Effectiveness of Implementation Guided Inquiry with Mobile Learning System Based Edmodo In Physics Learning

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ABSTRACT

The research aims to determine the effectiveness of guided inquiry with Edmodo-based mobile learning system implementation in physics learning. Edmodo is a learning management system application developed for mobile learning that enables students to access tasks and teaching materials anytime and anywhere. This research was quasi-experimental that used a pretest-posttest control group design with 11th-grade students in SMAN 1 Makassar as a sample, and each class consisted of 33 students who were used as the experimental class and the control class. The sample selection was carried out using a purposive sampling technique. The instrument used in this study was a physics learning achievement test in the form of multiple-choice tests. Data were analyzed using the T-test on two samples with test equipment that had gone through expert validation tests and empirical tests. The result of the T-test analysis showed no difference in learning outcomes between experimental and control classes before being treated, this result contradicts the results of the T-test analysis after treatment which shows significant differences in physics learning outcomes in students taught using guided inquiry by applying a learning-based mobile learning system with students taught using guided inquiry without mobile learning system. Based on these two T-test results and by using Cohen-D analysis with the result of 2.980. Therefore, the application of a mobile learning system based on Edmodo is effective in improving physics learning students’ outcomes in class XI MIPA SMA Negeri 1 Makassar.

Keywords: guided inquiry, mobile learning system, Edmodo, physics learning outcome

INTRODUCTION

The evolution of portable devices and wireless technology has produced many radical changes in the social and economic lifestyle of modern society. There are many technological devices produced in portable form and used by the community (El-Hussein & Cronje, 2010; Nugroho et al., 2020; Tanduklangi & Amri, 2019). According to Khan et al (2019), innovative learning practices such as student-centered learning can be achieved through various mobile learning solutions. Dynamic and diverse mobile learning contexts with various learning support applications freely accessible to students make mobile learning easier and more effective.
El-Hussein & Cronje (2010) stated that mobile devices are playing a role in disrupting traditional classrooms such as study rooms, laboratories, and all traditional teaching devices. In this case, mobile devices transcend the structural static boundaries of the classroom and make the classroom feel more effective. Mobile learning is not only seen as an effective alternative to distance learning, but also due to connectivity, screen size to suit student devices, diversity of user goals and educational needs, and theoretical coherence of mobile learning. It presents some challenges, such as the lack of frameworks.

One of the important components that is one of the factors in achieving the learning objectives is the selection and use of learning models, one of the recommended learning models in the 2013 curriculum for physics learning is a guided inquiry learning model. Some studies that have used this learning model in research by Wahyuni et al. (2016) show that the average value of the experimental class physics learning outcomes test that is taught using guided inquiry learning models is higher than that using conventional methods.

Al-Said’s (2015) research states that he adopted Edmodo (which was founded and designed by Nick Borg and Jeff O’Hara in 2008 as a new M-learning tool to present course content and to achieve research goals, because of various reasons. First, Edmodo looks and functions very similar to Facebook, and most students are familiar with social networks. Second, Edmodo is a secure social networking community that provides a micro-blogging environment for teachers and students. It can also be used as a cross-platform learning management system (LMS). Third, Edmodo is a secure and user-friendly gateway, accessible through web browsers and free smartphone applications such as Windows Phone, Ios, and Android. Additionally, teachers can send notes (SMS) and alerts to individual students, send assignments and quizzes, receive completed assignments, and vote. Students can also share content, submit homework, assignments, and tests, receive feedback, notes, and alerts from teachers, and vote.

In addition to research that implements guided inquiry as a learning model, some studies combine the use of guided inquiry models with simulation media, such as the research conducted by Khoiriyiah et al. (2016) and which shows that the application of Phet Simulation through guided inquiry is more effective used as an effort to improve student learning outcomes rather than the use of Optical KIT. So that it can be indicated that in this era of globalization, the use of both learning media and E-Learning influences the learning process of students.

SMA Negeri 1 Makassar is one of the state high schools in the province of South Sulawesi, Indonesia which in 2010 was the pioneer of an international standard school. However, because of the change in curriculum, the international standard school status called RSBI that has been pinned on some schools has now been abolished and has become a curriculum 13-based school based on government references. Based on observations and interviews that have been conducted from the results of the percentage, only about 5% of teachers of SMA Negeri 1 Makassar use E-Learning in the learning process, while based on observations of internet use for students, 83% use the internet to access social networks such as WhatsApp, Facebook, and Instagram. Based on the background above, the researchers conducted research on the learning outcomes of students with the title "The Effectiveness of
Edmodo-Based Mobile Learning System in Physics Learning for XI MIPA Students SMA Negeri 1 Makassar”.

