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Development of Quick Response Code (QR CODE) as A Plant Identification Innovation for Students of SMA Muhammadiyah 1 Pontianak

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ABSTRACT

QR code is a system that uses two-dimensional image codes which also originate from the evolution of barcodes. QR codes can be used as learning resources. This research aims to produce appropriate QR code learning media that get positive responses from students. The development of the QR code media uses the Research and Development method. In the 4-D development research model (Four D model), researchers only use up to 3 steps, namely: Define stage (Planning), Design stage (Designing) and Develop stage (Development). The research results show that the QR code media developed using expert validation sheets and response questionnaires received a score for the media aspect of 80.00% (feasible), the material aspect of 88.00% (very feasible), and the language aspect of 82.00% (very feasible). Meanwhile, the results of student responses used 2 development trials, these are small-scale trials 90% (very positive) and large-scale trials 88.41% (very positive). It can be concluded that the media developed in this research is valid and gets a very positive response from students.

Keywords: Development, Quick Response Code, R&D Model.

Introduction

Currently, the learning process is often conducted conventionally, where the approach used relies solely on books as the primary source of information. This approach tends to have a negative impact on student engagement in learning. Students who are confined to textbooks often display a sense of disempowerment and boredom during lessons. In this context, the use of instructional media can be considered as a potential alternative to enhance the quality of learning. Instructional media can provide variety and interactivity in the delivery of learning material, addressing student boredom and increasing motivation to learn. Considering the diverse developments in technology and learning resources, it is crucial to explore new ways that can make learning more engaging and effective.

In this era of globalization, an advanced school character becomes the key to success in creating a progressive and technology-responsive educational environment. Modern schools aim not only to provide academic knowledge but also focus on developing students' characters as individuals who are responsive, creative, and ethical. Advanced schools demonstrate a willingness to integrate modern technology into the learning process, including the use of mobile phones. Mobile phones, which have now become an integral part of daily life, have significant potential as effective educational tools. The progress in the use of this technology has been well addressed by students of SMA Muhammadiyah 1 Pontianak.

Quick Response Code or QR code is a barcode matrix or two-dimensional code that can store data information and is designed to be read using a smartphone (Sen & Tiwari, 2017). QR code is an abbreviation of "Quick Response Code," which means the contents of the code must be translated quickly. The code consists of black modules arranged in a grid pattern on a white background. The encoded information can be in the form of text, URL, or other data (Sutheebanjard & Premchaiswadi, 2010). To be able to read stored information, you can use a QR code scanner or you can use a smartphone that has a QR code scanner application installed which can be used for Android smartphone-based applications, such as product promotions, company website address information, product identification and so on (Prathivi, 2019).

The use of Quick Response Code (QR code) to digitize plant material, starts with identifying plants and collecting plant data, then the data is converted into QR code so that students can easily access information about the plant. Currently, the use of QR codes is quite common. Many countries in the world, especially Japan, have implemented QR code technology in their industry. In Indonesia, the use of QR codes is still not quite popular. However, QR code applications for various types of cellphones are quite widely available for free to download on the internet (Ridwan et al., 2010). Quick Response Code (QR code) is free to generate, and access data quickly and can be read with a smartphone. Quick Response Code (QR code) is already popular in several other countries and is gaining popularity in the United States (Jackson, 2011). With traditional teaching in schools, it turns out that students spend a lot of time listening and taking notes. Meanwhile, the learning process itself runs with a lack of time and many activities actually occur outside the teacher's supervision. This causes students' learning motivation to decrease (Diah, 2006). To achieve effective learning objectives in the learning process, methods are needed, one of which is using learning media that attracts students' attention, is active and is able to increase student motivation.

Methods

The research used is research and development or Research and Development (R&D) modified with the 4-D (four-D) development model recommended by Thiagarajan (Mulyatiningsih, 2012). The development procedures according to Thiagarajan are Define, Design, Develop, and Disseminate. However, the Disseminate stage (4) is not carried out.

