

The Utilization of the Potential of Tahura K.G.P.A.A. Mangkunagoro I through the Development of MARBLE (Moss Android Mobile Learning) Application For 10th Grade Students on Bryophyte Learning

Fattahu Husna Nurisma^{1, a)}, Muzzazinah^{2, b)}, Alanindra Saputra^{3, c)}, Nurmiyati^{4, d)}

^{1,2,3,4}*The Faculty of Teacher Training and Education, Universitas Sebelas Maret, Surakarta, Indonesia*

^{a)}*Corresponding author: fattahusna@student.uns.ac.id*

Abstract. The development of technology in the 21st century demands to use of technology in learning. However, it should apply contextual learning based on the surrounding environment. The misappropriation of technology and the lack of green areas in the school environment caused biology learning on bryophyte to be hampered. The use of technology in learning can create a fun atmosphere by combining the local potential and technology advancement. This innovation can be realized through developing learning media called MARBLE application. This study aims to: 1) utilize the potential of Tahura Mangkunagoro I for bryophyte learning, 2) produce the new learning media that is MARBLE application, 3) examine the advisability of MARBLE application. The type of research is Research and Development (R&D). This research applies the ADDIE model developed by Branch (2009) which consists of 5 stages, namely: analysis, design, development, implementation, and evaluation. The stages are carried out until the development stage because this study aims to determine the perceptions of teachers and students about the MARBLE application. The research was conducted from January to July 2020. The research was conducted in Tahura as a bryophyte sampling location. MARBLE feasibility testing was conducted by three media experts, three material experts, one learning expert, and three biology teachers. Data collection was conducted by using a questionnaire. The technique of data analysis was descriptive quantitative obtained from the results of the questionnaire. The results showed that the MARBLE application was declared valid by material experts with a percentage of about 81.7%, media experts with a percentage of about 90%, and biology teachers with a percentage of about 90.3%. The average of all percentages is 87.42% with the most valid category.

Keywords: *Android mobile learning, bryophyte learning*

INTRODUCTION

Forest Park (Tahura) K.G.P.A.A. Mangkunagoro I is a nature conservation area to collect natural, non-natural, native, and non-native flora and fauna and utilized for research, knowledge, education, cultivation, tourism, and recreation, by Indonesian Government Regulation no. 28 of 2011 Article 1 Paragraph 10. Tahura is located at the foot of Mount Lawu with an altitude of approximately 1,200 meters above the sea. Geographic differences in the Tahura area cause differences in weather and microclimate as a whole, especially a temperature and humidity (Andrian, et al., 2014). Indrawan (2007) stated that the altitude and slope of the slope can affect the richness of the species. Increased temperature will increase Bryophyta evapotranspiration and affect the surrounding air environment (Habib, et al., 2017).



This causes moss can grow well in Tahura. However, Tahura has not been widely used as a source of learning biology for high school students, especially the abundance of the bryophyte.

Moss is one of the biology subjects in 10th-grade high school. Moss is often found in humid places and live autotrophs. Lack of open moist green land in the school environment causes moss to can not grow so that the moss the material can not be conveyed properly because no moss object can be observed by students. Besides, the biology laboratory at the school has not provided a herbarium or preserved moss specimens.

Based on the results of research conducted by Armi and Noviyanti (2014), the understanding of the student's concept of plant material has the lowest value in moss sub material and its classification, while the highest value is in the sub material of seed plants. Supported by research from Zarisma, so many students have difficulty grouping plants based on their characteristics into their division (Zarisma, et al., 2016). According to (Syah, 2010), a student's low understanding of concepts is also caused by memory. The material is not acceptable by the students if the learning is not fun, so the teacher needs to apply more interesting learning methods, it is hoped that students can receive the material optimally.

The skills that must-have in the 21st century is learning and innovation skills, skills in seeking information through media and technology, and career skills in life (Trilling & Fadel, 2009). Technological advances in education have resulted in many innovations to help the learning process, one of which is learning media. Learning media is one important aspect that affects student's ability to understand the material. The use of media aims to prevent students from getting bored while learning and to clarify the material conveyed by the teacher to students (Siregar, 2013). One of the learning media that is developing is mobile learning. M-learning is a medium that refers to the use of cellphones, laptops, and so on. The students were unable to make good use of technology because it is only used for playing games, not for learning. A new learning media being developed based on m-learning are expected to be an alternative to create an attractive, fun, effective, and efficient teaching and learning atmosphere, so that can increase student motivation towards the material being taught (Muyaroah, 2017).

