DEVELOPMENT OF POCKET BOOK BASED ON QR CODE ON PLANE FIGURE MATERIALS FOR CLASS IV ELEMENTARY SCHOOL

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Article info		ABSTRACT
		Teaching materials are part of learning. The lack of variety of teaching materials used can make students less active and enthusiastic during the learning process. Several things can make students excited and active in learning, one of which is by using a QR Code-based pocketbook. This study aims to produce a QR Code-based pocketbook that is valid and practical in terms of validation of material experts, teaching materials experts, teachers, and student responses. The type of development research used is research and development (RnD). The research model used is the ADDIE development model. This research produces a pocketbook based on a QR Code on the material of plane figure of fourth-grade elementary school mathematics content. The QR Code-based pocketbook included in the Criteria is valid and feasible to use. These results are based on the average value of 2 material experts of 88%, the average value of 2 teaching materials experts of 97.75%, and the value of practitioners (teachers) of 100%, student responses 95.29%. Percentage based on these results, pocketbooks can be used in learning.

INTRODUCTION

Mathematics is a science studied to create a style of thinking by applying it to real-life situations. Math is an important subject to study beginning in elementary school (Crosnoe et al., 2010). Students in primary schools are taught mathematics to develop their ability to think clearly, critically, and collaboratively. However, because mathematics is generally regarded as a difficult and frightening topic by students, many are dissatisfied and have an attitude of being too lazy to count or attempt (Brown et al., 2008). Numbers and number operations, algebra, geometry, measurement, and data analysis are some of the fields of mathematics (Chang & Silalahi, 2017). One area of mathematics that is still difficult for students to understand is geometry. In primary education, geometry is separated into two categories: flat and space. Flatforms are made up of circumference and area, which include the calculating concept, necessitating further knowledge (Rizzi & Ruggiero, 2002). Many students still struggle to comprehend the formula for the circumference and area of a flat figure and sketch flatforms that do not match the prescribed size because the flat shape is one of the abstract elements in mathematics instruction. Based on observations obtained by researchers during KPL on September 2, 2020, in grade IV A State Elementary School Kotalama 1 Malang, notably pupils facing learning challenges during online learning, particularly in mathematics. Mathematics learning in class IV A is done through WhatsApp groups, with students receiving assignments via photos in math textbooks without any explanation of the material beforehand. This affects students' low motivation and curiosity, causing them to do some of their parents' tasks. The lack of variety in teaching materials used causes students to feel bored and not understand the material being taught. On January 19, 2021, the researchers performed observations and interviews at SDN 1 Genengan, Malang Regency, and found that some of the issues experienced were similar to those in Malang's Kotalama 1 State Elementary School. These issues include: (1) a lack of teaching materials during the learning process, (2) a lack of variety in other teaching materials, resulting in monotony in learning, and (3) the teaching materials

used are student worksheets (LKS), which have a flaw in that the colour is not appealing in the form of only black and white, and the images are less varied. (3) Students find it difficult to study online, and (4) students become bored and frustrated throughout the learning process.

The issues raised above are consistent with Kolitch perspective, notably the high number of student complaints about studying mathematics, such as a lack of grasp of the topic, inability to complete practice questions, and inability to keep up with the learning material offered (Kolitch & Brody, 1992). More students are given assignments without any explanation of the material beforehand (Rohrer et al., 2015). As a consequence of the lack of diversity of instructional materials employed, students become less engaged and enthusiastic in participating in online learning, particularly in math topics, which causes students to grow bored rapidly. Based on this description, a QR Code-based pocketbook is created as a teaching tool to make the learning process more fascinating and entertaining. Pocketbooks are instruments for communicating information about learning materials in order to help pupils reach their full potential (Nix, 2008). For grade IV primary schools, researchers also deploy digital technology in the form of QR Codes and plane figure materials. Because QR codes can retain data and deliver information fast, they may be used to build teaching materials that are distinctive and fascinating in comparison to past teaching materials (Law & So, 2010). The choice of research in grade IV was made because students between the ages of ten and eleven can think concretely about the math problems presented, and at this age, children will begin to develop an abstract mindset progressively (Wu et al., 2005). Fourth-graders are able to think clearly and rationally, and they can see or watch, participate in learning, and immediately experience the topics being studied. Pocketbooks have the following advantages: they are simple to carry due to their tiny size, they are durable and can be used often, they have appealing designs with colourful graphics, and they are entertaining. The next benefit is that this pocketbook comes with a QR Code that contains quizzes, flipbooks, and learning videos that correspond to the content of the pocketbook. As a result, in this work, we present a QR Code-based pocketbook that is legitimate in the eyes of material experts, teaching materials experts, and teachers (practitioners) and is useful for students who need to access content for fourth-grade primary school students.

