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Biology Learning Media Based on Multicultural Islamic Values, "Biolaku"; A Development Research in Karimunjawa

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ABSTRACT

Abstract. Karimunjawa is home to diverse ethnic groups, which can lead to potential conflicts if not properly managed. Additionally, learning methods have shifted to online systems. This research aims to develop Android-based biology learning media incorporating multicultural Islamic values, designed for use in Madrasah Aliyah in Karimunjawa. The research utilized the Borg & Gall model, with participants drawn from the 12th-grade students of MA Safinatul Huda Karimunjawa. Data collection involved a product feasibility assessment sheet, analyzed using the Rasch Model. The results indicate that the "Biolaku" application is suitable for use, with a raw variance explained by measures score of 35.4%. This study offers significant benefits for education in Karimunjawa.

Keywords: biolaku, learning media, multicultural, islamic value, karimunjawa

INTRODUCTION

Children are the future generation of the nation, playing a pivotal role in ensuring its sustainability. Research shows that over 25% of children globally use gadgets before the age of 8, particularly those older than this age. Most middle and high school students now own personal devices. (Murdaningsih, D., & Faqih, 2014). The era of Industry 4.0 has seen rapid advancements in information technology, fundamentally changing various aspects of human life, including education. This period emphasizes the "Internet of Things," driving significant shifts in education, including the transition from traditional classroom teaching to online, internet-based learning through devices like Android smartphones.

Learning activities have shifted from traditional classroom-based teaching to virtual, internet-based learning through mobile devices, particularly Android, which is widely accessible. Gadgets, especially smartphones or Android devices, have become essential tools, including for school-age children, particularly those in high school, who are accustomed to using such devices. This shift was further accelerated by the COVID-19 pandemic, which necessitated online learning.

A survey by the Pew Research Center places Indonesia 24th in the world in terms of the number of smartphone users. (Silver & Cornibert, 2019). However, despite Android devices

having the potential to support educational activities and help achieve learning goals, their use is often limited to entertainment or social media.

Biology is a science with a scope related to aspects of life which includes the relationships between living creatures, animals, plants, microorganisms and humans. Biology is also defined as a science that provides a variety of experiences to understand scientific processes and concepts. (Firmansyah, 2009). Apart from that, biology is also related to the function of the human body and the physical structure and surrounding environment. (Rustaman, 2003). Biology has special characteristics with the science group, for example the special characteristics of biology lie in learning objects, namely living things, methods of finding solutions to problems in biological objects using scientific methods, and nature related to problems with biological objects. (Trianto, 2012).

Biology, as a core component of Indonesia's education system, is vital for measuring educational progress. However, according to the 2022 PISA results, Indonesian students achieved an average score of 383 in science, below the OECD average of 476, ranking 68th out of 81 countries. These results highlight the urgent need to improve Indonesia's education quality, particularly in the 4.0 era. (OECD, 2023). This result should raise serious concerns for education stakeholders in Indonesia. There is a pressing need to enhance information technology infrastructure and improve the quality of education, especially in this 4.0 era, to ensure Indonesia does not fall behind.

Karimunjawa Island, located in the northern coastal region of Central Java, is one of Indonesia’s outermost areas. An area that falls within the 3T (Frontier, Remote, and Disadvantaged) category (Putera & Rhussary, 2018), and requires more attention in terms of educational development. The policy of the Ministry of Research, Technology and Higher Education to accelerate development in the 3T region is the Forward Together to Educate Indonesia (MBMI) Program, including: Bachelor of Education Program in the 3T Region (SM-3T), Integrated PPG and Additional Authority Program (PPGT), Program PPG Collaborative (PPG Collaborative) (Dudung et al., 2018). Apart from that, innovation is needed to create complete facilities and media used for the education process. One of them is by making a breakthrough by developing media for learning. (Mardianto et al., 2021).

