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Development of QR-Code Assisted Leaflet Media to Improve Junior High School Students' Science Literacy

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ABSTRACT

21st century education requires students to have various basic literacy skills, one of which is science literacy. Science literacy is important in science learning because it can make it more meaningful. Existing facts prove that students' science literacy in Indonesia is still relatively low. It is hoped that the existence of leaflet media assisted by the Quick Response Code (QR-Code) can improve the science literacy skills of junior high school students in learning science. The aim of this research is to describe the level of validity, practicality and effectiveness of QR-Code assisted leaflet media. The method used in this research is development using the ADDIE development stage. The techniques used in data collection are observation, interviews, tests in the form of pretests and posttests, validation sheets, and learning implementation observation sheets. Based on the results of research that has been carried out, leaflet media is declared very valid by experts with a percentage of 90%, practical by observers with a percentage of 90%, and the effectiveness in the n-gain test is 0.71 which is included in the high category. Thus, leaflet media assisted by QR Code is suitable for use in developing science literacy in junior high school students.

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A. INTRODUCTION

Education is one of the primary human needs, part of education is learning. Learning is a process, method and effort to make humans into creatures who are always learning. The relationship between students and teachers as well as learning resources in a learning environment that has been arranged, planned, implemented and analyzed in a structured manner to realize effective and efficient learning goals and standards can also be interpreted as learning (Harahap, 2020). Tools utilized to support the learning process and serve as a means of providing information are called media. The term media originates from the Latin word medium, which is its plural form, meaning a go-between or intermediary (Zahwa & Syafi'i, 2022). The appropriate use of instructional media can be an effort to enhance students' foundational knowledge, interest, and curiosity (Firmadani, 2020).

21st century education requires students to have various basic literacy skills, one of which is science literacy (Narut & Supardi, 2019). Science literacy is an understanding of scientific knowledge regarding scientific concepts which involves the ability to think

scientifically to make decisions (Robbia & Fuadi, 2020). Mastering science literacy is important in the academic field and requires students to be equipped with science literacy from an early age, the aim of which is to help students solve problems in a rational way (Nurhasanah et al., 2020). Science is a 2013 curriculum subject taught at junior high school level, the aim is for students to be able to master science concepts and principles, skills to develop the knowledge learned, and have a confident attitude (Mayshandy et al., 2021). Natural Sciences studies natural phenomena related to facts, concepts and discovery processes (Ardhani et al., 2021). Science learning is more meaningful if students have science literacy skills that help students understand science concepts and then apply them in real life. Science literacy focuses on training students to have a responsive and critical mindset towards science (Rahma, 2022). The results of the PISA study in 2018 stated that Indonesia was ranked 70th out of 78 countries with a score of 369 (OECD 2019). The results of the 2022 PISA study state that Indonesia is ranked 64th with a score of 383 (OECD 2023). Based on the data obtained, it can be seen that Indonesia has experienced a decline and is far from the OECD average score of 489 (Ningsetyo & Sunarti, 2024).

Students' science literacy is at a low level, with one of the contributing factors being the use of inappropriate instructional media. The selection of suitable learning media is a crucial effort in enhancing science literacy skills (Istiqhfarini et al., 2019). Teachers must carefully consider the media used in instruction as it significantly influences the student learning process by increasing interest and curiosity, as well as fostering active participation and comprehension of the material (Rachmawati et al., 2020). Given the importance of media selection in the learning process, this research aims to develop innovative instructional media to improve science literacy skills. A study conducted by Wahyuni et al. (2022) indicates that students prefer learning media featuring concise text summaries complemented by relevant images. However, the media commonly used in schools still rely on thick textbooks with minimal illustrations, which are often unengaging and difficult for students to understand.

One alternative that can be used as a learning medium to increase science literacy in science subjects is leaflet media. Leaflet media is a sheet containing information sources whose language is easy to understand and is equipped with picture illustrations that can attract readers (Wahyuni et al., 2022). Increasingly developing technology means that leaflet media can be connected to Quick Response Code (QR-Code), which is a digital technology that is capable of containing various data (Haliza et al., 2023). The use of leaflet media as a learning medium has been carried out by several studies, such as Ramadhani et al. (2020) who stated that the use of leaflet media can increase students' understanding, knowledge and science literacy. Wahyuni et al.'s research. (2022) proves that leaflet media makes it easier for teachers to convey information in the form of material to students during the learning process, so that students can easily understand it.