RESEARCH METHOD

The research was carried out in the State Elementary School 1 Genengan in Malang Regency as a test location. The research participants were fourth-grade primary school pupils in the even semester of 2020/2021. The research took place in May of 2021. This is an R&D project using the ADDIE development approach (Adri et al., 2020). The ADDIE model is a basic and uncomplicated procedural methodology for producing educational material items, according to Adriani (Adriani et al., 2019). The ADDIE development model design was employed, which has five stages: (1) Analysis (Analyze), Design (Design), Development (Development), Implementation (Implementation), and Evaluation (Evaluation) (Evaluation). The ADDIE development model can be seen in the flowchart of Figure 1.
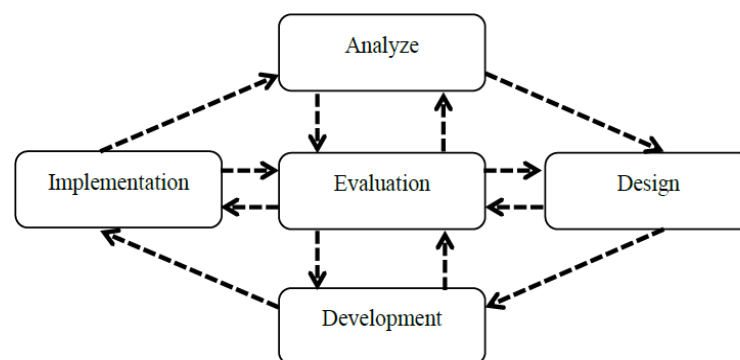

Figure 1. Stages of the ADDIE Model

Qualitative and quantitative data were utilised in the QR Code-based pocketbook development research. The qualitative data from the research on the creation of a QR Code-based pocketbook was gathered by distributing questionnaires in the form of criticism and ideas from experts and instructors (practitioners), which were utilized to enhance the product before it was tested on students. The results of filling out questionnaires from material experts, teaching materials experts, and instructors (practitioners) yield quantitative data, which is then computed to determine the product's validity and practicality. The qualitative data analysis approach is based on criticism and ideas from material specialists, instructional materials experts, and teachers (practitioners). The quantitative data analysis approach then employs a questionnaire that is scored numerically using a formula developed by Oluwatayo (Oluwatayo, 2012) to assess product validity and practicality.

$$V_{ah} = \frac{T_{se}}{T_{sh}} \times 100\% \tag{1}$$

Description of the equation formula; Vah is the result of expert validation, Tse is the total empirical score obtained, and Tsh is the maximum total score. Suppose the criterion score for all items in the validation questionnaire of material experts, teaching materials experts, and instructors is 71.00 per cent -100 per cent. In that case, the teaching materials are deemed to be valid and acceptable for use (practitioners). If the degree of achievement is still less than 71%, it must be updated based on the validator's ideas and advice. Table 1 illustrates this.

