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Research Article

Development of Android-Based Application on Biodiversity Material

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Abstract
This study aims to develop an Android-based application on biodiversity to enhance public understanding of biodiversity and its relevance to daily life, while promoting active community involvement in conservation efforts. The research employed a research and development (R&D) methodology using the PLOMP model, which consists of five phases: preliminary investigation, design, realization/construction, test and evaluation, and implementation. The application, titled Biodiversity Games, integrates multimedia elements to support interactive and engaging learning experiences. Validation was conducted by peer reviewers, yielding an overall validity score of 93.4%. Specifically, the display aspect achieved a score of 87.5%, the learning objectives 96.87%, and ease of use 95.83%. These results indicate that the application is highly valid and feasible for use in educational settings. The implementation phase conducted at MTs Dar El Hikmah demonstrated that students found the application accessible, engaging, and helpful in understanding biodiversity topics. Feedback also suggested that the application enhances science literacy and student motivation. Minor revisions were recommended to improve visual clarity on smaller devices. Overall, the Biodiversity Games application has strong potential as an effective digital learning tool for biodiversity education in Indonesian schools.

Keywords: Android Application, Biodiversity, Educational Technology, PLOMP, Science Learning

1. Introduction

The development process in the world of education never stops adapting to existing developments (Namiroh et al., 2018). Advances in educational technology and learning technology require the use of various educational media and increasingly sophisticated devices (Miftah, 2018). Technology and media can be effective tools in learning if used appropriately and wisely. Multimedia applications are presented in the form of images and animations, so they can arouse students' attention and interest in the learning process. This is proven by 80% of 26 respondents who agreed with this statement (Wijaya & Devianto, 2019).

According to Yuniar Supardi (Safitri & Basuka, 2020), Android is "an operating system for mobile devices based on Linux, including operating systems, middleware, and applications." Meanwhile, according to Yosef Murya (Safitri & Basuka, 2020), Android is "a Linux-based operating system for mobile devices (phones) such as smartphones and tablet computers (PDAs)." Therefore, it can be concluded that Android is a Linux-based operating system used to manage hardware resources for mobile phones, smartphones, and tablet PCs.

Indonesia is an archipelagic country with diverse territories, ranging from narrow to wide, flat to hilly to mountainous, and is home to various flora, fauna, and microorganisms (Hafiz, 2021). However, biodiversity in both terrestrial and aquatic ecosystems continues to decline. Tropical forests, which are treasures of biodiversity, are shrinking and agricultural land is degraded. Coral reefs, mangrove forests, and other marine biota are also affected (Sutoyo, 2010).

The species extinction rate is estimated to reach a quarter of the 30 million plant and animal species that became extinct in 2000. Estimating plant and animal species extinction is even more difficult. The Red Data Books of IUCN and ICBP list 126 bird species, 63 mammal species, 21 reptile species, and 65 other animal species in Indonesia that are currently threatened with extinction. Other data shows that 187 of 500 (37.4%) mammal species are endemic, 144 of 2000 (7.2%) reptiles are endemic, 121 of 53 (44%) butterflies, and 162 endemic bird species (10.8%) of 1500 species (Hoffmann et al., 2008).

In 1966, the International Rice Research Institute (IRRI) introduced the IR-8 rice variety, which was rapidly cultivated throughout Asia. It turned out that IR-8 was easily attacked by various types of insects and diseases. In 1968 and 1969, this rice was attacked by bacterial disease. In 1970 and 1971, this rice variety was affected by another tropical disease outbreak called Tungro. In 1975, Indonesian farmers lost 500,000 hectares of Green Revolution rice land due to brown planthopper attacks. In 1977, IR-36 was developed to be resistant to eight species of serious insects and diseases, including bacteria and tungro. It turned out that the rice was actually infected with two new viruses called Ragged Stunt and Welted Stunt. New seed diversity erosion is also a means of invasion and spread of insects (Syahri & Somantri, 2016)

Based on the description above, this research focuses on "Biodiversity Game" Indonesia. This refers to the ease of human access to obtain information in the form of images and animations that are more attractive to children. In addition, because of the lack of public knowledge about biodiversity in Indonesia and the lack of platforms to obtain such knowledge. Therefore, the purpose of this research is to create an Android-based application on biodiversity material to increase public understanding of biodiversity and its impact on daily life and encourage active community involvement in biodiversity conservation and preservation efforts.

