Developing eXeLearning application through project-based learning

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Abstract. This study aims to develop web-based teaching materials using eXe to know the students’ responses toward the eXeLearning in mathematics learning on linear program topic using the Project-Based Learning. This study employed 4D method (Define-design-develop-disseminate) as the research method and the instruments involved in this study were: teaching media, and questionnaire to get students’ responses. The subjects of this study were ten students of class XI of SMA Negeri 1 Pundong and ten students of class XI of SMK Multimedia Buluspesantren who were randomly selected. Descriptive qualities technique was employed in analysing the data. The results show that the students’ responses toward the mobile learning is at a level of 74.94%, which indicates mobile learning applications developed in good categories and suitable to be used in learning activity.

1. Introduction
Mathematics teachers as the spearhead in the success of mathematics learning must have the right strategy when teaching. It would be better if the teacher uses a variety of methods that will make students participate and be active in learning. It is important for teachers to try to find alternatives to improve the quality of the results achieved in learning can increase [1]. Some teachers still use conventional approach because they are more practical and do not waste much time. Whereas the media can replace the role of the teacher to present materials for learning. It is time for teachers to share tasks with the press so that they have more time to do other roles, not just as informatory [2]. In this learning period, it is possible for individuals to develop their talents and potential (students) through “Technology supported knowledge” and opportunities for all parties to pursue lifelong learning [3]. One of them is using mobile learning.

Mobile learning is a technology development concerning information and communication that can affect the scope of education [4]. Some studies show that mobile learning can be integrated with the learning process of mathematics [5, 6]. Through mobile learning, students can access knowledge using their smartphones whenever and wherever [7]. The study of mobile learning has shown the most favourable results [8]. With the existence of mobile learning, the teaching and learning process will be more effective. Students can access subject matter from anywhere without being limited by space and place and have flexibility because it is not related to time. Mobile learning can be a complement to the subject matter given in class. One of the mobile learning applications is eXeLearning.

The eXe (eLearning XHTML editor) is an authoring program, where teachers can develop and publish learning materials without the need for expertise in programming language [9]. In eXeLearning programs, the topic can be presented in the form of tutorials and accompanied by multiple choice practice questions. eXeLearning to make Web-based teaching materials designed to convey teaching materials more comfortable
and more interesting [10]. In the eXe program, the teacher only opens the eXeLearning page, then fills with text, images, and videos and then automatically forms a table of contents that links to all pages [11].

In 21st-century learning is required to have a 4C goal characteristic, namely creativity, critical thinking, communication, and collaboration, which is better known as the 'Four Cs' acronym [12]. In comparative studies, students who were learning using collaborative learning have higher learning outcomes than students who are given learning using conventional strategy [13]. One of collaborative learning is project-based learning. Through project-based learning collaborative characters can be raised. In this era, students need effective learning media and can use wherever. Cellular devices such as laptops and cell phones have become learning tools with great potential [14]. Most high school students today have a smartphone. However, most students use smartphones only for social media activities; there are still few teachers involving smartphones in learning [4]. This research will develop the learning process using the project-based learning method using the Android application system. Project-based learning will help students learn the material in the form of a project.

Project-based learning is one type of collaborative learning. Project-based learning or project-based learning models are learning models that use projects or activities as media that involve students in transferring knowledge and skills through the discovery process with a series of questions arranged in a task or project [15]. This Learning Model is generally related to the discussion of real problems. Project-based learning is a way of learning that uses issues as a first step in collecting and integrating new knowledge based on their experience in actual activities [16]. The project-based learning model allows students to carry out scientific learning activities in the form of asking questions, observing, investigating or experimenting, reasoning and establishing relationships with others to obtain information or data.

However, various factors can influence success in learning mathematics. One of them is the teacher's strategy in delivering material to students. Some teachers still use conventional approach because they are more practical and do not waste much time. Then to overcome these problems is to use learning media.

This study aims to develop web-based teaching materials using eXe and to know the response of students using eXe learning in learning mathematics in linear program materials using the best learning project. PjBL will help students learn the topic in the form of a project in which students will try to solve and answer a fundamental question provided by the teacher through mobile learning with the eXe learning application.