Table 1. Expert Validation Categorization Criteria

Achievement Level (%)	Category	Test Decision / Meaning
86,00 – 100,00	Excellent	Can be used without revision
71,00 – 85,00	Valid	Usable, but needs minor revision
56,00 – 70,00	Fair	It can be used with major revisions
41,00 – 55,00	Poor	Cannot be used
25,00 – 40,00	Invalid	Cannot be used

In quantitative data analysis techniques using questionnaires, student responses are measured by numbers using a formula that refers to Akbar (2017: 82).

$$V_{pg} = \frac{T_{se}}{T_{sh}} \times 100\% \tag{2}$$

The explanation of the equation formula is; Vpg is the result of user validation; Tse is the total empirical score obtained, and Tsh is the maximum total score. If the score criteria for all items in the student response questionnaire are 61.00 per cent -100 per cent, the teaching materials are regarded to be legitimate and viable to employ. The production of this research's teaching materials must be realistic in order for them to be employed in the classroom. The instructional materials must be updated if they do not fall into the practical category. The requirements in Table 2 demonstrate this.

Table 2. Criteria for Categorization of Student Questionnaires

Achievement Level (%)	Category	Test Decision
81,00 – 100,00	Very practical and very interesting	It can be used without revision
61,00 – 80,00	Quite practical and very interesting	Usable, but needs minor revision
41,00 – 60,00	Less practical and very interesting	It can be used with major revisions
21,00 – 40,00	Impractical and very interesting	It cannot be used
00,00 – 20,00	Very impractical and very unattractive	It cannot be used

RESULTS AND DISCUSSION

This study's findings are broken down into four sections: (1) development techniques, (2) validation results, (3) trial outcomes, and (4) final product design. The discussion's outcomes are used to establish if the items employed are acceptable and viable. The following are the findings and discussion:

Development Procedure

The first step is to examine the demands in relation to the current challenges in order to gather information for the product creation process. Observation and interviews were used to gather the first data. Interviews with instructors were performed by asking a variety of questions concerning the learning process, student motivation in learning, teaching materials utilized, barriers in learning, and the character of the fourth-grade children who were the topic of the research. The second stage involves utilizing the Corel Draw X7 tool to create a QR Code-based pocketbook. The design step includes deciding on the components of the pocketbook, such as the cover, introduction, table of contents, KI, KD, indications, learning objectives, usage instructions, characters, and material that begins with apperception through the characters in the pocketbook. It is envisaged that these figures will serve as study buddies for students, providing practice questions to sharpen students' cognitive capacities and skills and assessment questions in the form of essay questions about material covered in pocketbooks, reference lists and author biographies. Compiling an assessment tool to determine the level of validity and practicality is also required. Validation of material experts, instructional materials experts, and teachers are all part of the validity instrument. Student surveys are practical devices that may be used to learn about student reactions to pocketbooks.

The third stage is the development of the QR Code-based pocketbook design that has been made. The following stage is printed according to the selected material when the full design is completed. Validators consisting of material experts, instructional materials experts, instructors (practitioners), and student answers will be used to validate the final product through the dissemination of questionnaires. Testing on a small and big scale is the fourth step. The primary purpose of this stage is to complete the design and development of QR Code-based pocketbooks in order to assist students in achieving their learning objectives. The evaluation stage is the fifth stage. This step is used to determine if the QR Code-based pocketbook instructional materials are suitable or should be changed. The findings of criticism and ideas for validation from material experts, instructional materials experts, teachers (practitioners), and student trials are used to conduct the evaluation.

Validation Results

Material specialists, teaching materials, and instructors have all given their approval to the QR Code-based pocketbook that has been designed (practitioners). This is done to assess the educational materials' validity and applicability. Table 3 shows the results of the experts' evaluation.

Table 3. Results of the Validation Assessment of Experts and Teachers (Practitioners)

Validator	Value Validation	Criteria	Description
Material Expert One	86,25%	Valid	
Material Expert Two	89,75%	Valid	QR Code-based pocketbooks are a great way
Teaching Materials Expert One	98,5%	Valid	to study since they are valid,
Teaching Materials Expert Dua	97%	Valid	engaging, and useful.
Teacher (Practitioner)	100%	Valid	

