Effect of teaching material based on mobile learning to learning outcomes of natural environment

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Abstract. Learning materials that are integrated with technology are currently being used. This study aims to determine the effect of mobile learning-based teaching materials on student learning outcomes in thematic learning in elementary schools. This study uses an experimental method with a 2x2 level treatment design, to answer the question of how the influence of mobile learning-based teaching materials for elementary schools. The results showed that there were significant changes to the learning outcomes of students after using mobile learning-based teaching materials, compared to using conventional teaching materials. Thus it can be concluded, that teaching materials based on mobile learning can affect the learning outcomes of elementary school students.

1. Introduction

Learning materials that are integrated with technology are currently being used, one of which is teaching material based on mobile learning. Mobile-learning is defined as an activity (learning) that gives each student to be more productive when consuming, interacting or giving information [1]. The use of this kind of technology makes teaching materials have image, sound and movement content) Mobile learning denotes instructional content or activities that are delivered on (or mobile) devices, that accommodate limited multimedia delivery, primarily in the form of audio, images, animation (video), and text [2]. Several studies have also examined this. Mobile learning offers learning opportunities to learners without the limitations of time and space. Mobile learning has introduced a number of flexible options to different disciplines and different educational levels [3]. Mobile learning motivated learner engagement in the learning process and the same time it offered them opportunity to learn anytime and anywhere. Furthermore, mobile learning and their studies are also assisted by them in managing their studies and facilitated learning. In sum, it is evident that the effective learning enhancement tool if properly designed [4]. In learning and teaching activities, teachers must provide quality learning material for their students so that students get learning outcomes that maximum. For this reason, in the learning process in several schools, teachers use teaching materials based on mobile learning, and some others use conventional teaching materials such as LKS books and textbooks. The teaching materials are prepared with the objective of providing materials for learning in accordance with curriculum demands taking into account the needs of students covering the characteristics and environment of the students.
Teaching materials can help students find alternative to learning materials to textbooks that are sometimes difficult to understand [5]. The question is: (1) are learning materials based on mobile learning able to influence student learning outcomes for the better? (2) Whether there are differences in student learning outcomes using mobile learning-based teaching materials with student learning outcomes using module-based teaching materials.

State of the art in this study is the development of research products in the form of smartphone applications in which there are several learning materials in the form of animated films. Then this application is also equipped with several additional features, such as interactive quizzes that can provide test results automatically, and summaries and learning assignments that are written in writing. Research conducted by researchers has differences in terms of content, researchers focus on developing animated films that can be properly and interestingly consumed by elementary school students in grade II, animated characters who play roles also often invite audiences to ask questions in a virtual way. There is a difference from the research conducted by Susan Nash, which in the learning video only shows animated videos, but there is no communication between the animated character and the audience. Then in terms of product use. The researcher designed that the research products developed could be used by teachers in class, and students at home. For this reason, researchers designed this learning application based on mobile learning in a simple way so that it can be used by all groups. In contrast to research conducted by Comas-Quinn whose research products were only intended for students. The researcher also designed the product with bright colors so students were interested in learning to use this learning material based on learning with a happy feeling. In this perspective there is a difference with the research conducted by Shohel and Power which puts forward mobile learning products only at the efficiency of information retrieval.

2. Literature review
M-learning refers to the delivery of learning to students anytime and anywhere through the use of wireless Internet and mobile devices, including mobile phones, personal digital assistants (PDAs), smartphones and digital audio players. Namely, m-learning users can interact with educational resources while away from their normal place of learning—the classroom or desktop computer [6]. Mobile technologies are one of the fastest growing areas of technology. For educators, they offer an appealing opportunity for learners to transcend teacher-defined knowledge or approaches by accessing multiple, alternative sources of information. Hardware advances that allow pocket sized minicomputers to be carried around easily have combined with improved wireless networks to increase the pace and scale of attempts to innovate in learning and teaching, as well as encouraging investigations into mobile devices as classroom tools [7]. Unlike what Comas-Quinn expressed in Levene's research publication, the main thing about mobile technology is being able to access information anytime / anywhere, which is able to provide opportunities for students to study formally or informally [8]. On the other hand Burden and Kearney revealed that mobile learning has made an unlimited relationship between virtual and physical environments. The contemporary m-learning literature in various studies covers case studies of innovative mobile applications that are authentic, connected, participative inquiry-based approaches. Research has explored possibilities for science learning across formal and informal contexts, making seamless links between virtual and physical environments, and particularly using participatory simulations and augmented reality technologies [9]. Mobile learning refers to a learning context in which learners utilize their individual portable devices to access a mobile network to conduct their learning, whether in or out of the classroom [10]. The future view presented by Aladwan that Mobile learning (m-learning) is seen as the key to the era of electronic learning (e-learning) that will come. Meanwhile, the use of mobile devices for learning has made a significant contribution to providing education among higher education students throughout the world [11]. A distance difference is not to be a barrier in mobile learning, because Mobile learning technologies are ideal in the ODL context because they are flexible, accessible, available, and cater for a myriad of interaction activities [12]. In study conducted by Christensen dan Knezek, involving 1414 teachers from a large public school district in the southwestern USA, major findings are that elementary school teachers are more open to using smartphones, tablets
and other hand-held information technology devices for mobile learning in their classrooms, when compared to middle school or high school teachers [13]. As a consequence, several countries, such as Singapore, Thailand and Taiwan, have put a great deal of effort into implementing mobile learning in school settings to improve students’ higher-order thinking [14]. Learning based on mobile learning has now been found in various forms of application and also learning activities, some of which have the theme of interactive stories, learning interactive reading, recognizing letters or numbers. Everything is packaged in an applicative menu and an attractive display that can be used by teachers or students.