**Problem of Research**

Based on the above background, the problems raised in this study are how much physics learning outcomes of students taught using guided inquiry by implementing an Edmodo-based Mobile Learning System?, how much physics learning outcomes of students taught using guided inquiry?, and are there differences in physics learning outcomes of students taught using guided inquiry by implementing Edmodo-based Mobile Learning System with the physics learning outcomes of students taught using guided inquiry?.

**Research Focus**

This research was focused on students’ physics learning outcomes. The low learning outcomes of students in conventional learning spaces are considered very worrying, especially the use of technological devices by students, most of whom only access social media. Technological developments have also encouraged many media and technology-based learning activities coupled with the use of learning models that can build students' abilities such as PBL, Inquiry, and discovery learning models. One of the results of technological developments that are considered quite capable of helping the learning process is technology in the learning management system. This technology allows students to be able to build their learning environment anywhere and anytime. this is considered to be able to help students in improving their learning outcomes, especially in subjects that are considered difficult such as mathematics and physics.

Physics is a lesson that provides knowledge about the universe to practice thinking and reasoning, through the reasoning ability of someone who continues to be trained so it develops, then the person will increase his thinking and knowledge. On this basis, absolute physics must be taught to every student. This phenomenon is a serious problem and needs to get the full attention of all parties, whether the government, school, community/parents, or students themselves (Kholilah, et al., 2020).

The study of physics and its applications is essential to the technological development of any country. However, disruptions such as the Covid-19 pandemic have threatened the proper teaching of physics in secondary schools, forcing most countries in the world to go into lockdown to prevent the continued spread of the highly deadly virus. The impact of this disruption may hinder the achievement of secondary school physics curriculum goals (Bada and Jita, 2021).

Learning physics is very closely related to experimental activities, as said by Kuhn & Vogt (2015), Smartphones in particular, are well suited as experimental tools due to their large number of sensors. In addition to microphones, most smartphones also contain accelerometer and electric field strength sensors, light intensity sensors, GPS receivers, and cameras. This way all sensors can be read by their corresponding sensors, Software (app) that allows a large number of quantitative experiments to be performed on a smartphone in
physics classes. This shows that improving student learning outcomes can be supported by the use of appropriate technology.

According to Sumartono & Normalina (2015), Learning outcomes can be viewed in two dimensions: the student side and the teacher side. From the student's perspective, the learning outcome is an improved level of intellectual development compared to per learning. However, from the teacher's point of view, the learning outcome is the completion of the learning materials. Whereas Junaidi et al (2019), Physics learning outcomes are the knowledge, understanding, and skills of students after they engage in teaching and learning activities about interactions between natural phenomena (objects) and core competencies at both the micro- and macro-levels, and is a form of attitude change.

In traditional classroom learning environments, instruction is conducted through lectures and activities provided by the teacher alongside course books and audio-visual materials. Learners listen to their teachers’ instructions while receiving visual cues through PPT, handouts, or whiteboard content before participating in learning activities or group discussions in the classroom, but in the case of M-learning, all these benefits can be realized anywhere and anytime (Boyinbode & Fasunon, 2015).

The emergence of revolutionary technology has had a very significant impact on educational technology. This has increased the potential of E-learning as a way of delivering education. Mobile learning is learning using wireless technology devices that can be bagged and used wherever a student device can receive transmission signals that are not disconnected (El-Hussein & Cronje, 2010). Mobile learning is a type of learning that is diversified according to individual needs, offering individuals the opportunity to start and end the learning process anytime, anywhere by providing new and different experiences (Akkaya, 2021; Altuntaş, 2017). Mobile technology is used in many fields and places. Help save time in healthcare, banking, society, and libraries. Another area where mobile technology is embedded in education. Mobile learning can connect formal and non-formal education, create equal opportunities in education and create individual learning opportunities. (Elçîçêk & Karal, 2019).

According to Mehdipour and Zerehkafî (2013), implicitly mobilized e-learning must be understood as a continuation of 'traditional' e-learning and as a reaction to traditional e-learning and its incompetence and limitations. This is one aspect of mobile learning that distinguishes him from other types of learning that specifically design learning experiences that take advantage of the opportunities that mobility can offer. M-Learning focuses on student mobility, and interaction with wearable technology, and learning focused on how communities and institutions accommodate and support an increasingly mobile population. Students are expected to engage with this learning resource away from the traditional learning environment.

