Effectiveness of Mobile Learning Media on Computer Assembly at Vocational High School

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Abstract. The purpose of this study was to determine the effectiveness of mobile learning media in computer assembly subjects in vocational high schools. Previously this media had been declared valid by media experts and material experts, which was then used by students. The research method used in this study is quasi-experimental, with time-series research design. Data collection techniques with pretest and posttest. The effectiveness obtained from the results of the post-test seen from classical completeness, all students declared complete and through the gain score in the medium category. Based on the findings of this study it was concluded that the mobile learning media is effective to be used as a learning media and increase the learning outcomes. This research recommends to be tested more broadly and to provide more complete content for the sake of improvement in the development of this mobile learning media.

Keywords: Effectiveness, Media, Mobile Learning, Learning outcomes

1. Introduction
The success of the learning process at school is influenced by many factors, including teachers, students, curriculum, learning environment, learning resources, learning outcomes, etc. Teachers and students are the two most important factors in the learning process. One of the things that affect the learning process is learning outcomes. Learning outcomes are factors that influence enough to be able to know whether the learning process is going well. If a learning process occurs as it should, then a result obtained will also be better. Vice versa, if a process does not go well it will be worried, the results will also not be good. If there is a problem with an outcome obtained in learning, then the thing that needs to be improved is a process contained in the learning because a process will greatly affect learning outcomes.

Learning outcome is generally the evaluation of learners after completing certain learning activities and the achievement of learning activity to the predicted effect [1]. Ding et al. [2] pointed out the consistent concepts of academic performance, learning outcome, or learning achievement, i.e. students’ learning results on school subjects or persistent results through the learning process. Surjono [3] regarded the indicator to evaluate students’ learning outcomes as the major item to evaluate teaching quality. Learning outcomes would be affected by curriculum design, teaching method, and learning behaviour, and students’ learning objectives were to monitor self-learning, reflect learned knowledge, and learn how to learn. In this case, the learning outcome was the direct presentation of the learning result. Chassine, Villain, Hamel, and Dajen [4] indicated that evaluation of learning
outcome was the collect of data and information about student abilities satisfying course objectives; such evaluation was practiced in the course and was normally preceded by the assignment of work. McCann and Marek [5] regarded learning outcomes as indicators to measure student’s learning outcomes as well as the major items to evaluate teaching quality; such performance evaluations could stimulate and induce student’s learning, and the evaluation results allowed students and teachers understanding the learning and teaching results for explaining or improving teaching effects.

Based on observations in class X students of 6th Vocational High School Padang Computer Network Engineering Department in the subject of computer assembly. In the learning process, the teacher uses the lecture, discussion, question and answer method and also with the addition of the application of learning models that are assisted by PowerPoint presentation media, modelling computer devices, such as mainboard, memory, hard disk and others. But with the application of learning models and media that have been used by the teacher, it is known that there are obstacles in the learning process of computer assembly, namely during the process of learning the focus and activeness of students in the learning process is still lacking. Lack of learning support facilities is also a cause such as limited use of textbooks due to the lack of availability of textbooks and old editions, so students do not have the latest books that can increase student knowledge about the latest information about learning. The textbooks used has several drawbacks such as the language does not match the level of thinking of students so it is difficult to be accepted or understood by students and students tend not to like the textbooks because it is not accompanied by clear images and illustrations that are not interesting.

PowerPoint media used by teachers in the learning process as additional media still has shortcomings namely, it only contains learning material without interactive exercises/quizzes and simulations that facilitate interaction between students and the media so that student participation in learning is still lacking. The lack of this media is only focused on the teacher, so that this situation causes some students to get bored with the learning atmosphere, because students only listen to the teacher in class, but it can also reduce student interest in understanding computer assembly material so that later it will affect student learning outcomes and result in goals learning is not achieved. Percentage of completeness of class X students in Computer Assembly 2018/2019 academic year in semester one some students have not yet reached the Minimum Mastery Criteria as shown in Figure 1

![Figure 1](image)

**Figure 1. Student Learning Outcomes**

Based on Figure 1 it can be seen from each of the basic competencies, there are still some students who have not yet reached the KKM. The lowest achievement of learning outcomes is found in basic competencies (KD) 2, 3 and 9. Factors thought to be the main problem affecting student learning outcomes are the lack of attention, focus, and activeness of students towards the material delivered by the teacher. The solutions offered in relevant research to overcome these problems are the implementation of learning media using smartphones, namely mobile learning (m-learning).

The development of smartphones has begun to enter the formal education system [6] and influences changes in the learning process in the classroom. With smartphone technology, students can access learning material anywhere and anytime to access educational resources [7-9]. Wu et al [10] explain
that 86% of research on m-learning gives positive results. Similar results are also found in Chee et al [11], which explains that “most of the 144 m-learning studies have positive results. Average results are ranked next and negative results are ranked lowest”. Sung et al [12] argue that “smartphone technology has great potential to facilitate more innovative learning”. Students need the development of learning media that can increase student interest in learning and can increase the effectiveness of learning.

The purpose of this study is to look at the effectiveness of instructional media on student learning outcomes in computer assembly subjects. This tested media has already been tested and validated by media experts and material experts; it is necessary to know whether the media to be tested is suitable for learning.

