



Development of Physics Mobile Learning Media Interactive through Scaffolding Approach

Syamiah Alfi^{a*}, Suparno^b

^aPostgraduate of Physics Education, State University of Yogyakarta, Yogyakarta, Indonesia

^bDepartement of Physics, State University of Yogyakarta, Yogyakarta, Indonesia

^aEmail: syamiah.alfi2016@student.uny.ac.id

^bEmail: suparno2000@yahoo.co.id

Abstract

This study aims to develop Physics Mobile Learning Media (PMLM) "Interactive. The approach used is scaffolding to improve Higher Order Thinking Skills (HOTS) of high school students. This research is a development research. Classes used in this study are experiment and control class, each sample consists of 30 students of class X MIA conducted at State Senior High School 5 Kota Jambi. The results of this study indicate that PMLM media is feasible to use, the average result of expert and teacher assessment is 3.88 with very good criteria. While the questionnaire assessment of student responses to media PMLM and learning process of 3.86 is categorized very well. For the ability of Higher Order Thinking Skills (HOTS) students are measured using multiple choice questions with 20 question counts. The average value of pretest result of experiment class students was 49.46, then there was an improvement on the average posttest score of 79.71, with an average gain of 0.60 indicating in medium category.

Keywords: Physics Mobile Learning media (PMLM); Scaffolding Approach; Higher Order Thinking Skills.

* Corresponding author.

1. Introduction

Physics is one of the most important lessons to learn, because the class of physics is closely related to the natural environment around. Physics can teach students as a provision in living life in the future [8]. But in many students who do not like physics, because assuming physics is a difficult lesson. If not well, it is not difficult in physics. Lack of student interest in the physics learning process, make their physics learning outcomes low [20]. Which affects the final examinations held at any time [20]. In addition to the low physics, students are less in sharpening their ability in analyzing, and up the matter of physics [6] Given the ability to analyze and is very important, it is necessary to improve the cognitive aspects in the study of physics [6]. That ability is not only the low-thinking ability of the LOT, it also has to have high-level thinking skills (High Level Thinking Skills) [6]. From the problems faced today, in understanding the concept of physics, high-level skills are usually called High-Level Thinking Skills (HOTS) [15].

HOTS further comprises three categories: "content thinkers, critical thinking, and creative thinking [13]. Bloom's Taxonomy identifies HOTS working at the application level, analysis, synthesis, and evaluation [13]. The concept of Bloom's Bloom's Taxonomy, and classifies cognitive approaches to learning into six levels: 1. remembering, 2. understanding, 3. applying, 4. analyzing, 5. evaluating, and 6. creating [3]. The importance of teachers developing and growing HOTS of students in each age group compared with traditional teaching [15]. To raise the Higher Order Thinking Skill (HOTS) requires problem solving and the ability to think critically [14]. Given the rapid technological advancements associated with the development of digital devices impacting various aspects of life, including in education [18]. Since education is the most important aspect for a nation to face the challenges of the 21st century, encompassing science, technology, engineering, and mathematics, forms the basis for more effective and relevant education implementation [18].

In the learning process in school, teachers must be able to apply the technology in the learning process [10]. The use of ICT among learners is very important, because it can help find information needed by students [1]. The use of interactive learning media as a means of conveying information, for example by utilizing mobile learning like laptops, handphone, Ipad as a medium in the learning process [10]. The utilization of mobile learning is very helpful in the learning process. Mobile learning can be used as a learning tool, which makes it easier for students to find the required information [4]. M-learning means the use of mobile devices can access the subject matter anytime and anywhere with the help of terminals and mobile networks [2]. Mobile learning can increase the focus among academics as well as enable learning that is not limited by time and place [7]. The usefulness of mobile technology will mediate the relationship between ICT skills and student intentions to adopt mobile learning [7]. The use of true and effective technology in education must be supported by pedagogical [1]. Computer-based learning is supported by collaborative learning and constructive learning, requiring a skill [7]. Skills that are able to inspire students' thinking to think analytically, critically and creatively [7]. To support high-level thinking skills (HOTS), a suitable approach is needed to achieve the expected outcomes, the approach being scaffolding [17].

Scaffolding is a learning approach designed to foster a deeper understanding [17]. Support provided during the learning process is tailored to the needs of students with the aim of helping students achieve learning objectives,

including resources, tasks of interest, and guidance on the development of cognitive and social skills [17]. Scaffolding helps students engage in decision making, manage their investigation, problem-solving processes, and encourage students to articulate their thinking and reflect on their learning [17]. Scaffolding helps students gain maximum metacognitive control [9]. The use of collaborative learning techniques and scaffolding systems can improve student competence in education [9]. This can be achieved if, in learning, it produces objectives and processes that are affordable to students' abilities [9]. Scaffolding provides support to students at the right time and at the appropriate level [20].