2. Method
This researches uses research and development method aimed to know the feasibility of eXeLearning in mathematics learning on linear program topic using the Project-Based Learning. These procedure were: define, design, develop, and disseminate [17]. The research subjects were ten students of class XI SMA Negeri 1 Pundong, and ten students of XI SMK Multimedia Buluspesantren are chosen randomly. The object in this study is the student's response to learning media for the linear programming topic. The research data was obtained using student response questionnaires. In this study, researchers designed linear program material using eXeLearning. Each stage of the development involved in this study is outlined below.

2.1. Define
At this stage, reference studies are carried out from various sources [18], both from the internet and print media related to information in developing eXeLearning. Discussion with lecturers about the potential and problems in developing eXeLearning. So that later developed learning design using eXeLearning.

2.2. Design
At this stage, the Curriculum Analysis is carried out [19]. The analysis used in eleventh grade was the 2013 Curriculum. Linear program material in the curriculum was included in the first-semester specialization mathematics material, namely on Basic Competency to create a graph of the set of linear inequality system settlement using Student Worksheet. After that, the results of the field study showed that all students of eleventh grade used Android-based smartphones, and they claimed to have never used mobile learning based applications. Overall students respond with a positive response if there is a mathematics learning application that can help in the learning process [20]. So that the mobile learning application developed has the following characteristics, such as the contents refer to
the 2013 Curriculum, use simple language, and mobile learning uses new drawings and illustrations that are following the material.

2.3. Develop
At this stage the mobile learning based eXeLearning was produced. Development of eXe Learning converted to the Android application package (.apk) using the website two builder pro application. So that mobile learning can be installed on smartphones. So facilitate students in accessing the material wherever and whenever students are [21]. This media consists of the Linear Program (Title) page; Basic Competency pages, Indicators, and Objectives; Activities and Work Guidelines page; Material page; Activity page; and the Multiple Choice Questions and Descriptions page.

2.4. Disseminate
Products can be downloaded at https://goo.gl/ep1ZQN and installed using an Android phone. The sources of the data in this study are the result of the students' responses data. The analysis of the obtained data was conducted under the technique of descriptive qualitative. The analysis carried out on each criteria related to the response of each student for Project-Based Learning by eXeLearning based mobile learning. Moreover, the next analysis was done by using the same formula.

\[ p = \frac{f}{N} \times 100\% \]

Description:
P = Percentage of
F = Number value obtained
N = Number of maximum value

The percentage was searched with an intention to determine the status of something presented in percentage mode. Furthermore, on the Table 1 each percentage can be associated with several qualities (qualitative representation).

| Achievement Level | Qualification   |
|-------------------|----------------|
| 81% - 100%        | Very Decent    |
| 61% - 80%         | Worth          |
| 41% - 60%         | Fairly Decent  |
| 21% - 40%         | Less Worth     |
| 0% - 20%          | Not Eligible   |

Table 1 is used to assess the feasibility of the product (media) and the responses of the students. The conclusions of the product were used as a reference to assess the product whether it is feasible or not.

3. Results and discussion
Based on mobile learning research project conducted by Attewell and Savill-Smith, some of the benefits of mobile learning are: a) it serves flexible learning (anywhere and anytime) and it is personalized; b) it can be used to turn on, or add variation to, the conventional learning; c) it can be used to remove some of the formalities which are considered as non-traditional learners unappealing or intimidating, and can make the lessons to be more attractive; d) it can help to provide and support the learning of literacy, numeracy and language; e) it facilitates the learning experience, both individually and collaboratively; f) it can contribute to fight the resistance of the use of ICT by
providing a bridge between blind mobile phone and PC technology; g) it has been observed and proved that it can help young learners to maintain their focus in longer periods of time; and h) it can contribute to improving confidence and self-assessment in education [22]. Some appearance on products developed can be seen in the Figure 1.

![Product cover and menu](image1)

**Figure 1.** Product cover and menu

Figure 1 show the main page of the mobile learning in linear program material. The second figure showed main menu that has 2 parts namely: Linear Program and Questions. On the menu Linear Program are given 4 sub menus namely: Basic Competency, Indicators, and Learning Objectives; Activities and Work Guidelines; Material; and Activities. This attractive main cover expect to gain user interest for using the program. The user can choose any one of the main menu to begin they learning, but recommended to start from the first choice [23].

