

Design and Implementation of Mobile Learning with RASE Framework: Applying to The Balance of Rigid Bodies

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Article Info

Article History:

Submitted:
March, 24 2018

Accepted:
May, 6 2018

Published:
May, 7 2018

Keywords:
Mobile learning, Media,
RASE, Performance.

Abstract

This study aims to produce mobile learning applications with RASE framework on android platform that can be used as a tool of learning physics class XI on the subject of balance of rigid body. In addition to know the perception of learners to the media developed in terms of compliance with usability standards and mobile quality. This research is a research R & D with design include: requirement analysis, product planning and development, product development, product evaluation, final product, dissemination and presentation. The developed application named amolef has been implemented in 93 students of class XI Senior High School 3 Purworejo. Data collection is done by giving validation sheet to expert lecturer. Questionnaire response of learners has also been given to give input to the developed product. The results showed that the product of development result was declared viable based on expert assessment and response of the students with very good category. Through one sample t-test the characteristics of media meet usability and mobile quality standards. Implementation in the study of physics on the subject of balance of rigid body able to improve student performance.

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p-ISSN 2528-5971
e-ISSN 2528-598X

INTRODUCTION

Technology changes every day and affects everyone's lives. It also change some of the traditional industries, including the higher education industry. With the penetration of mobile technology and mobile devices, mobile teaching and mobile learning are already very popular in every country (Zhang, 2015). The results of mobile learning study are shown in Table 1 and Table 2.

The results of the research are shown in Table 1 and Table 2. These showed that there are at least four significant percentages of the benefits of using mobile learning to improve learning efficiency; to study anytime and anywhere; to fill in time for an activity to learn; to increase the learning interest of learners (Zhang, 2015).

Table 1. Results of mobile learning research in Australia

No	Answer	Response	%
1.	It increase my learning efficiency	13	38%
2.	It helped me study anywhere and anytime	19	56%
3.	It helped me study utilizing the small time slots	11	32%
4.	It helped my lecture/tutorial study	13	38%
5.	It made me feel interested in this subject	9	26%
6.	It engaged me in discussion with others students or teachers	3	9%
7.	It increased my performance in this subject	8	26%
8.	Others (Please	5	15%

Table 2. Results of mobile learning research in China

No	Answer	Response	%
1.	Increase learning efficiency	76	52%
2.	Study anywhere and anytime	60	41%
3.	Utilise smaller time slots to study	80	54%
4.	Increase my searching and learning in class	33	22%
5.	Increase my interests in learning	25	17%
6.	Engage me in discussion with students and teachers	18	12%
7.	Increase my performance	18	12%
8.	No difference to me	9	6%
9.	Others	3	2%

Mobile Learning

The potential of mobile learning ("m-learning") should not only describe learning content delivered or accessed with mobile devices only, but this should be seen as a way to increase learners' learning activities by providing access to both learning content and information supporters, can study anytime and anywhere. Therefore, both learners and devices that are using recently or in the future should be more flexible in displaying m-learning. Unlike other learning technologies, m-

learning is unique because it accommodates both formal and informal learning in collaborative or individual learning mode, and in almost any context (Haag and Berking, 2015: 43).

According to Zhang (2015) there are some problems encountered in learning using mobile devices, (1) how to change the curriculum and traditional teaching materials into digital content, (2) how to design good content that suit to mobile devices and according to the method of teaching (4) how to educate senior teachers to use mobile technology in teaching, (4) how to protect IP (Internet Protocol) and confidential information online, how to keep the network and stable signals during usage, and (5) how to engage learners in learning activities instead of playing games. Therefore, the design of m-learning requires hard work and trials involving curriculum makers, application developers, and learners.