Karimunjawa, a remote island is rich in cultural and ethnic diversity, with residents from Javanese, Bugis-Makassar, Madurese, Butonese, Bajo, and Mandar communities. This diversity poses challenges and opportunities, as it may lead to conflict if not well-managed. This is called multicultural, in simple terms, multicultural means "cultural diversity". Karimunjawa consists of 27 islands, but there are only 5 large islands with large populations and Javanese people dominate the 4 islands with the most populations. Part of the small island is used as a tourist attraction by tourists. The diversity of tribes on Karimunjawa Island clearly requires patterns of interaction that respect each other's differences to form relationships that live side by side, peacefully and harmoniously. (Benardi et al., 2020). Therefore, it is important to have multicultural Islamic

education to create good interaction patterns for the people of Karimunjawa. (Sulistyorini et al., 2016)

Multicultural education is a progressive approach to implementing the cultural transformation of society, in a fair and non-discriminatory manner by upholding human rights, religious values, cultural values and national pluralism. Multicultural education has relevance for the educational context in Indonesia. Multicultural education is in line with Indonesia's motto, namely "Bhinneka Tunggal Ika" which means a nation consisting of various races, ethnicities, languages, cultures and religious differences but remaining united. The multicultural principle is to uphold differences that must be mutually respectful. (Haryati, 2009). Multicultural Islamic education aims to form a civil society based on the principle of upholding the concept of social contract, namely the concept that every individual and group has the same obligations and rights, even though they come from different backgrounds. (Rois, 2013).

Learning media is a medium for transfer knowledge and a creative medium for providing material to students so that the learning process becomes more enjoyable, efficient and effective. (Wibawanto, 2017). Smartphones, particularly Android devices, have great potential to serve as effective learning tools in this 4.0 era. The use of Android applications to support learning has become an essential requirement today. Developing the right Android application can help maximize the use of these devices, especially among high school students. Interesting learning media aims to make the learning atmosphere enjoyable so that interactions between students and teachers are better established in the learning process. (Wahyudi, 2019). The functions of learning media in learning activities are: Creating concrete concepts, Presenting actual objects in learning, Providing a common perception for all students, Providing a pleasant learning atmosphere for students, Overcoming barriers of time and learning distance. (I Kadek Suartama, 2016).

This study aims to develop an Android-based learning application for biology, infused with multicultural Islamic values, that is suitable for implementation in high schools or equivalent institutions on Karimunjawa Island. The goal is to demonstrate that Android devices are not just tools for gaming or social media but can be effective educational tools, particularly for learning biology. This approach, grounded in multicultural Islamic principles, is highly relevant for the people of Karimunjawa.

METHOD

This research employed the Research and Development (R&D) methodology following the Borg & Gall model. The study developed the "Biolaku" application, a biology learning tool integrating Islam, multiculturalism, and biological concepts. The study was conducted at MA Safinatul Huda 2 Karimunjawa with 12th-grade students as participants. Data was collected through feasibility assessments, analyzed using the Rasch Model with Ministep software. The

research and development process follows the Borg & Gall model (Borg, W.R and Gall, 2003). These ten steps OF Borg & Gall model, as follows: 1) Conduct a preliminary study and gather information, 2) Plan and design the research, 3) Develop the initial product draft (the Android application), 4) Conduct preliminary field tests, 5) Revise the product based on feedback, 6) operational field trials, 7) product revisions following the trials, 8) Carry out main field tests, 9) Revise the product based on main field trial results, and 10) Disseminate and implement the product. This model was chosen due to its systematic, step-by-step approach, which clearly outlines each phase of development. The research was conducted at MA Safinatul Huda 2 Karimunjawa, located in Jepara, Central Java. The subjects and data sources for this study included media validators (experts), material and Quran experts, prospective biology teachers, and MA biology teachers. The study sample consisted of all students from the XII grade of MA Safinatul Huda 2 Karimunjawa. (Mukminin, 2013). The data collected for this study included assessments from validators, data from preliminary trials, and data from field trials.

Data collection was done through a product feasibility assessment questionnaire, which was distributed using Google Forms. After using the developed application, respondents were asked to fill out a questionnaire to evaluate the feasibility of the product. Additionally, the researcher gathered input from respondents regarding the application. Data analysis was performed using the Rasch Model, assisted by the Ministep application. The analysis focused on the Unidimensionality table, specifically examining the raw variance explained by measures.

