Content validity of android-assisted Problem Based Learning-oriented illustrated stories teaching materials

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Abstract: This study is a validation step, which aims to develop illustrated story teaching materials oriented problem-based learning with Android assistance. Specifically, the improvement of student learning outcomes in science was focused on Class IV in the Public Elementary School TelukKulon. This research is a validation stage which is part of research and development. This product contains science material in the form of audio-visual based learning videos, some problems must be solved and also games as feedback. Validation was carried out by four experts by expert judgment. The product was categorized as feasible and valid with an average validity of 3.65 or with very valid criteria. Based on data analysis, it is known that this teaching material is suitable for research.

1. Introduction

Indonesia was categorized as the low ranks in student performance surveys according to the Organization for Economic Cooperation and Development (OECD) announced the results of the 2018 Program for International Student Assessment (PISA). These results presented a measurement of the ability of 600 thousand 15-year-olds student from 79 nations. It showed that Indonesian students were again ranked among the lowest scores on measurements of reading, math, and science. In the category of reading ability, Indonesia was ranked in the 6th position from the bottom (74) with an average score of 371, while in 2015 the position went down from the 64th rank. Further into the science performance category, Indonesia was ranked in the 9th position from the bottom (71) with an average score of 396 and was again descended from the 62nd position in 2018 [1], likewise, preservice teachers of elementary school have scientific literacy skills at the nominal level [2].

In this regard, to the student’s problem, the proposed solution may be produced by changing the education system through developing students for directing them to be more creative in carrying out actions. Besides that, the government must treat more quickly with educational problems, particularly in creating a curriculum according to the conditions of students and more directed at their effectiveness.

In addition to the new curriculum development, one of the competency components that should be addressed is a teacher as a professional, who must master the subject matter and basic scientific concepts. Mastery of the material relates to the basic scientific concepts of the material to be taught. Accordingly, to master the subject matter requires mastery of the material itself. Here there are two ways of looking at teaching materials; from the substance of teaching materials, and how to coordinate the teaching materials[3],[4],[5].

Further, one of the ways to improve the quality of learning in Indonesia is by making students and teachers using the problem-based teaching materials so that students are able to think critically and to solve problems in everyday life. In this regard, learning must be packaged in an attractive model, which can develop students' thinking skills. Granted the importance of these skills, to affirm the role of
teachers in designing learning that can develop student learning, appropriate teaching materials are required in accordance with curriculum standards and can bring out the essence of thematic learning in a balanced way[6],[3].

Currently, the teaching materials owned by the school are only module books published by the government. The textbook has not yet made students to solve problems. The stimulus of the material and practice questions has not yet created to problem solving. The learning model tends to focus only on the activeness of each teacher. The teaching materials published by the government are used throughout Indonesia, as well as the teaching materials used are only limited, because they only get loan books from schools and the numbers are so limited that they have to take turns bringing them to study at home. Teaching materials in schools also do not display the character and skills that students must master, one of which is problem solving skills[7],[8],[9].

In view of the problems above, this study was undertaken to develop Problem Based Learning focused on teaching materials and the analysis of teaching material required according to the perceptions of students and teachers, to test the validation of teaching materials, and to describe the effectiveness of android teaching materials based problem based learning[10],[11].

2. Android illustrated story based on Problem Based Learning (PBL)

In general, teaching materials may include all materials, both information, tools, or text that is systematically arranged and displayed competencies that can be mastered by students in learning with the aim of planning and studying learning implementation[12],[13].

The choice and determination of teaching materials require one of the criteria that the teaching material must be attractive and can help students to make competence. Hence the teaching materials are produced according to the needs and compatibility with the basic competencies that will be attained by students. Types and forms of teaching materials are determined by analysis of curriculum and used material sources[14],[15].

Further development of quality teaching materials must have several criteria, namely (1) having clear objectives; (2) having benefits for both teachers and students; (3) the development of language learning relating to three factors, namely variables, teachers, students, and contextual variables; and (4) following the principles of developing teaching materials, namely from abstract to concrete, easy to understand, motivating, paying attention to individual differences, contextual, and providing feedback[16].

Problem Based Learning (PBL) is a teaching model characterized by problems that are presented as natural as possible and hence students work with problems by using their knowledge and powers according to their points of psychological maturity and learning ability [17]. According to Eggen and Kauchack [18], the type of problem-based learning may include; (1) the lesson, focusing on problem solving, (2) the responsibility for solving problems rests on students, (3) the teacher holding the process when students act on problems[19],[20].