1. Define Stage. The defining stage is the first stage in development research, where the goal is to establish and define learning requirements. This stage includes Front-end Analysis, Learner Analysis, Material Analysis, Learning Media Analysis and Formulation of Learning Objectives (Specifying Instructional Objectives)
2. Design Stage. The design stage aims to design learning media. Three steps must be taken in this stage: selecting appropriate media based on material and learning objectives, selecting the format, and creating an initial design according to the chosen format (Mulyatiningsih, 2012).
3. Develop Stage. The development stage aims to produce QR code-based learning media as revised based on input from material experts, language experts, and media experts.

The research began in the second semester of the academic year 2021/2022 and will be conducted at SMA Muhammadiyah. The research instrument used is a lesson on biodiversity. Data collection techniques and tools in this research include observation, interviews, and questionnaires. Development trials were carried out to obtain direct input in the form of student responses to the learning media that had been produced. The trials carried out were in small-scale and large-scale trials on class XI students with a total of 35 students. Small-scale trials were carried out using 20% of the number of students, namely 7 students, and large-scale trials were carried out using 60% of the number of students, namely 21 students based on high, low and medium levels of ability (Sutopo & Prayitno, 2018). To determine several categories of suitability for this QR code, a Likert scale measurement scale is used. The data obtained from the Likert scale measurement results are in the form of numbers. The figure is then interpreted in a quantitative sense (Labeau et al., 2021).

Table 1. Learning Media Experts' Assessment Criteria

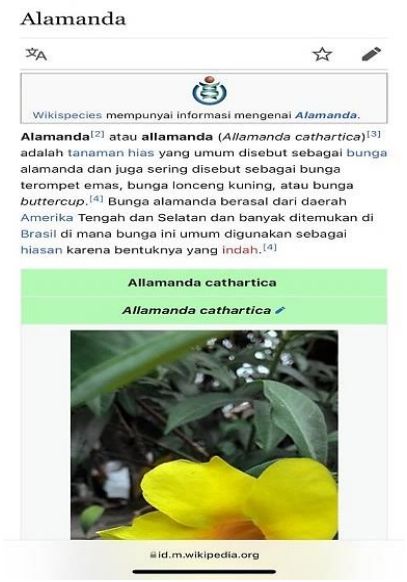
Question Criteria	Value/Score
Very good	5
Good	4
Fairly good	3
Poor	2
Very Poor	1

Source: (Riduwan, 2018)

Results and Discussion

Learning media will become interesting when it utilizes advances in information and communication technology (Sulasmianti, 2018). Munirah & Arief. M.M., (2015) stated that good learning activities require supporting media because it will enable teachers to understand students better. Ekayani (2017) defines learning media in general as a tool that aids the teaching and learning process. Furthermore, learning encompasses everything that stimulates the mind, feelings, attention, and abilities or skills of the learner, thereby promoting the learning process. Media is not only in the form of tools or materials but also encompasses elements that enable students to acquire knowledge (Amina, 2014). Initial media development is carried out with media design. This can be seen in Table 2.

Table 2. Quick Response Code Learning Media Product Format

No	Picture	Information
1	 (Initial design)	Initial design of QR code media
2	 (Revision)	The revision adds guidelines for using the QR code
3	 (Initial design)	Early web designs linked directly to Google

4	 (Revision)	The revision changed the website from Google to Google Drive.

