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Interactive Multimedia Lectora Inspire Based on Problem Based Learning: Development in The Optical Equipment

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Abstract. The integration of technology in the learning process is needed in this era where technology as the part of media can enhance the understanding and attention of students. This study aims to develop interactive multimedia Lectora Inspire based on Problem Based Learning model in the material of optical equipment. Research and development are following a step development of Borg & Gall. Based on the results validation of the product, the feasibility of the product from the material experts is 86%, from media experts is 93%, and from teachers is 87%. The products were then tested on a small scale and attractiveness of the percentage obtained by 83%. Furthermore, in field trials, the percentage of attractiveness obtained is 80%. Based on these results, interactive multimedia Lectora Inspire based on Problem Based Learning model in the material of optical equipment for eleventh class can be used as a learning media.

1. Introduction

The explosion of technology in the twenty-first century have an impact very quickly [1-4] to *the* development in all sectors of life. Rapid technological developments have strongly supported the existence of a revolution that the world is facing namely the fourth industrial revolution (Industrial 4.0) in various fields [5-6] one of them in the field of education [7], the implementation of technology in the field of education including the use of ICT (Information Communication and Technology) [8-11] to create and develop media, methods and teaching materials of interest [12]. However, the use of technology is not maximized because the teachers are still using the print media in the learning process [13]. The utilization of ICT for learning process today, one of it is the development of interactive learning multimedia [14].

Multimedia learning has advantages compared to other media, it is due to fully integrate learning multimedia computer technology [15-16] video systems and audio systems [17-18] to get a better combination to improve learner's attention [19-20] for the information submitted [21]. Interactive means there is feedback given by the media to learners who give orders to the media used [22]. Multimedia can be packaged and optimized functions to enhance the ability of learners when combined with appropriate learning models [23]. The model used in this study is a model of problem-based learning (PBL). This is a learning model that requires learners to develop thinking skills [24-27], problem-solving and intellectual skills, foster cooperation and development capabilities of social attitudes [28].

Computer applications (software) used in this study is Lectora Inspire. Lectora Inspire is an authoring tool that can facilitate educators in the manufacture of multimedia audio-visual-based learning [29-32] The material of optical equipment needed to use the media because this material is abstract in physics lessons. The novelty of this research is interactive learning multimedia Lectora Inspire will be developed using model Problem-Based Learning in the material of optical equipment that has not been

developed in an earlier study that this development is expected to be the innovation that can be used in the learning process.

2. Research Methods

The aim of this study is to develop interactive multimedia Lectora Inspire based on Problem Based Learning model in the material of optical equipment that is viable and attractive to learners. This study uses research and development (Research and Development). The steps include [33]:
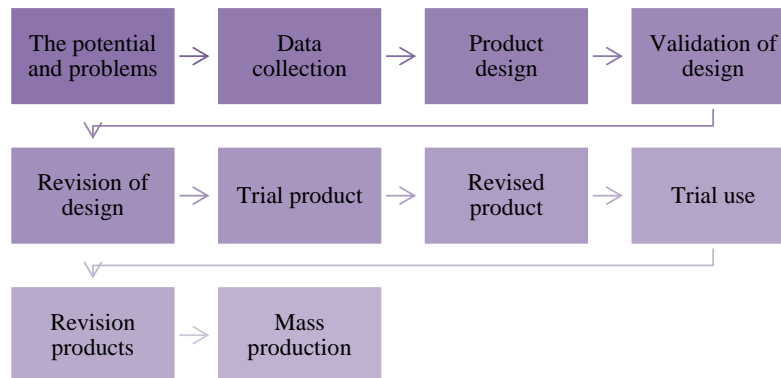

Figure 1 The steps of research and development

Based on the needs analysis and research purposes, this research look to unsuitable and attractiveness product that developed, without looking at the effectiveness of the product, the researchers limit the pace of research and development of (10) ten steps into a (7) seven measures, in line with previous research [12,21] the seventh stage of the study are described as follows:

1. Potential and Problems
At this stage, researchers led and set the problems, to find out the basic problems faced by the need at the data as a source of research support. Supporting data from this study came from the literature review and preliminary studies in the field.