2. Methods

The research method used in this research is the research and development method with the PLOMP model. The research model that refers to PLOMP development (Nieveen & Folmer, 2013) consists of 5 phases: preliminary investigation phase, design phase, realization/construction phase, test, evaluation, and revision phase, and implementation phase. The research procedure in this research explains the steps taken in creating an Android-based application on "Biodiversity Games" on biodiversity material. This procedure is carried out in 5 steps. The steps for developing Android-based applications can be seen in Table 1.

Table 1. Research Procedure

Stage	Data Collection Technique
Preliminary Investigation Stage	Curriculum Review
Design Stage	Android-Based Application Design Preparation and Instrument Preparation
Realization Stage	Android-Based Application Creation and School Observation
Test and Evaluation Stage	Android-Based Application Validation from Senior Students and Peers
Implementation Stage	Implementation to Schools

In developing this learning device, the validity objective is to test whether the developed Android-based application can be used as one of the appropriate learning devices and to test the degree of truth and accuracy. Validation responses use a Likert scale. The measured variables are converted into variable indicators. The Likert scale used consists of four categories as shown in Table 2.

Table 2. Likert Scale Assessment Criteria

Percentage (%)	Category
81-100	Very Valid
61-80	Valid
41-60	Quite Valid
21-40	Less Valid
0-40	Invalid

Source: Taluke et al. (2019)

Based on the evaluation criteria table above, the feasibility level of developing Android-based applications on biodiversity material can be determined as feasible or not. The standard used by researchers about whether Android-based applications are theoretically feasible is if the average is estimated ≥ 70%.

3. Results and Discussion

3.1. Preliminary Investigation Phase

The preliminary investigation phase will involve a series of steps to understand the specific context and needs of the project. There are several things that must be considered in this phase:

1) Identifying problems or main objectives to be achieved through Biodiversity Games
2) Analyzing the educational environment in Indonesia related to understanding and preserving biodiversity
3) Assessing relevant educational conditions and policies
4) Determining development targets to be achieved through the use of Biodiversity Games
5) Assessing the availability and accessibility of technology in schools that are the focus of research
6) Understanding the characteristics of students and teachers who are target users of Biodiversity Games
7) Mapping available resources for project implementation
8) Establishing cooperation with related parties, such as schools, educational institutions, or other related parties
9) Planning appropriate intervention and development steps based on preliminary investigation findings

3.2. Design Phase

3.2.1. Application Design

This application was created using only 2 websites: Genially and Free Website to APK 2. The stages in creating this application are as follows:

1) The first step is to open the Genially website

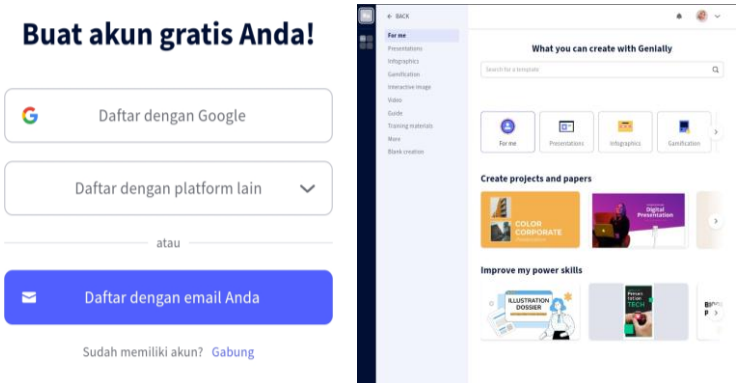

Figure 1. Genially Website Interface

2) Create games on provided templates or create them independently

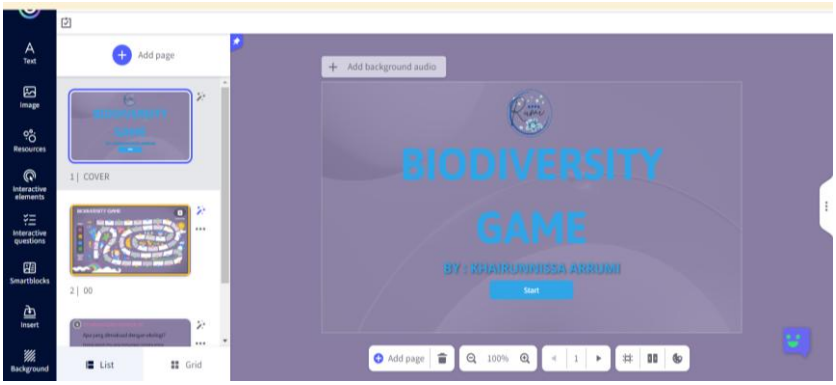

Figure 2. Game creation process on Genially

3) After each slide is completed, the slides we create will automatically be saved. To add clickable buttons, you can select them from the interactive element menu

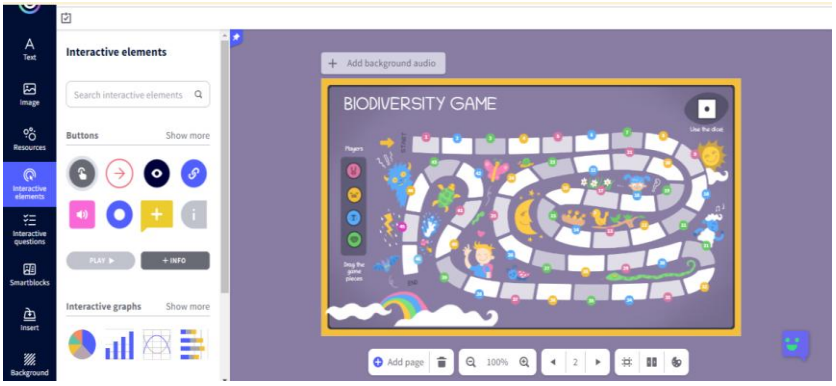

Figure 3. Example of slide editing in Genially

4) After finishing creating all components in the game, click the present section, then the game display will be full screen
5) Copy the game link from the Genially website then go to the second website, Free Website to APK 2

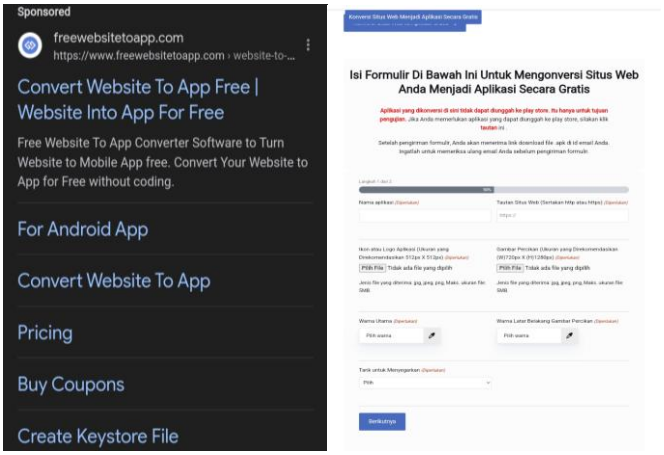

Figure 4. Interface of the Free Website to APK 2 platform used to convert Genially web

6) Follow the steps on the Free Website to APK 2 website then download
7) Finally, the APK is ready to use

3.2.2. Instrument Design

The designed instrument is a validity and practicality instrument about "Biodiversity Games" addressed to peers, senior students, and science subject teachers.

3.2.3. Realization Phase

The realization phase is the phase of realizing Android-based applications on biodiversity material with observation by science teachers. The observation results obtained show that there is extensive use of Android-based applications in learning. According to the informant, the use of multimedia is an effort to attract students' attention, so that students are more enthusiastic and active in learning, so that students do not get bored easily. The purpose of using Android-based applications is to achieve learning objectives. The advantage is that students are more interactive; from the teacher's perspective, it can make it easier for teachers to teach, because as we know, we are now in the 5.0 era. However, the obstacle often encountered in using Android-based applications is that many schools prohibit students from bringing mobile phones.

According to the informant, Android-based applications on biodiversity material are very suitable for the material and suitable for use in learning. In addition to attracting students to engage in learning, this application also plays a role in improving students' scientific literacy.