Based on the description above, the researcher seeks to create a fun atmosphere for teaching and learning biology by combining technological advances and local potential, especially moss in Tahura, which is realized through the development of learning media for the MARBLE application for 10th-grade students on bryophyte learning.

The marble application is a combination of modern learning and the richness of moss in Tahura which can be used to support the learning of moss in schools with minimal green land. This application is specifically designed for students to be happier when studying moss and its life, which in previous lessons the students felt bored and did not understand.

METHOD

This research is a Research and Development (R&D). R&D is a type of research that produces a product and tests the product's effectiveness. This study applies the ADDIE model developed by Branch (2009). The ADDIE model consists of 5 stages, namely: analysis, design, development, implementation, and evaluation which are described in 21 stages (Branch, 2009). The stages are carried out until the development stage, because this study aims to determine the perceptions of teachers and students about the MARBLE application, not yet at the large scale stage.

Research on bryophyte was carried out in the Forest Park (Tahura) K.G.P.A.A. Mangkunagoro I Karanganyar. Activities carried out in the utilization zone by identifying several types of moss with the criterion-based selection sampling technique developed by Bogdan & Biklen in 1982 cited by (Sutopo, 2006). The results of the moss identification were then entered into the MARBLE application.

The data collection technique was carried out in two steps, namely the moss data collection in Tahura and the MARBLE application testing data collection. The collection of moss data in Tahura is carried out in several stages, namely: 1) observing field conditions, 2) observing moss in Tahura, 3) recording the characteristics of moss species, 4) documenting the parts of moss, 5) identifying moss using assistance books and journals, and 6) enter the identification results and images of moss into the MARBLE application.

Application testing data collection is done by using a questionnaire. The type of questionnaire used in this study was a combined questionnaire, namely a closed questionnaire and an open questionnaire. The questionnaire used contains several questions that have been prepared by the researcher along with the answer choices, and some questionnaires are answered by the source with their answers. The questionnaires used included assessment questionnaires for material experts, media experts, learning experts, and teacher practitioners. The data analysis



technique used for the expert questionnaire was the percentage technique with the categories in Table 1, using the formula:

$$P = \frac{\sum x}{(\sum xi)} \times 100 \%$$

Information :

P = percentage of validity

$\sum x$ = total value of answers in all items

$\sum xi$ = total ideal score in all items

100 = constant (Riduwan, 2012).

TABLE 1. Level of Achievement and Qualification

| Level of Achievement | Qualifications |
|----------------------|----------------|
| 81-100% | Very valid |
| 61-80% | Valid |
| 41-60% | Fairly valid |
| 21-40% | Less valid |
| <20% | Not valid |

(Riduwan, 2012)

RESULT AND DISCUSSION

Based on the assessment of learning experts, it can be concluded that the learning plan prepared by the researcher is in the very valid category and is feasible to be applied in the learning process with an average percentage of 87.7%. The results of the assessment can be seen in Table 2.

TABLE 2. Assessment of Learning Plan by Learning Experts

| Aspect of Qualification | Value | Qualifications |
|---------------------------------|--------------|-------------------|
| RPP identity | 100% | Very valid |
| The formulation of indicators | 75% | Valid |
| Selection of teaching materials | 85% | Very valid |
| Selection of learning resources | 86.6% | Very valid |
| Selection of learning media | 90% | Very valid |
| Learning scenario | 95% | Very valid |
| Grading technique | 80% | Valid |
| Average | 87.7% | Very valid |

Based on the results of the assessment by material experts, it can be concluded that the material used in the MARBLE application is feasible and can be used in the application after repairs are made according to the advice given by the material expert with an average percentage of 81.6%. The results of the assessment can be seen in Table 3.

TABLE 3. Material Evaluation by Material Experts

| Aspect of Qualification | Value | Qualifications |
|-------------------------|--------------|-------------------|
| Material suitability | 82.2% | Very valid |
| Quality of material | 80.7% | Valid |
| Quality evaluation | 76.6% | Valid |
| Use of language | 73.3% | Valid |
| Feedback & motivation | 95.5% | Very valid |
| Average | 81.6% | Very valid |

Based on the results of the assessment by media experts, it can be concluded that the media developed is feasible and can be used after making improvements according to the suggestions given by media experts with an average percentage of 81.6%. The results of the assessment can be seen in Table 4.

