

The Development Of Android-Based Mobile Learning Supported By Problem-Based Learning Strategy For Students' Learning Success

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Abstract: Mobile learning is used as a media to support Science, Technology, Engineering, and Mathematics (STEM)-based learning. The focused of this study was to develop Android-based mobile learning supported by the problem-based learning strategy for students' learning success. This research and development study has employed the Analysis, Design, Development, Implementation, and Evaluation (ADDIE) model. Moreover, the data were descriptively analyzed and validated by experts along with practitioners. The validity results show that the mobile learning medium was valid and feasible to apply. The mobile learning implementation, students' activity and achievement arrive at an excellent result. It was declared that the development of mobile learning was valid, practical and effective. In addition, it is revealed that teachers utilize this learning media supported by the problem-based learning strategy to reach the success level of the students. Further studies can apply mobile learning to measure other variables, supported by other learning strategies.

Keywords: Android, Problem-Based Learning, Strategy Learning.

1 INTRODUCTION

A mobile device is able to provide assistance to people, students in particular, and to manage their everyday life. Based on the observation results conducted to 331 students, 91.24 % of them use Android-based smartphones and this indicates that smartphones are an integral part of the students. Moreover, as many as 30 students were given questionnaires with scale 1-10, consisting of four questions on the use of smartphones on a daily basis. The results show that smartphones are utilized for some activities by which 9.33 for social media, 5.67 for a phone call and text, 5.50 for browsing learning material, and 5.3 for playing games. It reveals that students mostly use smartphones for social media. For this issue, it needs a breakthrough to change the behavior of students in the use of their smartphones. The mobile device has become the learning media in the form of mobile learning to adjust to the development of millennial generations. The type of learning that can be employed inside or outside the classroom has to pay attention to learning mobility, technology mobility, and learner mobility.[1][2] Previous research results indicate that mobile phones help teachers and students in the learning process since it encloses comprehensive information. The information is effectively accessed by the students when they study and helping them connected with other people[3], The students give a positive response to this matter[4]. The use of mobile learning in the classroom provides an effect on group works, projects, active learning process, confusion and stress relief, communication enhancement, students' concentration, quickly-delivered topics, and practical use [5][6][7]. Mobile learning has also influenced the teaching and learning process and students' achievement [8][9], Future studies can also focus on research and development of mobile learning and its application in a more diverse field of science [10][11][12]. Pedagogical support is necessary for mobile use as a learning media during the learning process. A more significant matter is rationalizing mobile learning application in pedagogical learning strategies of a curriculum [13]. Teachers with a high-quality pedagogical ability are those who can teach well by employing learning strategies. Problem-based learning (PBL) is a strategy to support the mobile learning application in the classroom. A number of studies discover that PBL gives a positive effect on students' competence, making them

confidence and able to solve problems, as well as improving their achievement. Considering the previous research results, the purpose of this research is to develop valid, practical, and effective mobile learning and other device for students' learning success, supported by the problem-based learning strategy.

2. METHODOLOGY

This research and development study employed the Analysis, Design, Development, Implementation, and Evaluation (ADDIE) model to develop learning media. The developed product was Mobile Learning Media, lesson plan and students' worksheet oriented to problem-based learning, achievement test, observation sheets of learning implementation and students' activity. The mobile application named Appy Pie was used to design the mobile learning media. Before the process of design, a storyboard was created to facilitate this process. Below is the example of the storyboard.

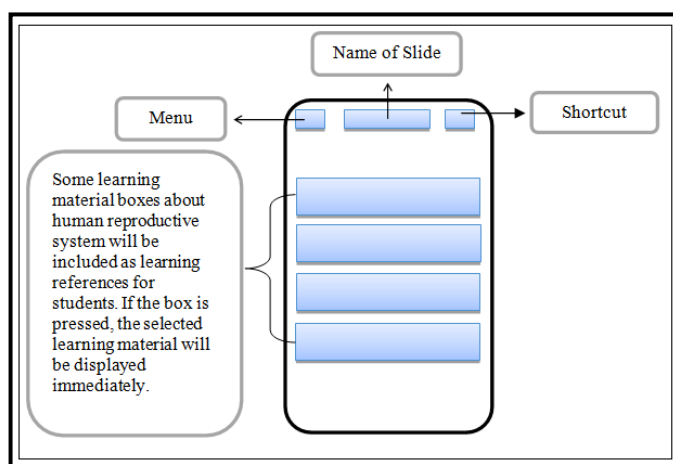


Figure 1: Example of Storyboard.