3.2.4. Test, Evaluation and Revision Phase

This stage aims to produce valid and practical Android-based applications (Arkadiantika et al., 2020). The validity of the developed Android-based application was discussed with validators. Validators consist of two validators: senior students and peers. The Android-based application that has been validated by senior students and peers obtained results from Table 3.

Table 3. Validation Results

No	Statement	Score		Average per criteria	% per criteria	% per aspect and category
		V1	V2			
Display						
1.	The "Biodiversity Games" application display is very attractive to play with	3	4	3,5	87,5	87,5
2.	Colors in the "Biodiversity Games" application are not boring	3	4	3,5	87,5	
3.	The "Biodiversity Games" application display is easy to understand and easy to play	3	4	3,5	87,5	
Application Objectives						
1.	The "Biodiversity Games" application can increase public understanding and awareness about the importance of biodiversity and nature conservation	4	4	4	100	96,87
2.	The "Biodiversity Games" application can provide interactive experiences that actively involve you in understanding flora and fauna	4	4	4	100	
3.	The "Biodiversity Games" application can inspire you to play a role in environmental preservation and conservation efforts	4	4	4	100	
4.	This "Biodiversity Games" application can help you develop various skills, including problem solving, creativity, and environmental understanding	3	4	3,5	87,5	
Ease of Use (User Friendly)						
1.	Instructions for this "Biodiversity Games" application are easy to understand	4	4	4	100	95,83
2.	The "Biodiversity Games" application is fast and responsive to your actions	4	4	4	100	
3.	You would recommend this game application to your friends based on your experience with its ease	3	4	3,5	87,5	

	of use regarding biodiversity easily accessible via smartphone					
Application Feasibility Level Value						93,4
Category						Very Good

Note:
Validator 1 (V1) : Meirisa Dahlia
Validator 2 (V2) : Annisa Hikmah Wati

Based on the validation results table, it is known that the feasibility degree of the developed QR-based module is 93.4, which falls into the very qualified category. Looking at each aspect, it appears that the display components, learning objectives, and ease of use are 93.4%. The validation value obtained is said to be very valid, but still needs improvement based on input from student responses to Android-based applications, particularly related to game visuals. Based on the results of Android-based application validators, this is very valid because there are several inputs regarding the quality of learning elements as well as the design and layout used.

3.2.5. Implementation Phase

The implementation phase is the phase to implement the created Android-based application so that it can be operated. Based on trials of the Biodiversity Game application to Grade VII students at MTs Dar El Hikmah, this application can make it easier for students to remember biodiversity material. When the Biodiversity Game application was implemented to students, students appeared enthusiastic to see how to use the application. In addition to implementation, the author also conducted interviews with students. Questions posed to students included whether they had ever used learning applications, what they learned after using this application, whether this application is very attractive and easy to use, and what criticism and suggestions they had for this application.

From these questions, it was found that students often use learning applications. Examples of frequently used applications include Ruang Guru, Brainly, Quizizz, and Kahoot. According to students, the application shown helps them learn Science subjects, especially biodiversity material. Students also said that the application shown is easy and can be accessed anywhere, not only at school. This application can also help them complete tasks related to biodiversity material. One of them also said that the application display is very attractive with material selection and example questions that are easy to understand. The criticism received for this application is that the visuals are too small, making it somewhat difficult to see and press certain parts. This application is more suitable for use on laptops than smartphones. Figure 5 are the documentation results when implementing multimedia learning to students:

Figure 5. Documentation of the implementation of multimedia learning with students

4. Conclusion

This study successfully developed an Android-based educational application focused on biodiversity using the PLOMP research and development model. The application achieved a high overall validity score of 93.4%, with the display aspect at 87.5%, learning objectives at 96.87%, and ease of use at 95.83%. These results indicate that the application is both valid and feasible for use as a supplementary learning tool in science education, particularly in enhancing students' understanding of biodiversity. This study suggest that future development of the application could include more interactive features, improved visual scaling for mobile devices, and broader topic coverage related to environmental conservation. Incorporating feedback from a wider user base, including educators and students from various regions, may also enhance the application's effectiveness and accessibility.

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