Mobile learning is a subset of e-learning that offers students a wide range of opportunities and learning opportunities in terms of mobile skills. Therefore, m-learning can be defined differently than e-learning in terms of student mobility as learners. The emphasis on technology in schools today ensures effective learning in new opportunities and improves learning outcomes (Sulisworo, 2017).
METHODOLOGY OF RESEARCH

General Background of Research

The type of research is Quasi-Experimental. Researchers used a research design in the form of a Nonequivalent Pretest and Post-Test Control Group Design. The time for conducting research for 4 months from March to June 2018. In this study, both the experimental class and the control class held 8 meetings with an allocation of 90 minutes for each meeting in SMA Negeri 1 Makassar, South Sulawesi, Indonesia.

Subject of Research

The sampling technique used in this study is purposive sampling based on the following considerations: 1) The ability of students in the experimental class and control class is not much different because they get the same treatment from educators, where the school does not use a ranking system. 2) Students in the experimental class already have access to the Edmodo application (account). Besides that, the students who were sampled in the experimental class were 33 people and the control class was 33 people and the students who were not present during the treatment and the pretest and post-test were not sampled. 3) Researchers can’t disrupt the rules that have been applied in the school, in this case, the class is divided by the school.

Instrument and Procedures

The instrument used in this study is a physics learning outcome test in the form of multiple-choice tests consisting of 20 indicators with 4 aspects measured. In the assessment, each correct answer was given a score of 1, and the wrong given a score of 0. This instrument has been tested where the number of questions before the trial is 55 numbers and after going through the trial and analysis of the items then the number of valid questions is 30 questions which are then used as a matter of pretest posttests, as for knowing the validity and reliability of the questions used validity test with biserial correlation coefficient while for the reliability used the formula KR-20.

This test is used as a data collection tool for the results of learning physics after attending the teaching and learning process. Learning tools in the form of learning implementation plans and student worksheets are also validated by validators who are experts in the education field and declared eligible for use in the study. Preparation of physics learning test results which are based on test grids that cover the material of optical devices and global warming in the even semester. Test items are made on the material of optical equipment and global warming provided during the research that is found in even semester.

The implementation of Edmodo-based M-Learning System media starts with the needs analysis, which is collecting materials, application programs, and other needs. After further needs analysis is done, the preparation of instruments in the form of learning devices will then install applications on computer or smartphone devices. M-Learning media and its
learning tools are then validated by a team of experts to correct the parts that are considered lacking and then revised again. Media M-Learning that has been validated is then used in the learning process in class XI IPA SMA Negeri 1 Makassar.

The implementation stage consists of several phases, namely: The initial test (pretest). At this stage, an initial test was carried out to find out the learning outcomes of students in both the control and experimental classes before being given treatment. The next phase was giving Treatment. At this stage, the experimental class was given treatment in the form of guided inquiry learning with the Edmodo-based mobile learning system, while the control class was given treatment in the form of guided inquiry learning without using LMS. The last phase was giving the last test (post-test). In this phase, a last test was carried out to find out the learning outcomes of students in both the control and experimental classes after being given treatment and data analysis is carried out for all data that has been collected for further interpretation related to the data.

Data Analysis

The data obtained in this study were all processed and analyzed using statistical techniques, namely descriptive statistics and inferential statistics to test the formulation of the proposed problem. For descriptive statistical analysis, we describe the score of learning outcomes obtained by students after being taught by applying the Edmodo-based Mobile Learning System in the form of frequency distribution tables. This is intended to find out the highest score, lowest score, average score, standard deviation, variance, and categories of physics learning outcomes. For inferential statistical analysis, before we conducted the hypothesis testing, first a prerequisite test is conducted which is the normality test (Chi-Square) and homogeneity test (F-test). Afterward, for testing the hypothesis, we used the t-test formula to see the difference between the learning outcome of the two classes, and Cohen-D for saw how big the effect of using Edmodo-based Mobile Learning was.