Table 1: Storyboard Description.

Explanation	Display	Interaction	Animation
This slide is to see the materials about the presented reproductive system.	1. Text: - Name of slide - Materials 2. Button - Menu image - Shortcut image - Material image 3. Background	1. Click the Menu Image to find the menu of "back to the main menu". 2. Click the Shortcut Image to type manually if wanting to directly discover various items in the application. 3. Click the Material Image to get in the selected material	Button animation

This research was conducted from March to May, 2018 in Senior High School SMAN 01 Manokwari, West Papua. It involved 20 students for small group trials and 82 students for large group trials as the subject. The site was selected due to some considerations, i.e., supporting facilities and infrastructure and students were allowed to use a mobile phone in the classroom.

Research instruments consisted of:

1. Validation sheet to determine the validity of the mobile learning and other device to be properly used in the learning process. This sheet was filled by two experts and one practitioner
2. Observation sheet of learning implementation
3. Observation sheet of students' activity, and (4) achievement test. Achievement test comprised 30 multiple choice tests and five essay tests.

The data analyzed descriptively included:

1. Analysis of validity data from experts and practitioner
2. Analysis of results of mobile learning implementation supported by the problem-based learning strategy. The criteria of validity analysis results and implementation were based on Table 2 [19] and Table 3 respectively.

Table 2: Criteria of Validity.

Range	Level of Validity
85.01% - 100.00 %	Very Valid (without revision)
70.01 % - 85.00 %	Average Valid (minor revision)
50.01 % - 70.00 %	Less Valid (major revision)
00.00 % - 50.00 %	Invalid (inapplicable)

The above table indicates that the criteria of mobile learning and other device considered worthwhile to use with the percentage of 70.01%. Nevertheless, revision is required to obtain a very valid result ranging from 85.01% - 100.00%.

Table 3: Criteria of Implementation.

Range	Criteria of Implementation
80 % - 100 %	Excellent
70 % - 79 %	Good
60 % - 69 %	Fair
40 % - 59 %	Poor
0 % - 39 %	Very poor

Table 3 was utilized to determine the success of mobile learning implementation supported by the problem-based learning strategy. The learning process using the mobile learning supported by problem-based learning was considered

successful if the good criteria were met. The criteria were for small and large groups trials. In addition, the measured aspects were learning implementation and students' activity. Table 3 was utilized to determine the success of mobile learning implementation supported by the problem-based learning strategy. The learning process using the mobile learning supported by problem-based learning was considered successful if the good criteria were met. The criteria were for small and large groups trials. In addition, the measured aspects were learning implementation and students' activity.

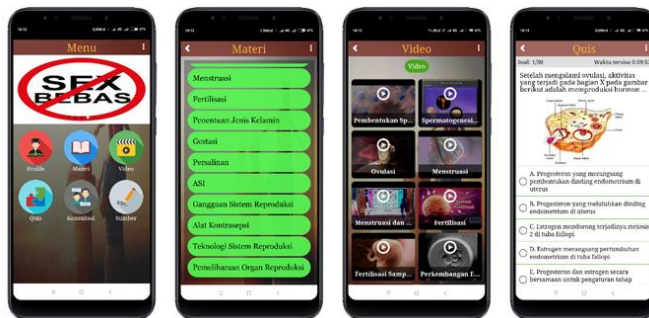


Figure 2: The example of Mobile learning design.

The above figure presents some parts of the mobile learning that have been designed, validated, and applied in the classroom. The main menu of mobile learning shows six parts, as follows:

- a. Profile: introduction and profile of the creator.
- b. Materials: Biology learning materials, especially the human reproductive system.
- c. Videos about the human reproductive system, such as sperm forming, menstruation, fertilization, intrauterine device (IUD), HIV, and the like.
- d. Quiz consisting of 30 multiple choice questions. When the question is open, the items order always changes, so that students cannot ask for their friends' answers to the questions. For instance, question number 1 for student A is in another number for student B.
- e. Consultation: A box that can be used by the students if they get confused with the mobile learning application.
- f. Source of references utilized to compose learning materials.