There are several steps that need to be considered when implementing the PBL model in learning. According to Hillman [21] stated that on problem-based learning, as in traditional forms of learning, teachers provide information to create opportunities for students to learn. Teachers also hold and guide student learning through educational activity to enable management of reading assignments. Furthermore, in PBL, students are encouraged to use metacognition in reading so that instructors can assess students' learning difficulties, provide feedback and behavior evaluation[22],[23].

Problem Based Learning also has advantages in its application. Yusuf et al[24] stated that the advantages of PBL as a learning model make realistic with student life, concepts according to student needs, fostering the nature of student research, strong retention of concepts, fostering problem solving abilities. Indicators of learning outcomes, according to Benjamin S. Bloom with Taxonomy of Education Objectives divided educational goals into three domains, namely cognitive, affective, psychometric[25].
3. Research method

This research is a validity content that is part of the development research phase according to Borg and Gall in Budiarti [26] which aims to develop illustrated story teaching materials-oriented problem-based learning with Android assistance in science concepts. This research begins with needs analysis by students and teachers, then continues with product design, and product development with product validity. The data on the feasibility of teaching materials were obtained from the validation results of material and media experts by providing suggestions, revisions for improvement of teaching materials before testing was carried out on students consists of material experts, media experts, language experts, and pedagogy experts. The instruments used in this study were interviews, needs analysis questionnaires, and validation sheets. The stages of the teaching material design process begin with the Powerpoint software processed by the Ispring Suite 8 software which is converted into the Website 2 APK Builder Pro v3.0 HTML 5 software with the help of Adobe Photoshop and Corel Draw image processing, and audacity sound processing. Furthermore, this teaching material was developed based on android. The results of descriptive quantitative validation were to see their validity and were analyzed qualitatively to see the suggestions given by the experts.

4. Results and discussion

4.1 The Need for Android Illustrated Story based PBL

The needs analysis was obtained from the results of the analysis of the development android illustrated story based PBL for grade IV elementary school students which included four aspects, namely (1) The desired teaching material, (2) language, (3) presentation, and (4) view. The questionnaire sheet contained an analysis of the needs of students and teachers. The questionnaire contained 20 questions each, including about the desired learning model, highlighted teaching materials, and learning outcomes related to materials of the Earth, Sun and Moon sub-book. These four aspects can be described as follows Table 1.

| Aspect            | Student Percentage | Information | Teacher Percentage | Information |
|-------------------|--------------------|-------------|--------------------|-------------|
| The desired teaching material | 88% | Really need | 88% | Really need |
| Language          | 94% | Really need | 100% | Really need |
| Presentation      | 91% | Really need | 94% | Really need |
| View              | 83% | Really need | 90% | Really need |
| **Average**       | **89%**           | **Really need** | **93%** | **Really need** |

Table 1 shows that the need for comic teaching materials oriented to Problem Based Learning assisted by android is very high. This can be seen from the questionnaire given to fourth grade students and teachers of SDNTelukKulon stated that they really need Android media in learning motion and style. The results of the analysis of the questionnaire on the need for comic teaching materials oriented to Problem Based Learning with the assistance of android indicate that it is necessary to develop Android-based teaching materials to improve student learning outcomes on movement and style materials for fourth grade elementary school students. Learning of science in SD / MI generally has not provided the maximum possible opportunity for students to be able to develop their creativity to find their own concepts [27]. To create an enjoyable learning atmosphere, it is necessary to have interesting learning innovations so that students do not feel overwhelmed by the teaching material that must be mastered [28].
4.2 Design of Android-Assisted Problem Based Learning-Oriented Illustrated Stories Teaching Materials

On this basis, the teaching materials developed are learning materials-based Problem Based Learning. The results of this development are expected to provide benefits for students, such as increasing student motivation to study the material and attracting students to be more active in learning. Figure 1.

![Figure 1. The display of android illustrated story based PBL](image)

The principle of developing problem-based learning materials includes the feasibility of the material, the content includes the principle of completeness, the principle of conformity, the principle of sufficiency, contains aspects of learning outcomes, the principle of curiosity, scientific principles, the principle of diversity of values, language includes the principle of convenience, attractiveness, communicative, conformity, the presentation includes attractive, creative and innovative, systematic, active, graphic principles include attractive, creative, innovative and practical principles. This scene can attract students' interest in learning the material and movement styles. The product of developing PBL teaching materials with motion and style material for elementary school students is presented in the form of a companion book, one of which is part of a book consisting of materials that combine several subjects in it, namely learning, one of which is about the analysis of reading solar eclipses, learning two pieces of information, visual lunar eclipse and learn three important pieces of information. Each learning includes material identity, problem orientation, student organizing, coaching student activities, presenting work, evaluating problems in the form of assignments for students.

