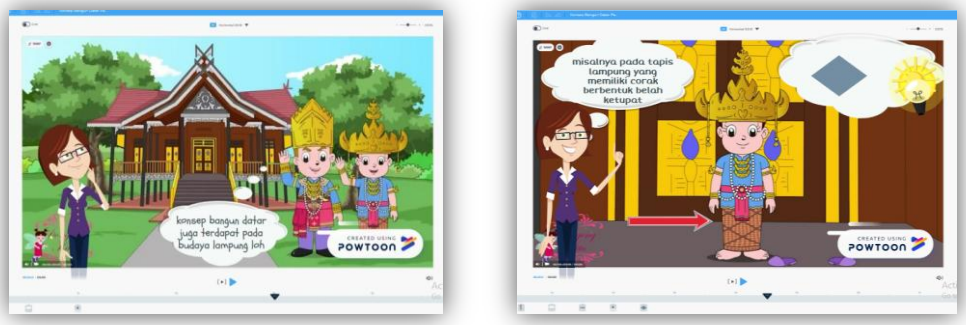

Figure 4. Ethnomathematics display on the *Powtoon*

Figure 4 shows the students that Lampung's heritage and Mathematics correlate with each other, such as in the construction pattern of traditional houses and the authentic Lampung clothing, namely the filter. The concept of rhombus in the Lampung filter is shown by a red arrow and presented with a *background* of traditional Lampung nuances and animation.

Table 3. Subject Display on *Powtoon*

Subject Display	Information
 Circumference and area of the rhombus	The rhombus formula is displayed with traditional Lampung nuances
 The square on the filter	The rectangle on the elephant and boat pattern on the filter is shown with arrows and is completed with animation. Apart from the Lampung filter, researchers also connect the two-dimensional theory with the traditional Lampung house.
 The rectangle on a traditional house	The rectangular part of the traditional house is shown by a red arrow. The subject is presented with animation and *background of* the traditional Lampung house.
 Trapezoid on the roof of the house	A trapezoid shape on the roof of a traditional Lampung house presented with an animation of a female teacher and a student.

4. Design Validation

a. Media expert validation

The results from the media expert validation showed the total score of the assessment was 66 with 15 assessment criteria. In the software aspect, the feasibility score was 90%. While the visual communication aspect feasibility score was 87%. Hence, the total final score obtained is 88%.

Table 4. The Media Expert Validation Result

	Score	Criteria
Software	90%	very feasible
Visual Communication	87%	very feasible
Final Score	88%	very feasible

Based on these results, it can be concluded that the ethnomathematics-based *Powtoon* learning media can be categorized as very feasible.

b. Subjects Expert Validation

The results from the subjects' expert validation showed the score from subjects expert assessment was 109 with 15 assessment criteria. In the material aspect, the score was 88%, the question aspect was 93%, the implementation aspect was 100%, and the language aspect was 82%.

Table 5. The Material Expert Validation Result

	Score	Criteria
Materials	88%	very feasible
Questions	93%	very feasible
Aplication	100%	very feasible
Language	82%	very feasible
Final Score	87%	very feasible

The final score obtained from the validator's assessment is 87%. Therefore, The material contained in the ethnomathematics-based *Powtoon* development can be categorized as very feasible.

5. Design Revision

After validating the media design being developed, the next step is to improve the design. During the design improvement, suggestions were obtained from the subject experts and media experts as validators which are then used as materials to improve the initial product.

6. Product Trial

After revising the design, the next step is to test the product in the actual scenario. The results from product trials can be seen in Figure 5.

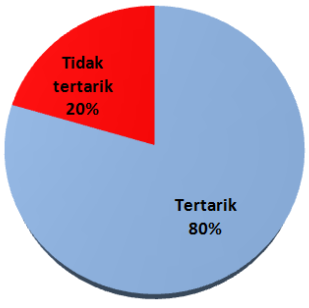

Figure 5. Product Trial Results

Based on the trials results conducted in VII B class of SMP Ma'arif 1 Metro, the total percentage of all questions was 80% of students were interested in ethnomathematics-based *Powtoon* media, while 20% were not interested in the media. Therefore, based on the feasibility

category of the media previously described, the ethnomathematics-based *Powtoon* learning media is categorized as feasible.

The preliminary step taken in planning the initial product was to conduct a needs analysis at SMP Ma'arif 1 Metro to obtain information in the field by conducting interviews with subject teachers. The result is that during the learning process, they used scientific methods and group learning. Meanwhile, the only media used were worksheets and printed books. Even though the school is already equipped with adequate facilities, it has not been used optimally for Mathematics learning. Based on the results of the student needs analysis questionnaire it was also known that some students were less enthusiastic to learn Mathematics. This is caused by several factors such as students easily feel bored, too many formulas to memorize, dislike calculating, and do not understand the subjects.