RESULTS AND DISCUSSION

Experiment Group

The results of the descriptive analysis of the student’s learning outcomes in the experimental class can be seen in the following table:

Table 1. Frequency Distribution and Percentage of Scores of Physics Learning Outcomes of Experiment Class Students

<table>
<thead>
<tr>
<th>No.</th>
<th>Interval</th>
<th>Category</th>
<th>Pretest</th>
<th>Post-test</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Frequency</td>
<td>Percentage (%)</td>
</tr>
<tr>
<td>1</td>
<td>0-5</td>
<td>Very low</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>6-11</td>
<td>Low</td>
<td>8</td>
<td>24.24</td>
</tr>
<tr>
<td>3</td>
<td>12-17</td>
<td>Medium</td>
<td>20</td>
<td>60.60</td>
</tr>
<tr>
<td>4</td>
<td>18-23</td>
<td>High</td>
<td>5</td>
<td>15.16</td>
</tr>
<tr>
<td>5</td>
<td>24-29</td>
<td>Very high</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Amount</td>
<td></td>
<td>33</td>
<td>100</td>
</tr>
</tbody>
</table>
Control Class

The results of descriptive analysis scores of students' physics learning outcomes in the control class can be seen in the following table:

<table>
<thead>
<tr>
<th>No.</th>
<th>Interval</th>
<th>Category</th>
<th>Pretest Frequency</th>
<th>Pretest Percentage (%)</th>
<th>Post-test Frequency</th>
<th>Post-test Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0-5</td>
<td>Very low</td>
<td>3</td>
<td>9.09</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>6-11</td>
<td>Low</td>
<td>13</td>
<td>39.40</td>
<td>13</td>
<td>39.40</td>
</tr>
<tr>
<td>3</td>
<td>12-17</td>
<td>Medium</td>
<td>9</td>
<td>27.27</td>
<td>14</td>
<td>42.42</td>
</tr>
<tr>
<td>4</td>
<td>18-23</td>
<td>High</td>
<td>8</td>
<td>24.24</td>
<td>6</td>
<td>18.18</td>
</tr>
<tr>
<td>5</td>
<td>24-29</td>
<td>Very high</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

The following is a comparison between the experiment class and the control class:

<table>
<thead>
<tr>
<th>Statistics</th>
<th>Experiment Pretest</th>
<th>Experiment Post-test</th>
<th>Control Pretest</th>
<th>Control Post-test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample size</td>
<td>33</td>
<td>33</td>
<td>33</td>
<td>33</td>
</tr>
<tr>
<td>Highest score</td>
<td>7</td>
<td>15</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Lowest score</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>Ideal score</td>
<td>13.8</td>
<td>20.03</td>
<td>12.1</td>
<td>13.06</td>
</tr>
<tr>
<td>Average score ($\bar{x}$)</td>
<td>3.47</td>
<td>2.33</td>
<td>4.95</td>
<td>4.40</td>
</tr>
<tr>
<td>Standard deviation ($s$)</td>
<td>12.1</td>
<td>5.46</td>
<td>24.5</td>
<td>19.43</td>
</tr>
</tbody>
</table>

The description of the presentation of physics learning outcomes scores in both the experimental class and control class is shown in Figure 1.
Based on the graph above shows that the distribution of frequency percentage in the category of physics learning outcomes is the largest in the experimental class 78.78% for the post-test score and 60.60% for the pretest score. While the largest frequency distribution of physics learning outcomes in the control class was 42.42% for the post-test score and 39.39% for the pretest score. So that the largest category of physics learning outcomes in the experimental class is in the high category for the post-test score and medium category scores for pretest scores, while the control class is in the medium for post test and low scores for the pretest. This indicates that the frequency distribution of physics learning outcomes for both experimental and control classes has increased.

### Table 4. Test Results for Inferential Statistical Analysis

<table>
<thead>
<tr>
<th>No</th>
<th>Class</th>
<th>Normality Testing</th>
<th>Normality Testing</th>
<th>Homogeneity Testing</th>
<th>Homogeneity Testing</th>
<th>Hypothesis Testing</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Pretest</td>
<td>Post-test</td>
<td>Pretest</td>
<td>Pretest</td>
<td>table = 1,693</td>
</tr>
<tr>
<td>1</td>
<td>Experiment</td>
<td>χ² table = 11.070</td>
<td>χ² table = 11.070</td>
<td>F&lt;sub&gt;table&lt;/sub&gt;: 1.804</td>
<td>F&lt;sub&gt;table&lt;/sub&gt;: 1.804</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Control</td>
<td>χ² count = 1.38</td>
<td>χ² count = 3.74</td>
<td>: 2.0294</td>
<td>: 3.5542</td>
<td>count = 1.614</td>
</tr>
</tbody>
</table>

Value of Effectiveness : Cohen – D = 2.98 (High Effect)

The implementation of the learning process requires a system that can enable students to easily access both learning material and school assignments where and at any time actively. *Edmodo-based Mobile Learning System* is a Learning Management System that supports this. Students are encouraged to move to study the subject matter following the topics they will learn. Learners who are initially limited by traditional learning spaces and 2 x 90 minutes learning hours each week require students to absorb lessons, take notes, work on LKPD, and collect assignments in each meeting. With mobile learning systems students no longer become bound, students can analyze learning materials while working on LKPD through LMS applications both during learning hours, rest hours, and in their free time while at home, so the learning process becomes more flexible. This finding is following research conducted by Mercado (2021), which implies that science student preparation has helped them learn physics courses in this new normal environment. But while we were well prepared, we faced challenges like unstable connections, distractions at home, and time pressure.