The development of this QR code media has been completed in accordance with the 4-D (four-D model) development procedure recommended by Thiagarajan (Puspita et al., 2017). Based on the development procedures that have been stated, the creation of QR code media was carried out in several development stages to produce the final research product, namely:

Define Stage (Definition)

The Define stage aims to determine and define learning requirements. According to Nurhidayah & Irwandi (2015), there are five stages that must be carried out at the Define stage. Includes front-end analysis, student analysis, concept analysis, learning media analysis and formulation of learning objectives. The front-end analysis stage is carried out by observation and interviews. This stage aims to raise and determine the basic problems faced in Biology learning so that the development of learning media is needed. Based on observations, it is known that the media used in schools use worksheets, PowerPoint, books, videos, charts, torsos, and the use of the internet to search for information. Based on observations and interview results with teachers and students, interesting and practical learning media are needed that are in accordance with the school mission which aims to eliminate students' boredom during the learning process. The results of the interview will be attached in Attachment A-3. According to Fadzlin et al (2012), learning media is a tool used to help deliver learning programs that are difficult to explain verbally. Front-end analysis was carried out in order to find out the problems that exist in schools regarding biology learning, especially the lack of media during learning, which results in students feeling bored with the material delivered by the teacher. Furthermore, QR code learning media was developed in class XI IPA 3 to help teachers and students during the learning process. This is in accordance with the statement (Yanti, 2017) that the use of learning media is very helpful

in the teaching and learning process for both teachers and students. After the front-end analysis is carried out, it is then continued with analyzing the students.

According to the interview results with teachers and students, it was concluded that students prefer learning media that are interesting and practical. Engaging and practical learning media are tools or technologies used to enhance the learning process in an interesting and efficient manner. These media are designed to make learning materials more easily understood and capture the attention of learners, for example, an interactive learning application. Attractive media will support the learning process at school. According to Nuryana & Sahrir (2019), the learning process becomes more interesting if applied with the right media so that students are motivated to pursue the knowledge they are studying.

The researcher then carried out the next stage, which is concept analysis, to determine the material. At this stage, researchers analyze the concepts that will be taught and develop the steps that will be taken. Concept analysis was carried out by identifying the biodiversity material taught in class XI IPA 3 and selecting the material according to what would be discussed on the QR code media. The material studied is a lesson on biodiversity. The material that will be explained starts from the morphological characteristics of plants, plant habitats and plant benefits.

Top of Form

The last activity carried out was the formulation of learning objectives. This activity is aligned with concept analysis. Learning objectives that have been developed are for students able to understand that the effective use of learning media in learning can help foster positive and creative attitudes within themselves.

Design Stage (Designing)

The design stage aims to design learning media. Four steps must be taken at this stage, namely: preparation of test standards (criterion-test construction), selection of QR code media (media selection) which is in accordance with the characteristics of the material, school conditions, student characteristics, and learning objectives, and format selection (determining QR media format). Code to be developed, create an initial design according to the selected format (Sulistiyawati & Herdianti, 2015)

In the first step, researchers prepared test standards which included material that would be displayed on QR code media, which is biodiversity material. The next step is media selection. The media chosen in this research is QR code media. The learning media developed in this research is a QR code. The choice of QR code media is not only an attractive and practical form, but it can also adapt to the visual potential of students. The QR code will be displayed on the screen in each class that will study the biodiversity lesson, so after they scan the QR code, they will immediately have the material for that lesson. Next, the QR code format used by researchers in the initial product design is designing the size of the barcode card for teaching materials with Google application to make it more attractive, next the letters: Times New Roman with a font size of 12, and a spacing scale of 1.15. The final step: The initial design of the QR code product includes the size of the barcode, how to use the barcode and the material.

Develop Stage (Development)

The development stage aims to produce QR code media as learning media that has been revised based on assessments from material/content experts, language experts and media experts. The development stage (development stage) is the third stage in development research. The product validation process is carried out by validators, in this case, lecturers or

experts who have experience assessing new products. The results of this analysis are used as a guideline for correcting/revising product deficiencies after going through the validation process (Auliya & Nurmawati, 2021). There are 9 validators consisting of 3 media experts (2 lecturers, 1 teacher), 3 language experts (2 lecturers, 1 teacher), and 3 material experts (1 lecturer, 2 teachers).