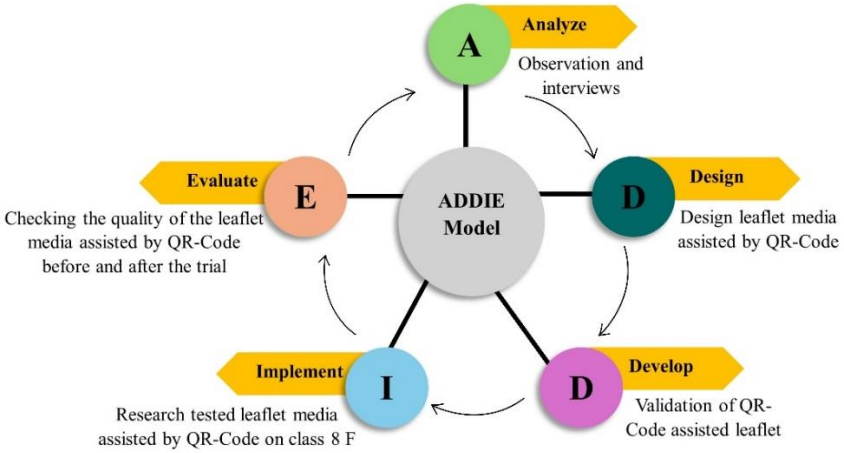
The selection of the digestive system topic for this study was based on an interview with a science teacher, who reported that this subject is particularly challenging for students. This difficulty stems from the presence of numerous complex terms and the

limited variety of instructional media, which often leads to student boredom. This finding aligns with the research by Dewi et al. (2021), who similarly identified the digestive system as a difficult topic for students. They concluded that this difficulty and a lack of student interest are often caused by the generally unvaried instructional media used in its delivery.

Based on a review of previous research, leaflet media integrated with QR-Codes are still infrequently utilized, and there has been no application of such media for the topic of the digestive system. Therefore, the objective of this study is to develop a QR-Code-assisted leaflet medium on the digestive system to enhance the scientific literacy of junior high school students.

B. RESEARCH METHOD

The method used in this research uses the ADDIE model research method (Analysis, Design, Development or Production, Implementation or Delivery and Evaluations) which was developed by Branch in 2009 to design learning systems. The ADDIE model aims to develop a leaflet media learning model assisted by QR-Code which was researched by researchers. The following are the concepts in the ADDIE model;



Picture 1. Stages of the ADDIE development model (Branch, 2009).

1. Analyze

The analysis stage was carried out by looking at and observing the conditions and environmental situation in class 8 F of SMPN 1 Arjasa, Jember Regency using observation and interviews so that they were able to determine which main problems when the teacher explained science subjects (with various types of teaching methods) the students seemed to be lacking. interested and not enthusiastic so that the material taught cannot be understood well. These problems are used as a reference or basis for developing self-assessment instrument products as a form of solution.

2. Design

The design stage is used to design the product form (leaflet media assisted by QR-Code) according to the results of the analysis in the previous stage. In this research, the determination of basic competencies to core competencies and

grids in accordance with the K-13 curriculum is needed in developing the QR-Code assisted leaflet media research method.

3. **Develop**

   The third stage is realizing the design of the assessment instrument which has been designed into an instrument that is ready to be tested on students. Development and validation of QR-Code assisted leaflet media can be carried out if the design has been validated by experts and science subject teachers so that it is ready to be tested by researchers (students conducting research).

4. **Implement**

   The implementation stage is to carry out product trials. At this stage, researchers tested leaflet media with the help of QR-Code on class 8 F students to determine the level of feasibility in developing science learning material on the digestive system at SMPN 1 Arjasa, Jember Regency.