**TABLE 4.** Media Evaluation by Media Experts

| Aspect of Qualification | Value | Qualifications |
|--------------------------------|--------------|-----------------------|
| Presentation design | 90% | Very valid |
| Interaction use | 90.4% | Very valid |
| Accessibility | 86.6% | Very valid |
| Reuse | 93.3% | Very valid |
| Average | 90% | Very valid |

Based on the results of the assessment by the biology teacher, it can be concluded that the MARBLE application can help teachers in the learning process so that it becomes more practical and provides new experiences for teachers when using the MARBLE application with an average percentage of 90.3%. The results of the assessment can be seen in Table 5.

TABLE 5. Media Assessment by High School Teachers

| Practitioner (Teacher) | Value | Qualifications |
|-------------------------------|--------------|-----------------------|
| Teacher 1 | 76.2% | Very valid |
| Teacher 2 | 96.2% | Very valid |
| Teacher 3 | 98.7% | Very valid |
| Average | 90.3% | Very valid |

The Results of Analysis Stages

Based on the results of the analysis, there were several performance gaps in the learning process, namely the presence of boredom and students' lack of interest in plant material, especially moss because the object being studied had a small and complex size. Based on the results of the questionnaire, as many as 87% of students were enthusiastic about taking biology lessons and all students had handbooks from school, but there were still 63% of students who still found it difficult when learning biology. Only 47% of students look for other reading material to understand biology material. Class XI students who have gone through Plantae learning admit that they have difficulty grouping moss. This is because moss plants cannot live in the school environment so that students cannot make direct observations. Also, the teacher does not hold a practicum to explore moss material and the biology laboratory has not provided moss preservation. These things cause 77% of students to get bored and prefer to play with gadgets. Besides, the learning media used by teachers have not varied. This causes students to easily feel bored and prefer to play with gadgets so that the use of gadgets at school is not optimal and has a negative impact on students. Based on the analysis of the use of the curriculum, a review of Basic Competence was obtained. The basic competency used is KD 3.8 "Grouping plants into divisions based on general characteristics, and linking their role in life" with the sub-competency of mosses. The material studied includes the characteristics of mosses, the body parts of mosses, the classification of mosses which are divided into three classes (mosses, liverworts, and hornworts) with two examples of each species, mosses metagenesis, and the benefits of mosses in life. From these problems, researchers tried to exploit the local potential of Tahura K.G.P.A.A. Mangkunagoro I as one of the learning resources on moss material which is packaged in the form of the MARBLE mobile learning application as an effort to solve problems in moss learning and reduce the negative impact of using technology.

The Results of Design Stages

Based on the results of the design stage, the researcher arranges the tasks that must be done by students to achieve learning objectives. Researchers determine the learning objectives, the core material of moss, evaluation questions, and instructions in the MARBLE application. The types of evaluation questions used in the MARBLE application are multiple-choice questions, descriptions, and games. The number of multiple-choice questions is 30 questions, the number of essay questions is 5 questions, and the three types of games are 34 points. The development of MARBLE learning media considers several purposes for using media, including 1) learning media following the facilities owned by teachers and students, 2) teachers and students can apply the learning media properly, and 3) the media can overcome problems that occur in class.