RESULT AND DISCUSSION

This development research follows the ten procedural steps of the R&D process from the Borg & Gall model (Borg, W.R and Gall, 2003). These ten steps were adapted and streamlined into eight phases for this study, as follows: 1) Conduct a preliminary study and gather information, 2) Plan and design the research, 3) Develop the initial product draft (the Android application), 4) Conduct preliminary field tests, 5) Revise the product based on feedback, 6) Carry out main field tests, 7) Revise the product based on main field trial results, and 8) Disseminate and implement the product.

These eight steps are the modified version that accommodates the research limitations, specifically concerning the stages of operational field trials, product revisions following the trials, and the dissemination process. The dissemination phase involved presenting the research findings and distributing the Android application to MA teachers and students (or equivalent) via the Play Store.

Several stages in this research, namely as follows:

1) Preliminary Study

The preliminary study was conducted by the researcher with the assistance of a team of field assistants. This phase involved a literature review focusing on the importance of teaching biology, how the curriculum should be structured, how biology education should adapt in the 4.0 era, and the Al-Quran perspectives related to biology

content. During this stage, the researcher also performed an analysis of the KI-KD (Core Competencies and Basic Competencies) and the Biology curriculum for high school (SMA/MA), referencing the PERMENDIKBUD attachment No. 37 of 2018, which outlines the KI/KD for subjects in the 2013 curriculum (Kementerian Pendidikan dan Kebudayaan Republik Indonesia, 2018)

2) Research Planning and Design

At this stage, the researcher, with the help of a team of field assistants, identified the KI-KD (Core Competencies and Basic Competencies) and the Biology material for SMA/MA, based on the guidelines set out in the attachment to PERMENDIKBUD No. 37 of 2018, concerning KI/KD for subjects in the 2013 curriculum. Additionally, the researcher selected Al-Quran verses that were relevant to the biology content . The researcher also began designing the content for the Android application that was to be developed.

3) Preparation of the initial product draft

At this stage, the researcher, with the assistance of a team of field assistants, works on creating a draft design and layout for the menu and content display of the application to be developed, namely the 'Biolaku' app. This process covers both the visual appearance and the content structure of the app. The researcher also hires an application development consultant to help bring the concept to life, focusing on how to effectively communicate the researcher's vision to the app developer. Throughout the production process, the researcher coordinates with the consultant, regularly checks, and monitors the progress of the app's development.

The appearance of the 'Biolaku' application is as follows:

Figure 1. The appearance of the 'Biolaku' application.

Once the product was successfully developed, the next step was to conduct a product validation test. This validation was carried out with the help of three expert validators: a media expert for the application interface, a content expert for the application material, and a Al-Quran expert to assess the relevance of the Al-Quran verses to the biological content.

The media expert validation was conducted by filling out an assessment questionnaire, available at : https://docs.google.com/forms/d/e/1FAIpQLSfwUTJNwPhBeqgUwaaARLVpkaMkAgG0TdbP7DbvSmIul5XEwg/viewform?usp=sharing, which was adapted from Edy Priyono's research (Priyono & Buditjahjanto, 2012). The questionnaire focused on three main aspects: usability, functionality, and visual communication, and these were assessed through six specific questions.

For the validation of Al-Quran verses' relevance to biological content, a Al-Quran expert reviewed and validated the verses included in the ‘Biolaku’ app. This validation ensured the relevance of each verse to the biological material. The results were documented in a table outlining the correlation between Al-Quran verses and biology, which can be accessed in this link: https://docs.google.com/spreadsheets/d/1ocPNJnBOktjT4vgpa8wqFPmW4g1GggJ7/edit?usp=sharing&ouid=104096081162535216056056&rtpof=true&sd=true.

Content expert validation was performed through a separate questionnaire, available at: https://docs.google.com/forms/d/e/1FAIpQLSdlmIrgA4UuxpUue9un3ZJzEG9ny6KpdCkCIDQNmcM9LCikqg/viewform?usp=share_link, also adapted from Edy Priyono's research (Priyono & Buditjahjanto, 2012). This questionnaire assessed three aspects: learning design, material content, and language/communication, with ten specific statements related to each area.

During this stage, the validators provided feedback and suggestions for improving the product. Key comments and suggestions included: a) the sound feature was inadequate and needed to be added to each menu, b) some videos did not load properly,

c) the text on the multicultural Islamic menu should be zoomable for better visibility, d) the "Ask the Teacher" menu had issues with sound functionality, e) some text sections were overly dense and small in font size, making them hard to read, f) there was minimal content related to Al-Quran verses, with only one verse included for Grade 1, and g) the discussion on multicultural Islam needed more depth.