5. **Evaluation/Assessment (Evaluate)**

   Assessment activities are carried out on the results of conducting leaflet media tests with the help of QR-Code. Through this assessment, it can be seen whether the feasibility of this QR-Code assisted leaflet media is appropriate or not according to validation from the validator. The assessment was carried out by checking the quality of the product's QR-Code-assisted leaflet media before and after the trial. If after evaluation there are problems with the product, the researcher will make revisions according to suggestions and input from the instrument validator, this is done so that the instrument created by the researcher is suitable for use.

The research subjects were students of SMP Negeri 1 Arjasa, Jember Regency. 32 Class 8 F took part in this research activity. This research was conducted in the 2023/2024 academic year. The attitude assessment that will be used as an instrument includes several things, namely, receiving, responding, assessing, organizing and characterizing a value. This data collection technique aims to make it easier to collect data and simplify the product development process. This research uses data collection techniques in the form of observation, interviews and questionnaires.

C. RESULT AND DISCUSSION

This research is entitled: Development of QR-Code-assisted leaflet media on digestive system material to improve junior high school students' science literacy, which aims to test the results of the application of the media in improving students' science literacy skills and produce leaflet media development products that are practical, valid and effective to be applied during the process. learning at SMPN 1 Arjasa.

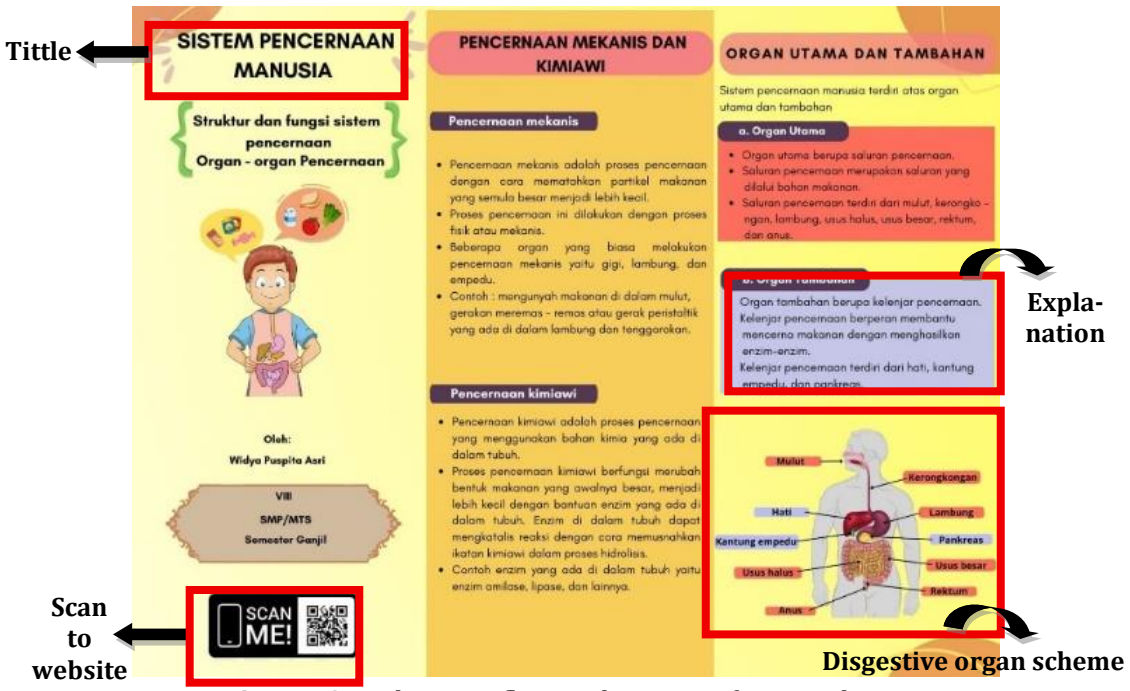
1. Analyze

Based on the results of interviews and analysis at SMP Negeri 1 Arjasa, Jember Regency as well as research literature studies that have been carried out previously, it can be a basis for researchers that this QR-Code assisted leaflet media can be used as a reference to increase science literacy in science subjects at the junior high school level.

