Implementation of OPTIKU *pocket book* based Android for enhancing problem solving ability

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**Abstract.** Problem-solving ability is one of the abilities that must be possessed by students in the 21st century. Field studies obtain data that some students have low problem-solving abilities. This study aims to determine the feasibility of learning, improvement of problem-solving abilities, and differences in problem-solving abilities of students between classes using Android-based pocketbook learning media with classes that do not use Android-based pocketbook learning media on optical instrument concept. The method used in the study was a quasi-experiment with the design of a non-equivalent control group. The sample was selected using a purposive sample technique. The results showed that the implementation of learning was classified as a good category and there were differences in the problem-solving abilities of the two classes of students because the N-gain experimental class was 0.63 and the control class was 0.53. This shows that Android-based pocketbook learning media can improve students' problem-solving abilities in the optical instrument concept.

1. Introduction

Technology is growing rapidly in the 21st century, so science and technology are important foundations in nation building. The 21st century requires students to have high-level abilities, hopes that students can associate the learning outcomes that they get with everyday life, so they can solve problems in everyday life. The high level of ability needed in the 21st century is the ability to solve problems [1]. On the other hand [2] adds that the factors that influence problem solving abilities are the knowledge structures possessed by students to solve problems and character problems. Therefore, in the learning process it is necessary to train students' problem solving skills so that they are able to adapt the needs of the 21st century.

Learning can not be separated from the process of transferring information, so it takes the media for the delivery process. Books become one of the solutions for delivering this information. However, books tend to be more easily damaged so they are less efficient [3]. One of the requirements for good learning media is learning media must be in accordance with the characteristics of students and conformity with the concepts to be delivered. The use of appropriate learning media will increase the interest of students in learning. Learning process will be easier and more interesting, so it can make students more comfortable and not seem bored or monotonous [4].

Today people cannot escape from technology, as well as students. At present, students spend more time with cell phones or Android compared to textbooks. Not a few students are very rare to open
textbooks, most students prefer to read information from digital media in the form of computers or cellphones [5].

Supported by this, the researchers implementation a learning media based on Android pocket book in physics learning. The selection of pocket books as learning media is because Android pocket books tend to be more accessible and more practical than textbooks. [6] states that the presence of pocket book learning media can increase students' learning motivation. Based on the results of previous studies, [7] states that according to media experts, physic pocket books obtain good categories and are very feasible to use as learning media because they obtain a feasibility percentage of 88.44% and 91.11%. [8] the results showed that there were higher learning outcomes for students using pocket books than without using pocket book. [9] also mentions that using pocket book learning media shows an increase in students' cognitive abilities both in the experimental class and in the control class. In the other side Pocket book based Android learning media is very suitable for use in the concept of optical instruments, because in this concept there are several types problems that can be solved using the help of pocket book based Android learning media are like the formation of shadows on a lens that requires a concrete picture so that students don't just imagine. Optical instruments are very closely related to everyday life so it will help students to improve their problem solving skills [10].

2. Experimental method
This research method used was quasi-experimental method with non-equivalent control group design. It conducted by comparing experimental and control group, each consists of 30 students. Both groups were given pre-test then given treatment and post-test. The research design can be seen in table 1.

| Group     | Before | Treatment | After |
|-----------|--------|-----------|-------|
| Experimental | O₁     | X₁        | O₂    |
| Control    | O₁     | Y         | O₂    |

The sample was selected using a purposive sample technique, consideration of sampling taken is the availability of learning media that will be used in the form of Android in the experimental class, and the level of ability of students in the experimental class is more homogeneous than other classes. Test instrument used in this study is a test of problem solving ability, in the form of essays. This test is given before and after treatment. The goal is to find out an enhancing in students' problem solving abilities. For the enhancing problem solving skill, we used normalized gain equation.

\[
<g> \equiv \frac{%<G>/ \%<G>_{max}} = \frac{(%<S_f> - \%<S_i>)/(100 - \%<S_i>)}{(100 - \%<S_i>)}
\]

Normalized gain interpretation categories used in this study can be seen in table 2 below [11].

| Value (\(<g>\)) | Criterion     |
|-----------------|---------------|
| \(<g>\) < 0,3   | Low-g         |
| 0,3 \(\leq\) (\(<g>\)) \(\leq\) 0,7 | Medium-g |
| \(<g>\) > 0,7   | High-g        |

3. Result and discussion
Based on research that has been done, data has been obtained in form of media validation result, observation results of implementation of the learning process, and result of pre-test and post-test. Before pocket book based on Android learning media was used on Students, the validation process needs to be done because good media is verified [12]. Where in the verification process contained validation and reliability. The pocket book validated first by three experts, they are media expert, content expert and
physics teacher. Result from media expert validation obtained value of 82.67 which is in good category, while from content expert obtained value of 64.8 which is in medium category and from physics teacher obtained value of 88.71 which is in good category. Based on validation result, it can be concluded that the pocket book based on Android learning media is worthy to use as learning media.

The increase of problem solving skill of students is known based on increase of student’s pre-test and post-test. Pre-test is conducted before giving treatment as an initial student’s skill test. Post-test is conducted after giving treatment as a final student’s skill test. The analysis data result of pre-test, post-test and N-gain of experimental and control class for optical instruments material is presented in table 3.

| Table 3. Score of Pre-test, Post-test, and N-Gain of experimental and control class. |
| --- | --- | --- | --- |
|  | Pretest | Posttest | N-Gain |
|  | Experiment | Control | Experiment | Control | Experiment | Control |
| Sum | 805 | 837 | 2192 | 1973 | 0.63 | 0.53 |
| Average | 27 | 28 | 73.1 | 65.8 | (medium) | (medium) |

The table 3 can be presented as a graph in the figure below:

![Figure 1. Enhancing of student problem solving ability.](image)

Based on table 3 and figure 1, obtained of increase in problem solving skill of experimental and control class. Experiment class shows pre-test average of 26.84 and post-test average of 73.07, this shows that experimental class has increased of 0.63 which is in medium category. Control class shows pre-test average of 27.9 and post-test average of 65.8, this shows that control class has increased of 0.53 which is in medium category. The results of the study obtained based on the sub-indicators of problem solving ability found that the highest N-Gain value is useful concept description. Based on this result, it shows that Pocket Book based on Android can help students in learning process and also can increase their cognitive skill.

4. Conclusion

Difference between student’s problem solving skill with and without pocket book based on Android learning media on optical instrument material can be known based on N-Gain of Both Class. Class that using pocket book based on Android obtained N-Gain of 0.63 while class without pocket book based on Android obtained N gain of 0.53. The increasing of problem solving skill in class with pocket book based on Android learning media is higher than class without it.
Acknowledgments
The researcher expressed his deepest gratitude to the Sunan Gunung Djati Bandung State University Research and Development Center for financial funding and the publication of this research.

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