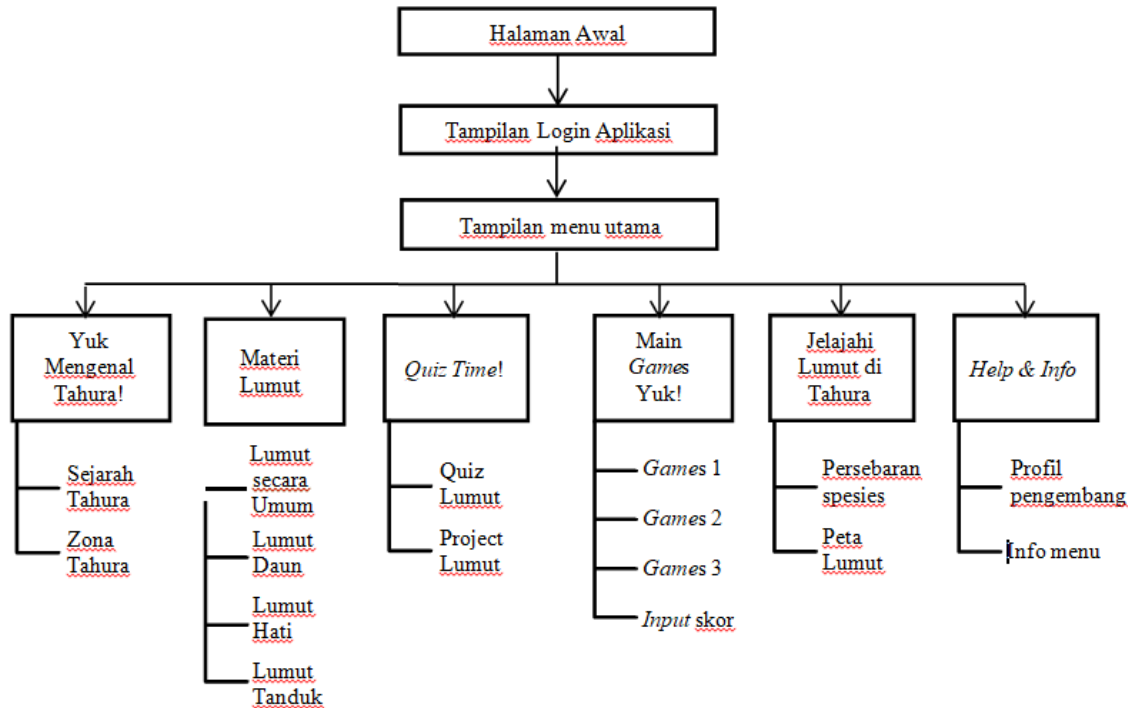


FIGURE 1. Marble application design overview

The Results of Development Stages

MARBLE application is developed using Android Studio software, Visual Studio Code, and Firebase. Android Studio functions to build application foundations so that they can be re-made according to content requirements. Visual Studio Code serves to visualize all content that has been built so that it can function properly. To store MARBLE user access, the Firebase Console software is used to store email data that has been registered in the MARBLE application, besides that Firebase can also store evaluation value data obtained by students during application use. After the application has been developed, a manual is made aimed at helping teachers and students operate the MARBLE application during learning. This manual contains procedures for installing the MARBLE application, information on using the menu, and information for inputting the scores that have been obtained when working on evaluation questions and games. Based on the assessment of learning experts, it can be concluded that the learning plan prepared by the researcher is in the very valid category and is feasible to be applied in the learning process with an average percentage of 87.7%. The results of the assessment can be seen in Table 2. Based on the results of the assessment by material experts, it can be concluded that the material used in the MARBLE application is feasible and can be used in the application after repairs are made according to the advice given by the material expert with an average percentage of 81.6%. The results of the assessment can be seen in Table 3. Based on the results of the assessment by media experts, it can be concluded that the media developed is feasible and can be used after making improvements according to the suggestions given by media experts with an average percentage of 81.6%. The results of the assessment can be seen in Table 4. Based on the results of the assessment by the biology teacher, it can be concluded that the MARBLE application can help teachers in the learning process so that it becomes more practical and provides new experiences for teachers when using the MARBLE application with an average percentage of 90.3%. The results of the assessment can be seen in Table 5.

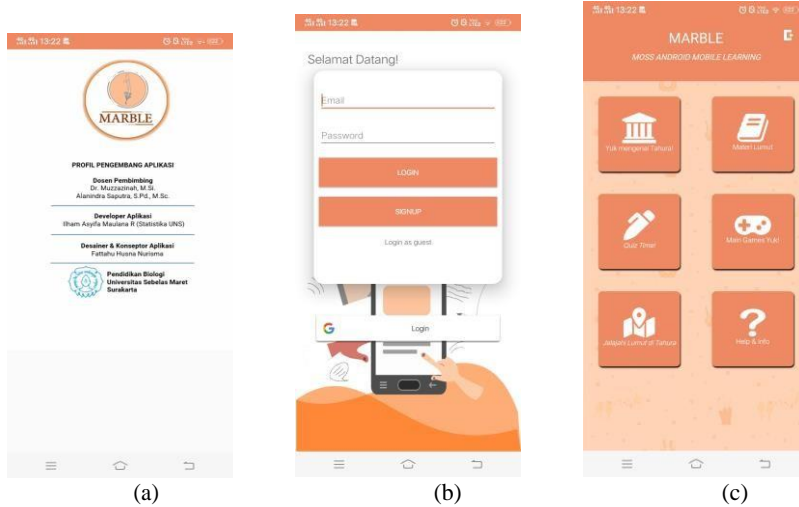


FIGURE 2. A description of the opening of the MARBLE application. (a) shows the application developer profile, (b) instructions for signing in and enrolling in the marble application using email, and (c) marble main menu which contains 6 menus