3. Method
This study uses experimental research. Experimental research methods can be interpreted as research methods used to find the effect of certain treatments on others in controlled conditions. The research design used was pre-experimental design with one-group pretest-posttest design model. This design uses a single sample with the following description:

Table 1. Design one-group pretest-posttest design.

| Pretest | Treatment | Posttest |
|---------|-----------|----------|
| O1      | X         | O2       |

The sample used in the study to determine the effect of mobile learning-based learning materials amounted to 40 second grade students of elementary school. The free variable in this study is the use of teaching materials based on mobile learning. While the dependent variable in this study is the learning outcomes of students.

4. Results
Based on the results of a field test of 40 respondents after carrying out mobile learning based thematic learning, a list of posttest scores was obtained. It can be seen that there are differences in student learning outcomes in the pre-test and post-test. The lowest value at the pre-test evaluation stage is 20, while the posttest evaluation stage is 30. The highest value at the pre-test evaluation stage is 86, while the highest value at the posttest evaluation stage is 100. The average value of the total pre-test and the post-test also experienced many changes, at the pre-test stage the average total value was 62.58 while the post-test was 73.10. The recapitulation above also shows an increase and decrease after students take part in thematic learning using teaching materials based on mobile learning. There were 25% or 10 respondents who experienced a decline, and 75% or 30 people experienced an increase after participating in the thematic sub-theme learning using the learning material based on mobile learning. Following is a description of field trial data.

Table 2. Test data description.

| Information        | Pre-test\(x_1\) | Post-test\(x_2\) |
|--------------------|-----------------|-----------------|
| Total              | 2503            | 2924            |
| Average            | 62.58           | 73.10           |
| The Highest Score  | 86.00           | 100.00          |
| The Lowest Score   | 20              | 30              |
| Standard Deviation | 17.2431889      | 19.473585       |
| Number of Respondent | 40            | 40              |

The posttest value of students after being given treatment using mobile learning-based teaching materials is higher than the previous pretest value. The application of teaching materials based on mobile learning, when the thematic learning process takes place makes students interested and easy to understand the material, especially in learning. This is because the characters in the learning video are cartoon characters that match the characteristics of students. The combination of motion picture, sound,
and writing in video media can add to the attraction and can facilitate understanding of information for students. Students can also stop the video at any time and replay the video when they feel they don't understand the parts they find difficult in the learning process. This is in accordance with the opinion of Daryanto that video is a very effective medium to assist the learning process, both for mass learning, individual learning, or group learning [15]. The average increase in the results of the pre-test and post-test showed that the study sample students had increased by 10.52 with an average pre test of 62.58 to 73.10 in the post-test average, this can be seen in the graph below.

![Graph of Learning Outcomes](image)

**Figure 1.** Graph of learning outcomes source.

5. Discussion
The general objective in this research is to find a clearer picture of the influence of mobile learning-based teaching materials for elementary school level students. The table above shows that the score of student learning outcomes after following learning with mobile learning-based teaching materials there is a significant difference between the pretest and posttest. This difference is indicated by the average score of student learning outcomes before participating in learning with mobile learning materials of 62.58 and the average score of learning outcomes of students after participating in mobile learning is 73.10. This means that there are differences in the scores of learning outcomes of students who are treated. Then it can be concluded that the learning material based on mobile learning give an effect to learning in elementary schools very well. In his result research Baek revealed, The results of this study showed Korean teachers' mobile learning attitudes was low in general. But, The group with more than 15 years of teaching experience showed higher attitudes toward mobile learning than those groups that were less experienced [16]. As a result of the research, it was determined that the readiness level of the prospective teachers does not change depending on the gender and the students use the mobile technologies most in communication, studying, acquiring information and making plans. In addition, in the study, the results have been reached, such as both theoretical and practical training should be given in universities in order to increase the availability of prospective teachers on mobile learning. [17]. The findings of the study showed that students had highly positive attitudes toward mobile learning. Furthermore, the students appreciated mobile learning as an approach that may significantly increase their motivation [19]. Findings show that mobile learning within higher education institutions in Africa increased student and lecturer collaboration and, provide distant communication, increased student participation and engagement, facilitating authentic learning and reflective practice, as well as fostering learning communities [20]. Educational research must recognize the challenges of advancing technological progress and improving availability of systems and mobile devices. A wise response to these challenges
is interrelated technological progress and availability are growing, the belief that learning is no longer bound to class but takes place anywhere and anytime, and encourages various learning experiences through mobile learning approach [21].

6. Conclusion

Based on the above data there is a significant effect for the use of mobile learning based learning materials. The results showed that there were significant changes to the learning outcomes of students after using mobile learning-based teaching materials, compared to using conventional teaching materials. Thus it can be concluded, that teaching materials based on mobile learning can affect the learning outcomes of elementary school students.

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