![Sub menu linear program material](image2)

**Figure 2.** Sub menu linear program material

Figure 2 show the sub menu from linear program material. On this page, students can know the benefits and learning step. The other hand, students are asked to reflect themselves to solve the contextual problems. From this contextual problem, students are expected to be able to model in their mathematics. Contextual issues it can be more comfortable for students to translate real problems into mathematical form [24]. Then, the students answer by following the path that has provided. From the example are given the linear two-variable inequality form to conclude the meaning of linear inequality.
Menu activities on Figure 3, it presents a sequence and graph problem series with essays made with the "Cloze Activity" menu. Cloze activity involved sentences that employed the target words in contexts that were distant in theme from the instructional text, being designed to help students understand and use related meanings for the target words, and in the process develop a sense that most words are polysemous [25]. On this page, students can interact directly using learning media by entering answers into the box provided. Students can also check their answers by pressing the "send" button and get a score then automatically there will be feedback in the form of precise quality details in solving the problem.
Figure 4 show menu question. On this menu consists of two submenu, the first is the Multiple Choice and the second is the essay. Students can immediately answer and correct whether the answer is right or wrong. The responses of the students toward the media are shown in Table 2.

| No. | Calculating | Aspects | Usefulness | Ease of use | Ease of learning | Satisfaction |
|-----|-------------|---------|------------|-------------|-----------------|--------------|
| 1   | Total Question | 8       | 11         | 4           | 7               |              |
| 2   | Score Maximum | 32      | 44         | 16          | 28              |              |
| 3   | Score Obtained | 24.35   | 31.95      | 11.6        | 22.0            |              |
| 4   | Average       | 3.04    | 2.90       | 2.90        | 3.14            |              |
| 5   | Percentage of | 76.09%  | 72.61%     | 72.5%       | 78.57%          |              |

Based on Table 3, the students’ responses toward the mobile learning on the aspects of the usability aspects (usefulness) got a percentage of 76.09%, ease of use [22] got a percentage of 72.61%, ease of learning got a percentage of 72.5%, and satisfaction got a percentage of 78.57%. Thus, it can be said that the students’ responses, to the eXeLearning in mathematics learning on linear program topic using the Project-Based Learning, is good. As it can be seen from the overall percentage which is 74.94%.

The results show that in overall process, the college students found themselves in such easiness in operating or using the media. Mobile learning of eXeLearning is easy to use because there are clear instructions on it. From the aspect of usefulness, the students found the presented materials were easy to understand and very useful. In general, students like to learn in using the mobile learning of exeLearning because of its flexibility and it can be used in their smartphones respectively. In the media implementation process, the researchers explained the material to be conveyed was about the graph of the linear inequality. Then the researchers gave the form of an .apk file for each student. Students responded positively to the given files. At that time of their learning process which was focused on the material on their smartphones’ screens, they were trying to understand the material. It is essential because there were some quizzes included in order to measure students’ comprehensions toward the material. The results of the quiz would be the additional value for students. Furthermore, the quality of the Mobile Learning application on linear program material for high school students of class XI based on the 2013 curriculum through the Project Best Learning method developed included in good criteria and feasible used in the learning process.

4. Conclusion

From the development of Mobile Learning applications on linear program material, then try out to determine student responses to mobile learning applications through the best learning project model. The responses of the students toward the instructional mobile learning based on aspect of its usability (usefulness) is at a level of 76.09%, on its aspect of easiness (ease of use) is at level of 72.61%, on its aspect of easiness learning (ease of learning) is at level 72.50%, and on aspects of its satisfaction is at a level 78.57%. The students’ responses toward the mobile learning in either category, can be seen from the overall percentage of 74.94% is entered at the level of achievement of 61-80%. Based on this assessment, in general, the Learning Mathematics mobile application is included in the excellent category. Thus, the Learning mobile application on linear program material for high school students of class XI based on the 2013 curriculum is feasible to teach for teachers and students studying independently at school or outside the school.

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