The impact of pocket mobile learning to improve critical thinking skills in physics learning

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Abstract. The purposes of the research is examined the influence of using pocket mobile learning to increase the students critical thinking skills. Pocket mobile learning is a determining by media using mobile devices. This investigation is the quasi experiment managing by post-test control group design. The independent variable is learning media in which the control group applied PowerPoint, while the treatment group applied mobile pocket learning. The data were analysed by means of ANOVA with the significance level of 5%. Based on evaluation we found that pocket mobile learning media of specifically physics material about dynamics of motion could enhance students critical thinking skills.

1. Introduction
Most of the students of Universitas Indraprasta PGRI who receive basic physics courses still have trouble to realize the experiments, formulas and solutions, graphs, and logical explanations at the same time in physics materials. Application of concepts in physics must be linked in normal life [1,2]. In several cases, we found that the students are uncertain to read books, references, and alternative sources linked to the concept of Physics. Based on our simple investigation, one of the explanations of students' unwillingness to read a textbook is because the majority of Physics books are heavy; so it reaches a lot of time to epitomize and retrieve the contents. In addition, the textbooks are mostly performed in an inflexible format with no pictures, attractive color varieties, and even run a monotonous typeface.

Another condition that makes physics is still considered problematic is the method of learning by lecturers. Lessons given in the majority class still use lecture and discussion methods. This situation makes students bored and depressed in learning Basic Physics. The critical thinking skills of students is lower. Therefore it takes creativity of lecturers to make the learning atmosphere to be fun. Critical thinking is the psychological activity fostering original ideas and original insights [3]. The divergent thinking skill is an element for creativity and differs from creativity itself. It is the skill to think from one point as center and then to spread in various directions. One needs the divergent thinking skill to be able to generate creative ideas or, in other words, to have the creative thinking ability. Four aspects in different thinking, especially, the factors of fluency, flexibility, originality, and elaboration [4].

According to Abrami [5], critical thinking is partially defined by detecting such fallacies without regard to specific subject matter, because errors of reasoning are based on argument design rather than content.

On the basis of the problems described above the need for innovation in learning so that the learning of physics becomes interesting. One of the interesting innovations is learning mobile learning in accordance with the current technological developments. The effectiveness of learning with technology has been tackled from both sides. There is evidence that the use of technology increases...
achievement and self-efficacy [6]. Mobile learning perspective can be classified into four, they are techno-centric, e-learning focus, formal education instrument and student-centered learning [7].

Mobile learning is a learning media using mobile devices. A term of pocket mobile learning is based on using of a technological and mobile device, such as PDA, mobile phones, laptop, and tablet in learning. State mobile learning is using of a mobile device to have possibility which can organize learning anywhere and anytime [8]. Mobile learning (m-learning) is the part of electronic learning or e-learning which gives broader opportunity in mobile mode, and better capabilities for students learning [9,10]. According to Taufiq [11], mobile learning is a new ICT improvement in education where mobile devices are used as learning media that contain of some materials or practical work aid so that they can be used inside or outside the school, and are lighter and portable.

There is a virtual classroom which can be accessed anytime and anywhere, so that the learning between students and lecturers do not have to be in a face to face interaction but in the e-learning process by android. An important feature of mLearning is that one of its goals, different from those of a traditional transfer of knowledge from teacher to student, is to empower students to actively participate in the construction of their own learning [12]. Nowadays, technology empowerment at schools is used to ensure the implementation of effective learning with new opportunities and to encourage better learning performance [13]. In science learning, most require visual media or supporting tools to facilitate the understanding of the material especially for materials related to natural phenomena [1,14].

Pocket mobile learning the power to make a transformation of learning experience and then direct learners to being able to develop divergent thinking, analyzing, and planning skills in response to things in existence around them. The divergent thinking skill is the skill of being able to elaborate on ideas creatively.

2. Method
This research is the quasi-experiment using post test only for control group design. The subjects were students in Physics Education of Universitas Indraprasta PGRI under the material of physics is Dynamics of Motion. The number of respondents was 24 students for treatment class and 26 students for the control class.