According to Table 3, material expert I's validation received a percentage of 82.25 per cent, while material expert 2's validation received a percentage of 89.75 per cent, resulting in an average value of 88 per cent with the criterion "valid" but needing to be amended or improved. Researchers themselves should make learning videos, improvements to writing reference lists, improvements to punctuation writing, and improvements to pictures in the quiz were made to improve practice questions, and

evaluation questions were changed to contextual questions and illustrated with pictures, learning videos should be made by researchers themselves, improvements to writing reference lists, improvements to punctuation writing, and improvements to pictures in quiz. These enhancements are being developed so that instructional materials in the form of pocketbooks may be used in the classroom during the learning process, particularly for mathematics. The topics to be taught in mathematics must be linked to past student learning experiences (Ernest, 2010). To make it simpler for pupils to learn and move on to the next content, concepts must be tailored to the material to be taught. The validation carried out by teaching materials expert 1 received a percentage of 98.5 per cent. In comparison, the validation carried out by teaching materials expert 2 received a percentage of 97 per cent, resulting in an average value of 97.75 per cent with "valid" criteria. However, the instructions for use by students need to be revised or improved. To make the learning process easier for pupils, revisions were made to include links contained in the QR Code. According to Kan et al., the existence of a QR Code can improve the efficiency with which mobile phones can discover information quickly and precisely (Kan et al., 2011). To utilize a QR Code, open the QR Code reader app and aim the camera at the QR Code you want to use. The QR Code reader software will then scan the data or URL link included in the QR Code (Al-Khalifa, 2008).

Teachers will validate products that have been validated by material experts and instructional materials specialists (practitioners). Before assessing the pupils, this is done to determine how valid and useful the instructional materials are. Validation was completed once and yielded a score of 100 per cent with "valid" criteria, indicating that the product was suitable for testing. According to the practitioner, fourth-grade pupils can benefit from studying using a QR Code-based pocketbook because it is both useful and fascinating. According to Rollings, pocketbooks have the following advantages: (1) they are simple to carry, (2) they are succinct, (3) they have a nice look, and (4) they are easy to read (Rollings, 2020). A pocketbook based on QR Code is practical with brief material content that can be carried and studied anywhere and easy-to-understand grammar and readability, based on these benefits. The QR Code-based pocketbook has an appealing appearance, with vivid illustrations and four characters that will become study buddies for pupils.

Test Outcomes

The trial was conducted twice, once on small size and once on a big scale. Six fourth-grade primary school kids participated in small-scale trials. A large-scale experiment involving 26 fourth-grade primary school pupils was done. Overall scores obtained from student group trials include attractiveness, ease of use, and use of the developed teaching materials. The small-scale trial received a 100% score and has flaws based on student criticism and suggestions, such as students finding it difficult to turn to the next page because pocket bookbinding does not make students comfortable in using it, so small revisions are needed for improvement before being used in large-scale trials. The percentage of students who were interested in learning to utilize pocketbooks was 95.29 per cent in the large-scale experiment, with a positive reaction from students, who said they were encouraged to learn about the flat wake content since there were quiz games, flipbooks, and learning videos. Students discover that things often seen at home and at school symbolize flat forms after learning to utilize pocketbooks. According to Saputra, using pocketbooks as instructional materials can help students comprehend the content better since they offer a synopsis of the material, example questions, and practice questions (Saputra et al., 2018).

Final Product Design

The design of the QR Code-based pocketbook product that has been designed is shown in Figure 2. The QR Code-based pocketbook is developed using the Corel Draw X7 program with an appealing collection of images and colours. A QR Code-based pocketbook was produced using sturdy and safe materials for primary school pupils. The QR Code-based pocket book, which has been validated by material specialists, instructional materials experts, and instructors (practitioners), has been changed in