This product not only contains material but is also game-based. The material is presented in the audiovisual learning video so that interaction occurs with students. This innovation was pursued so that students were increasingly interested in learning science and were able to hone their creativity. Teacher creativity in innovating learning methods plays an important role in the learning process. Android is becoming a very popular operating system because of its effectiveness and efficiency. The playing process is not only categorized as games that rely on physical strength but can also use the android application [29]. Android can also be used for educational purposes as a learning medium...
because of its ease and flexibility [30]. Mobile devices such as smartphones can be used to increase feedback activity during and after the delivery of instructions by the teacher [31].

Learning models developed with content containing images can meet student needs and contribute to the effectiveness of the teaching process [13]. This teaching material developed uses pictorial stories as part of the content. Several previous studies show that the use of pictorial stories is effective as a learning medium [32], [33]. Boyle, et al [34] show that a game-based approach is effective in learning. Educational games can be useful to support the teaching-learning process in a more fun and creative way and are used to provide instruction or increase user knowledge through an interesting medium [19]. Interactive media can provide new variations for students who are easier to memorize learning material when displayed with certain interesting images and sounds [5].

4.3 The validity of PBL materials
The validation test of material prototypes of PBL was performed to improve learning outcomes for those sub-themes in elementary school researchers by involving four experts. This is because at the revision stage it did not only pay attention to suggestions from experts but also paid attention to suggestions and input from practitioners as supervisors for the use of development products.

Aspects that are assessed include the feasibility of the content of teaching materials consists of content, language, presentation and view. They are the problem-based learning component, the feasibility of presenting teaching materials, and the linguistic feasibility of teaching materials and the appearance of teaching materials, aspects of the suitability of teaching materials, teaching materials with didactic requirements, construction requirements, and technical requirements. The results of the recapitulation of the validation test assessment of the product development of PBL teaching materials to improve learning outcomes can be concluded that the prototype of PBL teaching materials got a score of 93% in the very good category. The result of validation as shown on Table 2.

| Experts | Total score | average | criteria |
|---------|-------------|---------|----------|
| Expert 1 | 53          | 3.53    | Very valid |
| Expert 2 | 55          | 3.67    | Very valid |
| Expert 3 | 57          | 3.80    | Very valid |
| Expert 4 | 54          | 3.60    | Very valid |
| Average  | 54.75       | 3.65    | Very valid |

The suggestions from experts are Pictures or examples should not be too short, android media is suitable for learning science subject matter of motion and style, good and interactive media, suggestions on media display so that colors are changed brighter, PBL-based learning materials and teaching materials are very good and good for learning in elementary school in material motion and force, the material as a whole is good and worthy of use in research.

The advantages of the first teaching materials are seen from the attractive media interface design. Display elements that can be seen attractively from the media include cover and menu designs, consistent image proportions, and appropriate color, text, and background combinations. In addition to an attractive appearance, this teaching material has another advantage, namely the explanation of the material that is simple and easy to implement. The explanation of the material contains an image-producing sound. Regarding the use of the product, the advantages of this teaching material lie in its access to an Android smartphone. Students feel faster and understand the material and practical exercises when using Android-based material [3]. Computer-based interactive multimedia applications are valid and suitable for use in teaching and learning activities in elementary schools [24].
5. Conclusion
Development research is able to produce the implementation of Problem Based Learning teaching materials to improve learning outcomes science in elementary schools, it can be concluded that the results of developing android illustrated story-based Problem Based Learning-based teaching materials for improving learning outcomes science in elementary schools. developed based on needs analysis according to the perceptions of students and teachers. The content/material aspect requires that the material is in the form of an integrated story, with the motion and force material, which accentuates the problem, to improve learning outcomes. The linguistic aspect requires that the language used is in accordance with the level of student knowledge, according to the rules of good and correct Indonesian, effective sentences, communicative, and easy to understand. The presentation aspect requires teaching materials to be complete with student activities according to the indicators to be achieved, interrelated material, complemented by performance and singing activities, presenting information according to reality. The view aspect, equipped with supportive and attractive images, and an image on the cover that matches the integrated story content.

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