The dependent variables applied in this study was critical thinking skills. The independent variable is learning media in which the control group applied powerpoint, while the treatment group applied mobile pocket learning. The analysis technique used is the analysis of variance (ANOVA) with a margin of error (alpha) of 5%. The critical thinking skills instrumen is evaluation questions with multiple choice. The number of multiple choice are 20 questions.

3. Result and Discussion

3.1. Result
The descriptive statistics figured out the mean and standard deviation for each factor of the learning outcomes is shown in Table 1.

|                  | N   | Mean | Std. Deviation | Std. Error | 95% Confidence Interval for Mean | Minimum | Maximum |
|------------------|-----|------|----------------|------------|---------------------------------|---------|---------|
| Treatment group  | 30  | 66.83| 8.558          | 1.563      | 63.64 – 70.03                   | 45      | 80      |
| Control group    | 30  | 50.67| 8.277          | 1.511      | 47.58 – 53.76                   | 35      | 65      |
| Total            | 60  | 58.75| 11.667         | 1.506      | 55.74 – 61.76                   | 35      | 80      |
Table 1 indicates that for the critical thinking skills, group treatments had an average (66.83) which is higher than the control group (50.67). However, it needs to be analyzed whether these differences are significant enough to see the effect of learning media. This descriptive statistic displaying the effect of each independent variable through the one-way ANOVA as presented in Table 2.

| Table 2. One Way Anova |
|------------------------|
|                        | Sum of Squares | df | Mean Square | F     | Sig. |
| Between Groups         | 3920.417       | 1  | 3920.417    | 55.313| .000 |
| Within Groups          | 4110.833       | 58 | 70.876      |       |      |
| Total                  | 8031.250       | 59 |             |       |      |

From Table 2 it can be observed that the critical thinking skills between the control group and treatment group were significantly different, at the level of error of 5% or 95% level of confidence. So it can be said that in the critical thinking skills, the students who follow the learning media of pocket mobile learning reached the higher score than students who follow learning media with powerpoint.

3.2. Discussion

The operation of ICT in learning process in Indonesia can be considered in survey results [7] related to global digital statistics from the latest two years (2014, 2015). Although normally the infiltration of internet in Indonesia just reached 28% in 2015, but it comes considerable improvement linked to the attainment 15% in 2014. The developing simultaneous increases in many sectors are predicted to promote its infiltration in the future.

The practice of pocket mobile learning learning media can influence the students' critical thinking ability compared to powerpoint. The students are better engaged and reciprocal as they apply to smartphones and can be handled anytime and anywhere. Technology becomes a powerful learning tool and places students away from the decline of the times [15]. Physics learning that connects the concept with the analysis can be applied with mobile learning. The students are more interested in learning physics with something different that is with pocket mobile learning. The students are able to analyze physics concepts well. Pocket mobile learning displays the abstract concept becomes evident that is with the simulation of physics that explains the theories relating to normal life.

Learning media could support learners’ problem-solving and critical-thinking abilities. The use of learning media in a form of e-learning could improve learning into becoming more efficient with support from the learning motivation possessed by learners and it has a sufficiently significant impact on the e-learning [16]. Indicates that learning with technological media exerts a sufficiently significant influence with learners getting a stimulation effect from the use of the media in the learning process [17].

A multimedia online learning environment actively engages learners through different types of interactivities, which can help students with learning disabilities and English learners build literacy skills, manage cognitive load, and access rich educational resources [18]. Multimedia has introduced the pedagogical strength in facilitating student learning and supplementing learning with liveliness as it adds richness and meaning to the information presentation with the use of more than one medium [19][20].

The applications of mobile learning for smartphone in physics instruction, on the one hand, additional new experiments should be developed, and this involves continually scanning the relevant databases of free commercial smartphone applications [21]. On the other hand, it is necessary to investigate the impact of this material-aided situated learning approach on learning and motivation and to evaluate which factor might make an used material of an experiment more successful than another, or in other words: to evaluate design or development physics eksperiment. The growing level of science of technology, the use of mobile learning is growing with various functions and applications.
4. Conclusion
Based on analysis and research results can be concluded that pocket mobile learning media of specifically physics material about dynamics of motion could improve students' critical thinking skills. The result show that the students average score with learning use pocket mobile learning is higher than learning use powerpoint.

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