The analysis stage found that the results of observations and interviews regarding the digestive system material contained in learning in class 8 using the 2013 curriculum showed that students' understanding of learning tended to be passive and science literacy was low. This is due to the lack of student interest in science material which is generally dominated by text and minimal illustrations such as pictures related to the material. Students prefer learning media with illustrations in the form of pictures and videos as well as summaries of material that can be understood easily. The use of learning media when learning science is still less varied because teachers rely on textbooks and Student Worksheets. Teachers are used to using the lecture method and have not yet utilized digital technology in learning.

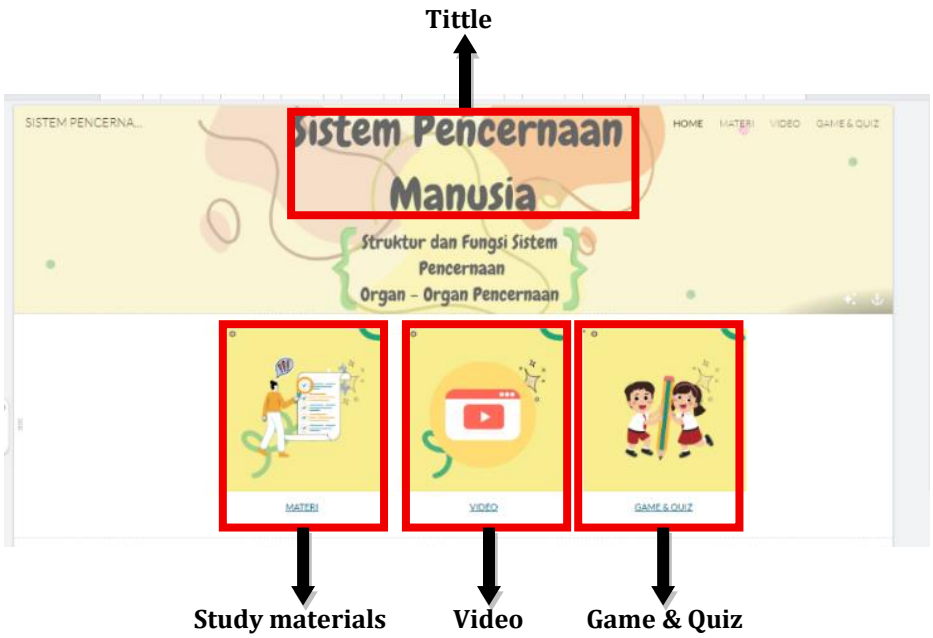
2. Design

In the first design stage, the researcher carried out the preparation of lesson plans, leaflet learning media assisted by QR-Code, as well as pretest-posttest questions. From here it was found that leaflet learning media assisted by QR-Code could be connected to Google sites which contained system material, picture puzzle games, quizzes. in the form of questions, and learning videos about the digestive system. Leaflet learning media in the form of practice question sheets can be filled in directly to train students' understanding. The preparation of leaflet media designs with the help of QR-Code can be seen in the following pictures:



Picture 2. Making Leaflets in the Form of Materials

Picture 3. Making Leaflets in the Form of Practice Questions



Picture 4. Creation of Material on Google Sites which will Later be Connected with a QR Code

3. Develop

At the development stage, validation was carried out with the aim of determining the suitability of QR Code-assisted leaflet media for use in the learning process which was carried out by three experts in the field, namely two science education study

program lecturers from the University of Jember and one 8th grade science subject teacher at SMPN 1 Arjasa. There are 2 validations carried out, namely leaflet media validation and learning instrument validation.

The results of the validation analysis in table 5 show the average percentage of validity is 90% with a very valid category. Validity testing is one of the stages for testing the contents of an instrument whose aim is to measure the validity or accuracy of the product implemented in the research (Alhakim et al., 2021). The results of the validity of leaflet media are in line with the statement by Meiristanti & Puspasari (2020) that leaflet media is declared very valid if the score percentage from validators is 81% -100%. The results of the validation can be seen in Table 1 below:

Table 1. Results of Validation of QR Code-assisted Leaflet Media

Assessment Aspects		Average of each aspect (%)	Average validity (%)	Validity level
Content Validation		92	90	Very valid
Construct Validation	Material aspect	87		
	Presentation aspect	87		
	Graphic aspect	93		