After receiving this feedback, the researcher and the team coordinated to make revisions and improvements to the app. They also worked with the application development consultant to implement the necessary changes to enhance the app's functionality and content.

4) Conduct preliminary field tests

The preliminary field trials were conducted with prospective biology teachers, focusing on both the usage and content of the application. During this phase, the researcher, assisted by a team of field assistants, distributed the application files (APK) and Google Form links for pre-trial questionnaires to the prospective biology teacher participants (students). Upon analysis, it was discovered that respondents experienced delays when attempting to install the application on their smartphones due to the large file size.

The feedback from these preliminary field trial respondents indicated that the developed application was well-received and innovative. However, they provided the following suggestions for improvement: a) adding a "back" button to the menu interface of the app, and b) incorporating sound into the application.

5) Perform product revisions

After receiving feedback and suggestions from the respondents, the researchers and their team collaborated to implement revisions and improvements. They also worked closely with the application development consultant to update the app. The revisions were minor, primarily addressing the points raised by the respondents during the preliminary trial.

6) Conducting main field tests

At this stage, the researcher, with the support of a team of field assistants, distributed the application files (APK) and Google Form links for the main field trial questionnaires to MA biology teachers and all 12th-grade students of MA Safinatul Huda 2 Karimunjawa, Jepara . The following are the results of the main field trials, which were analyzed using the Rasch model.

Table 1. Unidimensionality

STANDARDIZED RESIDUAL variance (in Eigenvalue units)	Empirical	Modeled
Total raw variance in observations	7.7 100.0%	100.0%
	2.7 35.4%	37.0%
Raw variance explained by persons	1.5 19.0%	19.8%
Raw Variance explained by items	1.3 16.5%	17.2%
Raw unexplained variance (total}	5.0 64.6% 100.0%	63.0%
Unexplained variance in 1st contrast	1.7 22.5% 34.9%	
Unexplained variance in 2nd contrast	1.4 18.2% 28.2%	
Unexplained variance in 3rd contrast	1.1 14.2% 22.1%	
Unexplained variance in 4th contrast	0.7 9.5% 14.7%	
Unexplained variance in 5th contrast	0 .0 0.0% 0.0%	

From the table above it is known that the raw variance explained by measures is 35.4%.

Table 2. Raw variance explained by measures criteria

Score	Description
<20%	Not fulfilled
>20%	Can be fulfilled
>40%	Better
>60%	Special

According to the table showing the raw variance explained by measures, a value of 35.4% indicates that the criteria are can be fulfilled, suggesting that the developed media meets the required eligibility standards. (Sumintono & Widhiarso, 2013).

7) Revise the results of the main field trials

After receiving feedback and suggestions from the respondents, the researchers, along with their team, worked together to implement revisions and improvements. They also collaborated with the application development consultant to update the app. The changes made were minor, focusing on enhancing the app's appearance to make it more visually appealing and user-friendly.

8) Conducting Product Dissemination and Implementation

Preliminary dissemination was conducted by presenting the research findings and distributing the Android application, along with will be publishing articles related to the project. For broader implementation in the future, the application will be submitted to the Play Store, making it accessible for use by all high school (SMA/MA) teachers and students.

CONCLUSION

The "Biolaku" application, developed using an adapted R&D approach, integrates biology education with multicultural Islamic principles. Expert validation confirmed its feasibility, and field tests demonstrated its effectiveness in supporting biology learning. Following minor revisions, the app was disseminated to schools and is ready for broader use via the Play Store, offering significant benefits for students and teachers in remote areas like Karimunjawa. The primary focus was on creating an Android application, 'Biolaku' for biology education that integrates Islamic and multicultural perspectives. After developing the app, expert validation was performed on its media, content, and the relevance of Al-Quran verses to the biological material. Results of the main field trials showing the raw variance explained by measures, a value of 35.4% indicates that the criteria are can be fulfilled. Based on feedback, the app underwent minor revisions, such as enhancing its design and functionality. Following successful field trials, the app's validity was confirmed, and it was made ready for wider distribution, including submission to the Play Store for broader use by high school teachers and students.

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