According to Afdhal (2015), enthusiasm is something that must be presented in learning, especially in mathematics learning. Enthusiasm correlates with passion. This means, when students have an enthusiasm for learning within themselves, students will tend to feel extraordinary excitement in achieving learning goals (Choirudin et al., 2020). Enthusiasm also applies to teachers. If the teacher is not feeling enthusiastic about teaching, it can be indicated that the teacher is teaching only to fulfill their obligations. However, when a teacher teaches enthusiastically, he or she will enjoy the teaching process so that it can be an inspiration for students to enthusiastically participate in the learning process.

Based on the results of the needs analysis, the steps to complete were to collect supporting references to create products in the form of *ethnomathematics*-based *Powtoon* learning media. The steps carried out by the researcher began with designing the initial appearance of the *Powtoon*. Whereas the material is made by integrating the material of rectangular and triangular two-dimensional shapes on ethnomathematics, such as filter cloth and traditional Lampung houses.

Ethnomathematics is used to help students understand the material, process, and articulate so the students can use Mathematical concepts or ideas in solving problems in their environment. Ethnomathematics activities according to Rosa et al. (2016) include counting, measuring, grouping, and designing buildings. Through Lampung heritage, students are invited to preserve and understand the concept of mathematics, namely the two-dimensional subjects found in the Lampung filter and traditional houses. Students are then asked to group any two-dimensional shapes that can be found.

The constraints experienced when designing the product were the process of combining the Lampung cultural concept with the *Powtoon*. In this section, the researcher must adjust the duration between the Lampung cultural videos and the maximum duration on the *Powtoon* in a single video slide. The music used must also be differentiated, namely between the explanation of the subjects and questions, whereas in a single video it can only contain one type of accompaniment music. For this reason, researchers made two types of videos with different music. Apart from this, the application suddenly experienced an error caused by unsupported

signal strength. However, designs are automatically saved in the *Powtoon* application. In this study, the feasibility of *Powtoon* learning media based on ethnomathematics was proven through the assessment of media experts and subjects experts before being tested on students.

When the learning media was tested, students' responses to the *Powtoon* learning media showed outstanding results, because the presence of intriguing animation and music effects on *Powtoon* media made the students excited and felt motivated to participate in Mathematics learning. In Dina Akhsanti's research, using animation as a medium can improve the learning quality and can increase learning motivation which will impact the student learning outcomes (Akhsanti, 2019). Music is not only used as entertainment but as a means to express feelings and convey moral messages. Likewise with Susanti and Rohmah (2011) that music can improve student learning and can affect brain performance. The existence of pleasant sounds in music can overcome learning challenges due to anxiety during the learning process (Roffiq, Qiram, & Rubiono, 2017).

According to the results of these trials, it is proven that the learning objectives can be achieved when the learning process is not only use conventional media but also using innovative and varied learning media. According to Triet and Loc (2020), technology will act as an efficient tool in accelerating Mathematics problem solving such as calculating, if Mathematics is seen as a set of fixed knowledge. However, if mathematics is observed as a mathematical activity, technology will serve as a learning tool to help students discover and understand mathematical concepts and their relations that exist in developing a conceptual understanding of students on Mathematics (Anwar, Choirudin, Ningsih, Dewi, & Maseleno, 2019).

In previous research, the implementation of *Powtoon* as a learning medium has been done, the difference lies in the material aspects and the model approach used. For example, in the research Video Development of Mathematics Learning Media with *Powtoon* Assistance, the learning media developed can be categorized as interesting (Astika et al., 2019).

In other research on ethnomathematics, the ability to think critically includes important elements, namely interpretation, analysis, evaluation, and decision making to solve problems. While the ethnomathematics concept is packed in the form of problems that are used to help students discovers Mathematical concepts (Choirudin et al., 2020; Malalina et al., 2020; Martyanti & Suhartini, 2018; Pangestu & Wafa, 2018; Wafa, 2019). From this context, it is not much different from research conducted by researchers, that is ethnomathematics concepts are used to describe the concept of material to students.

CONCLUSION

Based on the discussion on this research and development, it can be concluded that: 1) Development of *ethnomathematics* based *Powtoon* learning media is carried out following Borg and Gall's development steps which are limited to seven stages, namely, potential problems, data collection, product design, design validation, design revisions, product trials, and product revisions.

The final result is ethnomathematics based *Powtoon* learning media. The Lampung heritage used in Mathematics learning subjects is the Lampung filter fabric and the traditional Lampung house; 2) The feasibility of *Powtoon* learning media based on ethnomathematics on two-dimensional shape subjects based on the assessment of subjects experts gets a score of 87% categorized as a very feasible, and the assessment of the media expert gets a score of 88% with a very feasible category. Meanwhile, based on field trials in VII B class SMP Ma'arif 1 Metro got a score of 80% categorized as feasible. Therefore, based on this assessment, ethnomathematics-based *Powtoon* learning media on two-dimensional shapes can be used in mathematics learning.

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