Many studies have found that mobile learning has a positive influence on learning activities (Hwang and Chang, 2011; Evans, 2008; Cheon et al., 2012). The mobile learning program developed varies in terms of design, target group, learning methods, and implementation environment. Designers must consider the characteristics of the learner's mobile device. For example, the clarity in small and user friendly. Flexible mobile devices on learning materials is a key feature of the program. Interactive function and social communication are also believed to be important in order to engage learners and can improve long-term memory. Discussion between learners and communication with teachers helps learners to understand the material and apply knowledge in real cases. Feedback from learners also helps in improving the teaching curriculum, as instruction has to be dynamic and innovative processes.

It has been presented and discussed the theoretical framework for designing learning strategies with mobile phones taken from works by various authors. This oriented framework offers teachers and researchers interested in m-learning to design and implement mobile learning strategies in learning activities. Figueredo and Villamizar (2015) proposed a mobile learning framework that follows 6 stages including: analysis, identification, bases, design, and implementation. Each of these stages has been designed as part of the process that teachers must follow to build effective mobile integration strategies. Churchill et al. (2016) proposed a mobile learning design that integrates at least four major components—Resources, Activity, Support and Evaluation, RASE. Those four components have represented the usefulness of mobile technologies—Resources, Connectivity, Collaboration, Capture, Representation, Analytical and Administration tools.

The main idea behind the RASE learning design framework presented in Figure 1 is that resources alone are not sufficient to achieve maximum learning outcomes. In addition to resources, teachers need to consider activities for learners to engage in the use of resources and perform tasks such as experimentation and problem solving through active experience of achieving learning outcomes. Support to ensure that learners get help, and may be able to use the tool independently or in collaboration with other learners, solve the difficulties. Evaluation to inform learners and teachers about the progress of learning and to understand what else needs to be done in order to ensure the achievement of learning outcomes (Churchill et al, 2013)

The Android OS is an operating system for linux-based mobile devices that includes operating systems, middleware and applications. Android provides an open platform for developers to create apps. Then to develop Android, the Open Handset Alliance was formed, a consortium of 34 hardware, software and telecommunications companies, including Google, HTC, Intel, Motorola, Qualcomm, T-Mobile and Nvidia. At the inaugural release of Android, November 5, 2007, Android alongside the Open Handset Alliance declared support for open source development on mobile devices. On the other hand, Google releases Android codes under the Apache license, a software license and an open platform mobile device.



Figure 1. RASE Framework (Churchill et al., 2016)

The developed apps are written in html5 and javascript. Html5 and javascript codes are compiled together with the resource file data required by the application, where the process uses a tool called "CORDOVA" into the Android package to generate files with apk extensions. Application can be installed on mobile devices.

Conceptual Learning Object Model on Material Balance Material

Churchill (2010) has described the learning object clearly as a multimedia representation, designed to represent contemporary technology in order to educate learners by displaying data, information, concepts, and ideas. Classification of learning objects as follows presentation, practice, simulation, conceptual model, information object and contextual representation.

Conceptual models can be considered to be given by educators as digital resources that effective for science and learning, especially for the development of new concepts and literacy. A conceptual learning model is designed to represent a particular concept (or set of related concepts) and its properties, parameters and relationships. Learners can manipulate the properties and parameters with interactive components (eg, slider, button, hotspot area, text input box) and observe changes that are displayed in various modes (eg, numerical, textual, auditory and visual). This resource takes a short time to learn maximally and conceptual knowledge will be built (Churchill et al., 2013).

The conceptual model of a material balance system can be represented interactively, allowing learners to manipulate a number of parameters and observe the impact of their configuration. In order to realize the full learning potential of this learning object, teachers can create tasks (activities), involving learners in the investigation and exploration to highlight the relationships that are embedded in the object of learning.

METHOD

Research and development media of android-based physics learning in high school students is done in various stages. The workflow of media of android-based physics learning is shown in Figure 2:



Figure 2. Research workflow

Needs Analysis

At this stage, the developer analyzes the need to collect the data. That includes analyzing the journal about mobile learning, to analyze the data of the subject contained in the curriculum of 2013 revised edition in class XI semester 1 with a very essential subject to be developed, conducting a survey on physics learning by providing a number of questions related to learning the balance of rigid body and interests of learners will be an application in which there is a simulation that facilitates the learning of physics, especially the subject of balance of rigid bodies, and assessment of student problems.