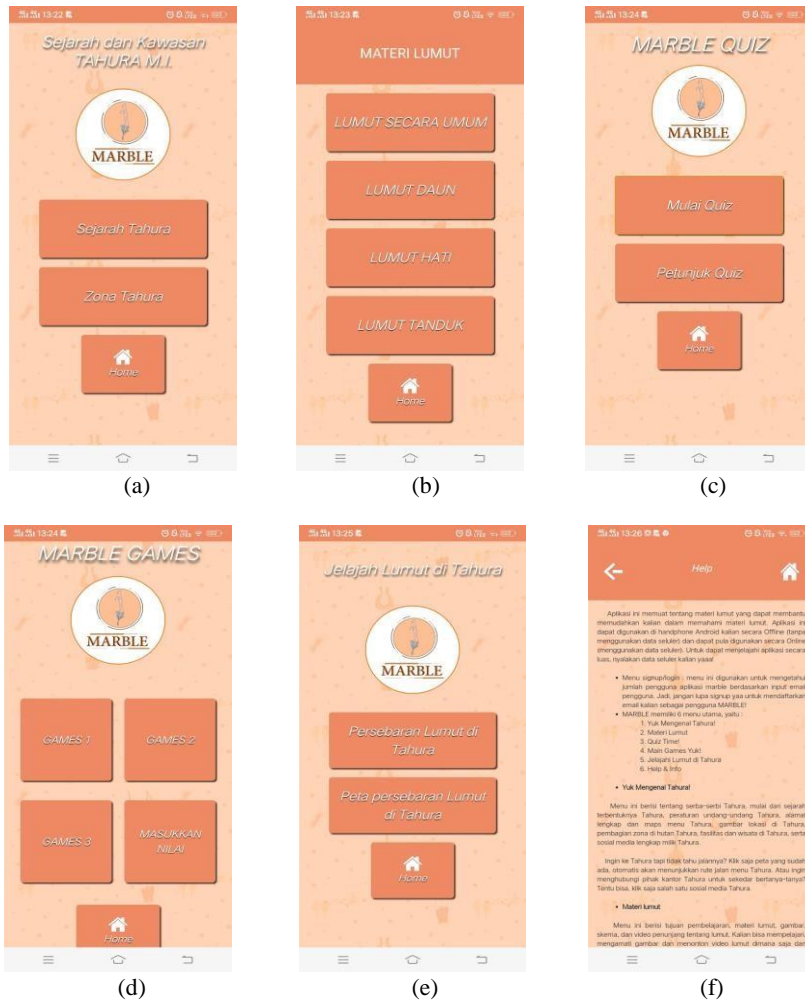


FIGURE 2. A description of MARBLE menus: (a) the history of tahura, (b) moss material, and (c) marble quiz, (d) marble games, (e) explore moss in tahura, and (f) help and info



CONCLUSION

Based on the research that has been conducted by researchers, it can be concluded that: 1) utilization of the potential of Tahura K.G.P.A.A. Mangkunagoro I Karanganyar for moss learning is based on the abundance of mosses and the geographical differences of Tahura, 2) the MARBLE application was developed with the ADDIE model which has five stages, namely, analysis, design, development, implementation, and evaluation. The stages are carried out until the development stage because this study aims to determine the perceptions of teachers and students about the MARBLE application. The MARBLE application was developed using Android Studio software, Visual Studio Code, and Firebase, and 3) the MARBLE application was declared feasible in terms of material and media use by the results of the assessment of three material experts, three media experts, and three high school biology teachers supported by a learning plan which is declared worthy of the learning expert.

Based on this learning media development research, the writer intends to provide suggestions for further research, as follows: 1) the limited use of the operating system in the MARBLE application, which is only on the Android and PC systems, further research is expected to develop further so that the MARBLE application can be used on the system. iOS, 2) the MARBLE application only contains material about moss, further research is expected to develop applications such as MARBLE which discusses other materials in biology subjects, and 3) there are still application bugs that cannot be fixed completely by researchers, further research is expected can improve so that the application can run better.

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