Development trials were carried out twice, small-scale trials and large-scale trials. According to Pratiwi et al (2018), it is important to carry out small-scale trials first to anticipate errors that may occur during the actual implementation of the model, as well as to analyze the obstacles that may be encountered and try to reduce these obstacles when implementing the next model. In the small-scale test, 20% of the total number of students were tested and the results were obtained for 7 students. For the large-scale test, 60% of the total number of 35 students were carried out and the results were obtained for 21 students. The class chosen was class XI IPA 3 because this class was an Adiwiyata class.

Media Aspect

Media is a tool used by teachers with a customized design to improve the quality of learning (Purwanto, 2019). Media expert validation is used to determine the suitability of the media being developed. There are 2 aspects of assessment that are considered they are the size of the learning media and the design of the learning media. Based on the data, it is clear that the average percentage of the suitability of the media obtained through the media validation process is 80.00%. This proves that the resulting QR code media is suitable for use.

Language Aspects

Language aims to determine the correctness and suitability of the grammatical aspects of the product being developed. According to Putra (2017), language is a necessary aspect of understanding information. Information will not arrive if the language used is not easily understood by the recipient of the information. There are 3 aspects of assessment that are considered, namely straightforward, communicative and interactive, suitability to student development, conformity to language rules, and use of terms and symbols/icons. Based on the data in Table 2, the percentage of language eligibility is 82.00%. According to Bahri HS et al (2019), if the validation value is between 81% and 100%, it is classified as very feasible. This proves that the resulting QR code media is very suitable for use.

Material Aspects

Materials are carried out to determine the accuracy and suitability of the content of the material media to be developed. According to Olivia (2021), learning material is knowledge, skills and attitudes that students must master in order to meet the specified competency standards. There are 4 aspects of assessment that are considered, namely the suitability of the material with the SK and KD, the accuracy of the material, the currency of the material, and encouraging curiosity. The research results show that the percentage of material feasibility is 88.00%. According to Amalia et al (2021), if the validation value is between 81% and 100%, it is classified as very feasible. This proves that the resulting QR code media is very feasible.

Student Response to QR Code Learning Media

After validating the experts and getting the results that the QR code learning media is very suitable for use, the QR code media meets the criteria to enter the next step, getting student responses. Student response is the student's response and interest in the QR code media that has been developed. Student responses were obtained by giving questionnaires to students. This uses a Likert scale in questionnaires so that students have alternative answers available. According to Ardiansyah & Nugraha (2021), students' positive responses can be used as a benchmark for students to feel more comfortable with the learning media used in the

learning process. Student response data was obtained through 2 stages: small-scale trials and large-scale trials.

The small-scale trial aims to find out whether the QR code media developed is suitable for use in learning. Based on Table 2, the results of small-scale development trials calculations obtained a value of 90.00%. According to Abidin (2015), if the student response value is between 84% and 100%, it indicates a positive category; this means that QR code media can be tested for large-scale development.

The large-scale trial aims to find out whether the QR code media developed is suitable for use in learning or not, and to what extent the media can be used in learning. Table 2 explains that the results of the large-scale development trial of student responses obtained a score of 88.641%. According to Abidin (2017), if the student response value is between 84% and 100%, it indicates a very positive category. This means that the QR code media is said to be very positive to use. According to Wicaksono (2021), a positive response is obtained if the response questionnaire category shows that more than 50% of statements receive a strong or very strong response, so the media is said to be worthy. Positive responses also show that the QR code learning media developed is able to make students more understand and have a high interest in the lesson.

Conclusion

The QR code learning media meets the feasibility aspect in the media aspect of 80.00% (feasible), the language aspect of 86.00% (very feasible) and the material aspect of 98.66% (very feasible). QR code learning media with student responses to QR code learning media. In the small-scale trial, the student response was 90.00% and in the large-scale trial, the student response was 88.41%. Data was obtained which stated that respondents gave a very positive response to the QR code learning media.

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