response to objections and suggestions. Then it was put to the test on fourth-grade primary school pupils, using small-scale and large-scale testing. The following are the findings of expert, teacher, and student evaluations.
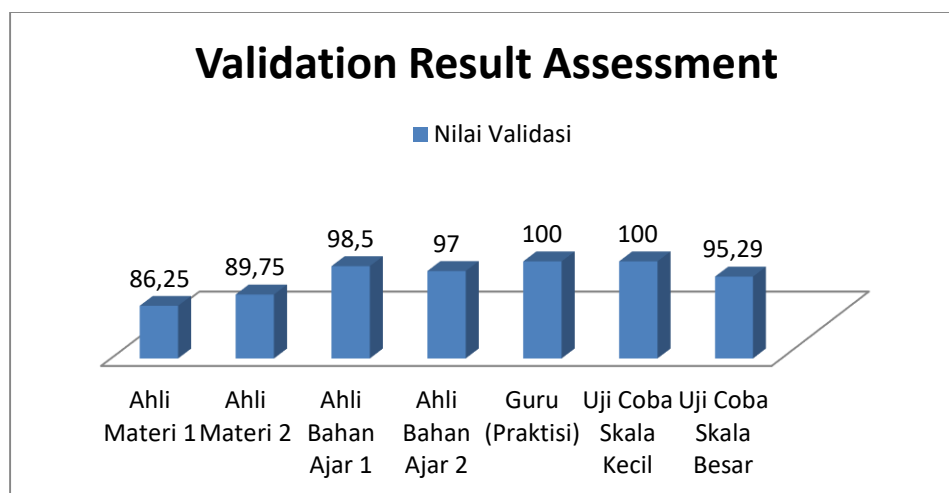

Figure 3. Assessment of Validation Results

The QR Code-based pocketbook that has been constructed and developed is highly valid, fascinating, and practical, based on the data acquired in Figure 3. This is evidenced by the fact that material expert I received an 86.25 per cent score, material expert II received an 89.75 per cent score, validation by teaching materials expert I received a 98.5 per cent score, teaching materials expert II received a 97 per cent score, validation by teachers (practitioners) received a 100 per cent score, small-scale trials received a 100 per cent score, and large-scale trials received a 95.29 per cent score. Furthermore, pupils responded well to this pocketbook on the basis of a questionnaire. The creation of a QR Code-based pocketbook is also in accordance with Arsanti's (2018) statement, namely the criteria for good teaching materials include; (1) the material is adapted to the curriculum, the material in the QR Code-based pocketbook has been made in accordance with the 2013 curriculum; (2) the presentation of the material is adjusted to the principles of learning, pocketbooks based on QR Code are expected to motivate students in the learning process so that students become active and eager to learn; (3) good grammar and legibility, QR Code-based pocketbooks are made with simple grammar for fourth-grade students and can be read clearly; and (4) attractive design, QR Code-based pocketbooks are made as attractive as possible, there are four characters who will accompany students to study, as well as colourful pictures so that they can increase students' curiosity to learn using this pocketbook. The findings were extremely satisfactory based on the results of small and large scale experiments done on fourth-grade primary school children. Students are enthusiastic about utilizing the QR Code-based pocketbook to learn how to construct plane figures, rectangles, and triangles. The utilization of enjoyable instructional materials can assist pupils in comprehending the information delivered by the teacher. According to Harden, in order for students to accept the content provided by the instructor, teachers should be able to employ instructional materials that are exciting, enjoyable, and tailored to their requirements (Harden & Crosby, 2000). As a result, the utilization of teaching materials in the classroom is vital for students to grasp the topic. According to Kusumaningrum, the purpose of teaching materials for instructors is to lead their actions so that relevant competencies can be taught to students, while the purpose of teaching materials for students is to offer guidance so that competencies may be learnt and mastered (Kusumaningrum et al., 2019).

CONCLUSION

The material feasibility level of the QR Code-based pocketbook is 88 per cent, which means that it is a pocketbook that is viable in terms of content compatibility and grammatical precision. Meanwhile, it is 97.75 per cent in terms of the appearance of teaching materials, implying that the QR

Code-based pocketbook is practical in terms of appearance, usage, and presentation of teaching materials. When utilized in studying the mathematical content of plane figure material in class IV of SD Negeri I Genengan, Malang Regency, this feasibility is incorporated in practicality. Furthermore, the data collected from small-scale trials on the validity and practicality of teaching materials is 100 per cent, while large-scale trials provide a percentage of 95.29 per cent, implying that students are engaged and passionate about learning by utilizing pocketbooks based on QR Code. Product development is done to enhance existing goods based on the validation of teaching materials and materials so that QR Code-based pocketbooks may be used on flat-shaped materials by fourth-grade primary school children.

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