2. Methodology
This research was conducted in class X students of 6th Vocational High School Padang Computer Network Engineering Department in the subject of computer assembly totaling 34 students. The sample in this study was determined by purposive sampling, which is the sampling technique used by researchers because researchers have certain considerations in taking the sample [13].

The research method used in this study is quasi-experimental, with time series design research design. Sugiyono [14]. The approach used is a quantitative approach. A quantitative approach to research involving oneself in calculations or numbers or quantities. This is in line with Arikunto’s opinion, quantitative research is demanded to use a lot of numbers, starting from data collection, interpretation of the data and the appearance of the results [13]. Data collection techniques with pretest and posttest tests. This study uses an experimental class that compares student learning outcomes before using m-learning media and student learning outcomes after using m-learning media.

The instruments in this study were questions in the form of multiple choice consisting of 25 questions with levels of cognitive competency C1 (knowledge), C2 (understanding), and C3 (application), m-learning media and learning tools in the form of lesson plans. Data collection techniques used in the form of pretest and posttest questions.

3. Results and Discussion
The effectiveness of the use of m-learning media is reviewed in two ways namely, looking at the comparison of pre-test and post-test results through classical completeness and gain score. Test the effectiveness of learning outcomes is done by looking at student learning outcomes by conducting tests on students as respondents used in this study. The test that is conducted at the beginning of the meeting (before students use m-learning media) is called the pre-test three times to determine the clarity of the group's condition before being given treatment. After the condition of the group to be examined can be clearly known, then only given treatment. While the test is done after students learn using the developed media, this test is called the pre-test which is also carried out three times. During these three tests, there was an increase in student learning outcomes from the first, second and third post-test. The learning outcomes obtained by students in the pre-test and post-test using multiple choice questions were 25 questions. In the third pre-test results with 34 students there were 9 students who completed and 25 students who did not complete. Whereas in the last post-test there were 34 students who completed and none of students who did not complete. For more details on how the process of increasing student grades at the beginning of the pre-test and until the last post-test can be seen in Figure 2.
Classical completeness can be seen from the percentage of students who complete after using m-learning media. The basis for determining the effectiveness of m-learning media is if the percentage of student’s completeness is greater than or equal to 85%, then the m-learning media is effectively used in learning. The average results of students' grades in Computer Assembly subjects can be seen in Figure 2. Based on the analysis results described in Figure 2, data obtained the number of students who completed the post-test as many as 34 students (100%), this shows the classical completeness has been achieved, it can be concluded that the m-learning media is effectively used when viewed from classical completeness.

To see the effectiveness of m-learning media from increasing pre-test and post-test learning outcomes, the gain score is calculated. The m-learning media is said to be effective if the gain score is minimal in the medium category. The gain score obtained is 0.69 in the medium category. Based on the value of the gain score that reaches 0.69 with the medium category, it can be concluded that the m-learning media is declared effective in improving student learning outcomes on aspects of student knowledge. The results of this study are in line with the results of Zaus [15] which states that after learning using m-learning media an increase in student learning outcomes.

Based on the results of the analysis data of the learning outcomes in the Computer Assembly Subject were very effective using the android based m-learning media rather than using media PowerPoint the students has used before and the android based m-learning media can improve student learning outcomes. This is relevant with previous research conducted by Leinonen [16] which found out that mobile apps that are designed for learning are in education showed that M-learning can increase students' cognitive traits.

The effectiveness of the development of learning media can be seen in Computer Assembly subjects, especially in the basic competencies of implementing computer assembly which is carried out by conducting pre-test, post-test. Based on the assessment through classical completeness in the post-test all students get a complete grade. Furthermore, through the comparison of the results of pre-test with post-test obtained a significant difference in student learning outcomes before and after using m-learning media that get the gain score in the medium category. This m-learning media is an effective learning media to improve student learning outcomes in Computer Assembly subjects. This result is relevant to other studies that show that the application of m-learning in learning can improve student learning outcomes [17].

In accordance with the opinion of Elkhateeb et al [6] who developed m-learning media for undergraduate students in Egypt, m-learning developed to improve learning outcomes and improve student understanding in understanding learning material. Fredyana [18] also develops an android-based learning media that gets positive responses from students and can improve student learning outcomes and is categorized completely based on the pretest and post-test scores. In line with Zatulifa’s research [19] m-learning applications are able to improve student learning outcomes and student creativity. El-Sofany [20] and Zhao [21] who develop learning media using mobile and with this media the effectiveness of learning increases as seen from students cognitive learning outcomes.
4. Conclusion
The results of this research are products from the android based m-learning media on Computer Assembly subjects which are declared effective in improving learning outcomes. This can be seen from the results of the comparison between pre-test and post-tests that have been done by students. Before students use m-learning media in this learning process, the validity of the media expert and material expert has been tested first. This is needed to find out whether this media is appropriate for students to use in the learning process, and whether it is in accordance with the syllabus and lesson plans of computer assembly subjects.

From the results of the research that has been done it can be concluded that, on average, student learning outcomes have increased from when students have not used the media and after students use m-learning media whose gain score is in the medium category and all students completed in the post test. The effectiveness of the use of m-learning media can be seen from the enthusiasm of students seeking answers to evaluations, and studying the subject in m-learning media with animated videos and simulations. So, it can be concluded, this m-learning media is an effective media used in learning and can improve student learning outcomes.

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