Scaffolding requires problem solving skills in solving a problem, can be done in a discussion, providing teaching materials and designing tasks [20]. Assistance given to students is gradually reduced [19]. The integration of mobile learning media with scaffolding is able to overcome the problems faced by students in the learning process [11]. Scaffolding combined with mobile learning emphasizes the importance of supporting interaction in the learning process [16]. The combination of mobile learning media of physics material and scaffolding approach resulted in Interactive Media Physics Mobile Learning Media (PMLM) using Scaffolding approach.

2. Goals and Methods

The purpose of this research is to:

- Produce an interactive Physics Mobile Learning Media (PMLM) material Newton's legal worth to improve Higher Order Thinking Skills
- Knowing the effect of PMLM implementation of Newton Law material with scaffolding approach to increasing HOTS high school students

3. Results dan Discusion

Validation results have been done by lecturers of media experts and 4 teachers to test the feasibility of PMLM media from the aspects of software engineering and visual communication can be seen in Table 1.

Table 1: PMLM Media Validation Results

Aspects in Media	Average score	Category
Software engineering	3.85	Very Good
visual communication	3.92	Very Good
Average	3.88	Very Good

This study was conducted on the even semester of the academic year 2017/2018 on Newton's legal material in class X MIA senior high school 5 Jambi City. The sample consisted of 30 students of class X MIA, consisting of 30 students of experimental class and 30 students of control class. The product produced from this research is

interactive media by combining scaffolding approach as the approach used in the learning process. This research is a development research through planning and development phase.

From Table 1. It shows that Physics Mobile Learning Media (PMLM), which has been validated by expert lecturers and some teachers eligible for use with an average score of 3.82 is included in the excellent category. The initial view and menu contained in PMLM media can be seen in Figures 1 and 2.



Figure 1: PMLM media initial view



Figure 2: PMLM menu display

Figure 1 shows the main view of the PMLM menu, while Figure 2 shows the menus contained in PMLM consisting of competence menu, material, evaluation, and practice manual. Table 2. Provides information about students' responses to PMLM media used from the assessment aspect of PMLM media and learning process using scaffolding approach.

Table 2: Results of student responses to PMLM media

Aspects in the media	Average score	Category
Response to PMLM	3,88	Vey good
Learning process	3,85	Very good
Average	3,86	Very good

From Table 2, it shows that students' responses to PMLM media combined with scaffolding approach as the approach used in the learning process, both from media assessment aspect and learning process are categorized very well with an average score of 3.86. So the PMLM media is said to be worthy to be used as a learning medium in school.

Further improvement of Higher Order Thinking Skills (HOTS) student ability can be seen in Table 3. Table 3 shows the increase of gain average score between control and experiment class. To measure the ability of Higher Order Thinking Skills students are given a matter of 20 double-closed grounded, each control class and experiment first done pretest. Then for the experimental class of learning process using PMLM media with scaffolding approach, while the control class does not use PMLM media. After the treatment in the experimental class using PMLM media, then given posttest to the students of the experimental class and control class. Table 3 shows the result of the increase between pretest and posttest score of students before and after using PMLM media with scaffolding approach in the experimental class.

Table 3: Improve student HOTS

Class		Average score	Gain	Category
Eksperimen	Pretes	49.46	0.60	Medium
	Postest	79.71		
Kontrol	Pretest	46.63	0.55	Medium
	Postest	71.38		

In Table 3 there was an increase between the pretest and posttest values of the experimental and control class students. The gain value for the experimental class is higher than the control class. So it can be concluded that the ability of Higher Order Thinking Skills students in the experimental class increased after using PMLM media.

4. Conclusion

From the results of research that has been done that interactive Physics Mobile Learning Media (PMLM) is feasible to be used as a medium of learning in school, as a means and infrastructure to help students in learning. PMLM is operated using laptop / computer In the process of learning done in the classroom, the approach used is scaffolding approach. Scaffolding is the gradual assistance provided by the teacher, then the assistance is slowly reduced, so that the student can learn independently with the reduction of the aid. In addition to feasible use in learning, PMLM is able to increase Higher Order Thinking Skills students. In PMLM media there are 20 closed-ended, double-choice questions designed in accordance with the HOTS indicator. The HOTS indicator consists of analyzing, evaluating and creating. These indicators are summarized in the 20 questions contained in PMLM. In accordance with Table 3, it shows an increase in the value of student learning in the experimental class before and after using PMLM

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