4. Implement

The practicality of QR Code-assisted leaflets can be determined based on the implementation of the learning process obtained from the learning implementation observation sheet. Practicality testing is a necessary stage to determine the ease of the learning media being developed (Irawan & Hakim, 2021). The learning implementation observation sheet was filled in by three observers during the learning process using QR Code-assisted leaflet media. The following are the results of the learning implementation that have been filled in by observers, which can be seen in Table 2:

Table 2. Observation Results of the Implementation of QR-Code Assisted Leaflet Media

Observed aspects	meeting…… in using leaflets						Percentage (%)	Criteria
	1	2	3	4	5	6		
Learning steps	0,92	0,92	0,94	0,94	0,92	0,94	93	Very Practical
Use of Leaflet Media	0,86	0,90	0,88	0,86	0,86	0,86	87	Very Practical
Evaluation	0,88	0,92	0,88	0,92	0,88	0,92	90	Very Practical
Average	0,88	0,91	0,90	0,91	0,88	0,91	90	Very Practical

5. Evaluation/Assessment (Evaluate)

The effectiveness of QR Code-assisted leaflet media for training science literacy can be tested through pretest and posttest activities as well as through student response questionnaires. Palupi et al. (2022) stated that the effectiveness of the product being developed can be determined by looking at the students' pretest and posttest results.

Questions to test science literacy skills that have been declared valid are then tested on students to determine the effectiveness of using QR-Code assisted leaflet media. The results of the analysis of science literacy skills can be seen in Table 3 below:

Table 3. Effectiveness of Students' Science Literacy Skills

Component	Skor		*N-gain <g>*	Category
	Pretest	Posttest		
The number of students	32	32	0,71	High
Lowest score	38	75		
The highest score	63	96		
Average	51	85		

Based on Table 3, the average student pretest score is 51, while the school's Minimum Completeness Criteria (KKM) is 75. The average pretest score obtained is not sufficient and is still far from the KKM. The students' average posttest results obtained a score of 85, which indicates that leaflet media can increase students' average scores because the scores obtained are sufficient for the KKM. This statement is in line with research by Palupi et al. (2022) who explains that a product is said to be effective if it can improve student learning outcomes. So it can be seen that leaflet media assisted by QR-Code can be used to improve the science literacy skills of junior high school students.

The effectiveness of learning media can also be determined through student response questionnaires (Sulistyawati et al., 2021). Test the effectiveness of leaflet media using a student response questionnaire aimed at class 8 F students at SMPN 1 Arjasa, totaling 32 students. Questionnaire sheets were distributed at the last meeting after the learning process using leaflets. The results of analyzing student response questionnaires can be seen in Table 4 below:

Table 4. Results of student response questionnaires

Observed aspects	Response percentage (%)	Category
Instructional Media	89	Very good
Material	90	Very good
Benefit	89	Very good
Score Average	89	Very good

Based on the results of the questionnaire analysis of student responses to leaflet media assisted by QR Code, an average score of 89% was obtained, which was included in the very good category. The very good category indicates that leaflet media can be implemented in learning. Based on research by Afridah et al. (2018) it is known that the use of leaflet media can be declared feasible and effective in learning if the category achievements are very good.

D. CONCLUSION AND SUGGESTIONS

Based on the results of research that has been carried out, leaflet media is declared very valid by experts with a percentage of 90%, practical by observers with a percentage of 90%, and the effectiveness in the n-gain test is 0.71 which is included in the high category. The application of QR-Code assisted leaflet media in learning has a positive impact on students, increasing students' activeness and understanding of the material presented. Students are more enthusiastic about participating in learning because the QR-Code assisted leaflet media contains material in more concise and easy to understand language. Interesting picture and video illustrations related to the material can support students' understanding and improve science literacy which was previously low. Thus, leaflet media assisted by QR Code is suitable for use in developing science literacy in junior high school students.

This study suggests that developing a leaflet medium can be used as a reference for other subjects to improve students' scientific literacy. The researcher hopes this study can serve as a reference for future researchers in developing the leaflet medium into an e-leaflet.

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