Based on the results of the descriptive analysis in the experimental class and control class, it was seen that the scores of students' physics learning outcomes in the experimental class were higher than those in the control class. This difference is caused because the experimental class is treated by applying Guided Inquiry with *Edmodo-based Mobile Learning System* while the learning control class is treated just by applying guided inquiry.
learning. Prerequisite test results show that the average score of students' physics learning outcomes between the two classes (experiment and control) is normally distributed but has a heterogeneous variance. From the results of testing the hypothesis, it was found that the increase in students' physics learning outcomes taught by applying *Edmodo-based Mobile Learning System* is higher than students taught with guided inquiry learning in class XI MIPA SMA Negeri 1 Makassar in the academic year 2017/2018. This shows that the hypotheses that have been prepared previously are proven to be true at the research location. This is following the theory that states that with students being able to choose virtual learning objects from the environment using the help of mobile learning, they can get a direct understanding of the learning environment and subsequently, increase their motivation and learning experience (Chiang et al., 2014).

By implementing an Edmodo-based mobile learning system in a lab class, students actively seek answers to the problems they encounter, and examine, find, and draw conclusions about themselves logically, critically, analytically, and systematically. This method encourages students to improve their reasoning, think honestly and openly, stimulate creative thinking, and make them willing to learn more. Edmodo’s presence as an LMS application helps students plan, organize, and manage learning resources for real-world academic work. By applying the Edmodo-based mobile learning system to the learning process, students become responsible for managing their learning resources and learning activities. In this way, students can find a more flexible sense of learning. This is also following the research conducted (Imhof et al., 2018), This was achieved by using simple technical tools within the framework of a simple four-component recommendation system. As a result, students with low background knowledge and/or low academic performance received more different instructional support than those with high background knowledge or high performance.

Based on the calculation of effectiveness by using the Cohen-D formula that the effectiveness of implementing an Edmodo-based Mobile Learning System in the learning process in experiment class is obtained the Cohen-D effect size is 2.980. Where based on the criteria proposed by Cohen about the size of the effect included in criteria D > 0.8 which indicates that the treatment effect used is in a large category. Thus it can be concluded that the effectiveness of the treatment in this case the application of the *Edmodo-based Mobile Learning System* is quite large in improving students' physics learning outcomes in class XI MIPA of SMA Negeri 1 Makassar. As one indicator that supports these conclusions can be obtained from the results of data analysis on the pretest and post-test. The results of the pretest showed that there were no significant differences between the results of physics learning in the control and experimental classes indicating that the ability of students both in the control and experimental classes was the same before being treated, then different things were seen in the results of the post-test which obtained the results of the analysis which states that after being treated, between the control class and the experimental class, the differences in physics learning outcomes are quite significant, this indicates that the implementation of *Edmodo-based Mobile Learning System* influences the improvement of students' learning outcomes. This is also consistent with research conducted by Muhajir et al (2019).
Furthermore, the results obtained above are also compatible with the research conducted by Fahmi et al (2021) states that guided inquiry-based e-learning learning is effective on students' 21st-century skills with an average score of student response questionnaires of 72.67% in the effective category. and the results of student test questions with an average score of 84.67% in the very effective category. Therefore, guided inquiry-based E-learning assisted by the Edmodo application can be developed by educators on other materials so that physics learning feels more meaningful.

CONCLUSIONS

There is a significant difference between students' physics learning outcomes taught by using guided inquiry learning by implementing the Edmodo-based Mobile Learning System with students taught using guided inquiry learning in class XI MIPA SMA Negeri 1 Makassar. The value of the effect of Edmodo-based Mobile Learning System in physics learning for students of class XI MIPA SMAN 1 Makassar shows that the treatment effect used is quite large. Based on these findings, it is implied that Guided inquiry with Edmodo-based Mobile Learning System helps students in improving students physics learning outcomes. It is hoped that future research will try to combine learning management systems other than Edmodo with interactive learning media.

Acknowledgments

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References