Table 4: Learning Device Validity Data.

Learning Device	Validity	Validity Level
Mobile Learning Media	94.20 %	Very Valid
Lesson Plan	91.60 %	Very Valid
Students' Worksheet	94.80 %	Very Valid
Achievement Test	94.80 %	Very Valid
Observation Sheet of Learning Implementation	91.80 %	Very Valid
Observation Sheet of Students' Activity	90.20 %	Very Valid

Table 4 reveals that mobile learning and other device arrive at the very valid result. It signifies that those media are suitable for the learning process in the classroom.

Table 5: Learning Implementation.

Trials	Average Percentage	Criteria
Small group	94.32 %	Excellent
Large group	93.81 %	Excellent

Table 6: Students' Activity.

Uji Coba	Average Percentage	Kriteria
Small grup	82.72 %	Excellent
Large group	85.14 %	Excellent

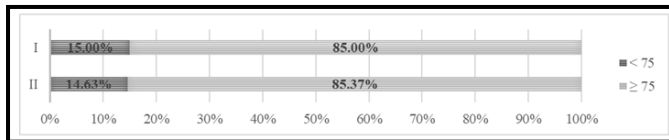


Figure 3: The Results of Students' Achievement in the trial groups. I presents the small group trial and II is the large group trial.

Figure 3 brings out the facts that 85.37% of the 82 students are successful in the learning process of the large group trial. Compared to the small group, there is an increase of 0.73% of the successful students. This implies that the students make good achievement in the learning process using the mobile learning media supported by the PBL strategy. The success level is based on the standard of the minimum percentage of 85% of the students scored 75. The development of Android-based mobile learning that is supported by the PBL strategy gets an excellent result. When this media is implemented using the appropriate learning strategy, the concept mastery and students' activity have markedly improved. The developed mobile learning is presented to fulfill students' needs in which most of them have smartphones, yet they do not use it for good as a media to acquire information, learning materials in particular. The implementation success in small and large groups' trials reveals that the mobile learning supported by PBL strategy reaches the excellent criterion. This success also means that mobile learning and problem-based learning strategy is an appropriate combination. The implementation result is in line with the students' activity that arrives at an excellent category, meaning that the implementation of mobile learning supported by PBL strategy and students' activity are linked to each other. Mobile learning designed in this study is different from the design in the previous study [20]. They integrate the stages of problem-based learning into mobile learning. In this study, however, the stages of problem-based learning are not integrated into mobile learning. The mobile learning comprises a variety of learning materials, the human reproductive system, and quiz. The purpose of this design is that mobile learning can be implemented to other topics and supported by other learning strategies in the near future. From the aspect of students' success, the small and large groups' trials show that they achieve an excellent result. This result is a follow-up from the previous study's recommendation that mobile learning in the learning process uses innovative learning that develops [21]. The achievement of students' success in the standard of 75 in biology subject employing the PBL strategy is only 58% in the trial I and 71% in the trial II [22]. In regards with the school standards, the students are not considered successful, yet the initiative to develop and implement the mobile learning with the problem-based learning strategy can make 85% of the students improved by reaching the school score standard. The PBL strategy is now recommended to apply in Indonesian schools. Students are finally able to master learning competencies, particularly in the

human reproductive system learning material of Biology subject.

3. CONCLUSION

Based on the use of mobile learning and other device, the success of learning implementation employing the mobile learning with PBL strategy, the success of students' activity, and the success of students' competence mastery, the development of Android-based mobile learning and other device are valid, practical, and effective. This media development supported by the PBL strategy leads students to make a great achievement in the learning process. Further studies can compare the use of mobile learning media supported by the PBL strategy to conventional learning strategy. It is also expected that this mobile learning can be applied with other learning strategies as suggested in the curriculum 2013 in Indonesia, such as Inquiry-based learning, Discovery learning, or Project-based learning. The delimitation of this study is that it still focuses on mobile learning by using smartphones. In the next research, when the application is created, it can use the "save as" for Android and Windows users.

5. REFERENCES

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