Product Development Planning

At this stage, the developer determines the purpose and character of the product, searches for the content sources of the product design to be created, arranges the stages of making the product/concept of the product in the form of storyboards, flowcharts and develops the initial product form of physics learning multimedia application.

Product Development

Early product development of physics-based applications of this android, researchers consult directly with expert lecturers.

Product Evaluation

With the existence of validation by experts it will produce a representative measuring tool in obtaining data. Small-scale field trials of initial products in the form of physics-based android-based multimedia applications are conducted to obtain responses and product revisions by experts and learners

Final Product

The final product is generated by the developer based on input and revision of the original product. After going through expert reviews and trials, the product is refined based on the expert's input and the learners, resulting in a physics-based android-based multimedia learning product on physics lessons in high school that are feasible and effective. Products are also implemented in the XI MIPA classroom to get students' feedback on usability and mobile quality aspects.

Dissemination and Presentation

At this stage is to disseminate the product in the form of physics material applications that can be downloaded for free through the play store on smartphone/gadget. Product dissemination is done through MGMP activities or through social media such as facebook, instagram, tweter, whatsApp, and others.

RESULT AND DISCUSSION

In this research has been carried out the development of mobile learning applications as presented in Figure 3. The application follows the RASE framework that contains the subject of the balance of rigid bodies. The application has been applied to students of XI Senior High School 3 Purworejo. The development of this application is done through six stages of development covering needs analysis, product development planning, product development, product evaluation, final product, dissemination and presentation. A description of the activities undertaken at each stage of development along with the results obtained has been described in the section of the research results discussed earlier.

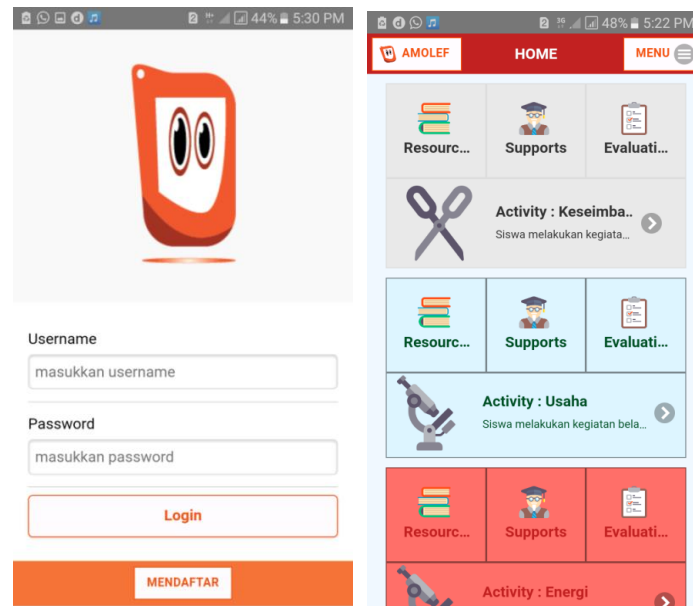


Figure 3. Mobile learning applications

Product development called amolef that has been validated by media experts, material experts and small groups of learners. The average overall assessment of learning media developed is 88.23% with very good category. Thus, this media is suitable for learning media.

The results of the questionnaires given to the learners after they apply the amolef application in the learning. The number of students as respondents as many as 3 classes with a total of 93 respondents. Nine statements in the questionnaire were given to the learner who were categorized in two ways: usability (learnability, understandability, operability) and mobile quality (metaphor, interactivity, learning content) shown in Table 3.

Aspects of usability through three questionnaire statements (P2, P3 and P4) have been found in amolef applications: learnability, understandability, operability (ISO, 2003). Student response from P2 and P3 statements revealed that amolef application is not difficult to use and easy navigation, whereas from P4 statement revealed that learners agree that the application guide him to make hypothesis. One sample t-test of neutral value 3 has been used to analyze it ($t_{95} = 12,827$, $p < 0.05$ for P2; $t_{95} = 8,847$, $p < 0.05$ for P3; $t_{95} = 9,822$, $p < 0.05$ for P4).

According to the results analysis also, learners gain experience that amolef as an interactive learning media. Interactivity aspect results have been confirmed ($t_{95} = 8,018$, $p < 0.05$ for P6; $t_{95} = 17.828$, $p < 0.05$ for P8). Assessment through P1 and P9 statements revealed that this application is an effective application in learning and provides an interesting experience ($t_{95} = 13.235$, $p < 0.05$ for P1; $t_{95} = 13.644$, $p < 0.05$ for P9). Statements P1 and P9 are aspects of learning content that describe the feelings of learners with regard to the quality of the amolef application. Another aspect of application quality is metaphor, it has been shown that learners have learning experiences through the whole learning process ($t_{95} = 11,158$, $p < 0.05$ for P5; $t_{95} = 11,346$, $p < 0.05$ for P6).

Tabel 3. Result Statement Questionnaire with aspect asked to learners.

Code	Statement	Aspect	<i>Mean±Standard error</i>
P1	This mobile learning experience was enjoyable.	Learning Content	4,08±0.081
P2	This mobile application was easy to use.	Learnability	4,00±0.078
P3	Navigation through this application was easy	Operability	3,72±0.081
P4	This application guides me to formulate a hypothesis	Understandability	3,94±0.095
P5	The given suggestions in the application were relevant	Metaphor	3,82±0.073
P6	This application helps me understand the relationships between different variables.	Interactivity	3,63±0.079
P7	The given suggestions help me to understand the topic	Metaphor	3,86±0.076
P8	This application helps me to improve my reasoning skills	Interactivity	4,30±0.073
P9	It is an effective learning application	Learning Content	4,02±0.075

The results and analysis of the application of amolef to learners shows that learning using mobile learning can help learners improve learning performance. Research (Hwang & Chang, 2011) suggests that the use of mobile learning applications improves learning performance rather than learning in the traditional way. The results of the study by Ahmed and Parsons (2013) show better learners' performance in their learning activities, while learning using mobile learning.

Implementation of amolef in learning has been in accordance with the results of previous research. The RASE Framework in the Mobile Learning Application Physics (amolef) is able to encourage learners to perform learning activities such as solving problems given by teachers, designing hypotheses, and making reports as a result of evaluation. Resource that contains material balance of of rigid body used by learners as a theoretical basis to conduct learning activities such as understanding the concept of torque or create a hypothesis of activities in the activity menu. Learners are expected to be able to understand the resource, so that learning activities in the activity menu can be completed properly. Activity of the learners, will encourage the formation of independent characters learners in learning. If learners have difficulty in learning, then the support menu can be used for support in understanding the concept. Evaluation as an application menu that serves to create artifacts / reports either is a temporary report or final report. Temporary reports are used for formative assessment of teachers for good reporting.

CONCLUSION

Mobile learning physics (Amolef) with RASE framework on the android platform that is suitable to be used as a physics learning tool on the subject of the balance of rigid body. Amolef can be installed in android smartphone. Amolef can integrate affordance technology in learning through design selection following RASE framework. Amolef can be used as a tool of physics learning on the balance of rigid body through simulation. Amolef can quickly make progress report learn, so that teacher have opportunity to conduct formative activities. Amolef can make a final report in the form of .pdf as a final assessment of learners. Mobile learning applications with RASE framework on the android platform have been implemented in physics learning on the subject of the balance of rigid

body whose characteristics meet usability and mobile quality standards. Implementation of amolef in learning can improve learners' performance through learning activities.

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