2. Data Collection
Having found the problem, then the data collected to be analyzed in terms of both curriculum includes the study of the depth of the material, the use of multimedia learning and evaluation.

3. Product Design
Once the data analysis is done, the draft design of multimedia-based interactive learning Lectora Inspire model Problem Based Learning would be made. The draft is then implemented into the initial product,

4. Validate Design
The next step after completion of the initial product is consulting a team of experts. A team of experts is needed to validate are of subject matter experts and media experts. Subject matter experts and media specialists to validate the product to product-based interactive learning multimedia Lectora Inspire Problem Based Learning model fit for use.

5. Revised Design
Upon validation of the product completed, the next step is to revise the products that are considered still need improvement. Revisions were made based on the advice given by validator, both expert material, and media experts.

6. Test Product
The next step, after the product through a series of stages of the revision, the product is then tested to the user. The process of product testing is an important part in development research conducted after the design of the finished product. The test product is intended together. The data could be used as a basis for

setting the level of effectiveness, efficiency, and the appeal of the product. The test product in this study conducted on the test education practitioners, small group trials and trials field.

7. Revised Product

Once the product is tested, it is known weaknesses of the product. The weakness was later amended in order to produce a quality product and ready for use. The instruments used in data collection are pieces validation of a questionnaire using a Likert scale. Sheets validation in this study consisted of sheet material validation, validation sheet media, education practitioners sheet validation and testing questionnaire sheet attractiveness.

Data analysis techniques step - the first step to change the results of the assessment of media experts, subject matter experts and attractiveness of the response is still in the form of letters transformed into a score with provisions that can be seen in the following table

Table 1. Scoring [34]

Category	Score
SB (Excellent)	5
B (Good)	4
C (Moderate)	3
K (Low)	2
SK (Bad)	1

Furthermore, calculate the percentage of the feasibility of each every aspect of formula Likert scale.

$$x_i = \frac{\Sigma S}{S_{max}} \times 100\ \% \qquad (1)$$

Information :
Smax = maximum Score
ΣS = Total score
xi = Value eligibility questionnaire every aspect
Next, calculate the average percentage of all respondents using the formula:

$$\overline{x} = \frac{\sum_{i=1}^{n} x_i}{n} \qquad (2)$$

Information :

$\overline{x}$ = Average end
xi = Value eligibility questionnaire every aspect
n = number of statements

Furthermore, changing the average score obtained into a qualitative value in accordance with the eligibility criteria of products based on the criteria in the following table.

Table 2. Assessment criteria [12]

The Feasibility Score of the Learning Media	Criteria
0 - 20%	Not feasible
20.01% - 40%	Less feasible
40.01% - 60%	Quite feasible
60 , 01% - 80%	Feasible
80.01% - 100%	highly feasible

Changing the average score obtained into a qualitative value corresponding to the attractiveness of the product assessment criteria based on the criteria in the following table.

Table 3. Assessment criteria[35]

Percentage (%)	Criteria
0 ≤x≤ 20	Very Unattractive
20.1<x≤ 40	Less attractive
40.1<x≤ 60	Quite interesting
60.1<x≤ 80	interesting
80.1<x≤ 100	Very interesting

3. Results

Based on a series of development measures that have been done, then the resulting product research and development in the form of multimedia-based interactive learning Lectora Inspire model Problem Based Learning on the material optical instruments of class XI. Results and discussion of research and product development are described as follows.

1. Potential Issues and Data Collection

Potential problems and the collection of data obtained from the observation in SMA Negeri 1 Sukoharjo, SMA Negeri 1 Adiluwih and MA Ma'arif Keputran on learning physics that learning is less attractive, innovative and varied when schools have facilities that support the implementation of learning which is exciting, innovative and varied. However, such facilities have not been put to good use by educators. Based on the observation of the learners require instructional media an interesting, innovative and easy to use to convey the message properly. Besides learning to tend to be passive without involving the active participation of learners requiring appropriate learning models to be combined with the learning media.

2. Products Interactive Learning Multimedia

Based interactive learning multimedia products Lectora Inspire model Problem Based Learning on the material optical instruments XI classes designed for learning becomes more interesting and less monotonous. Here are some views of this multimedia.

Figure 2 Initial View Multimedia
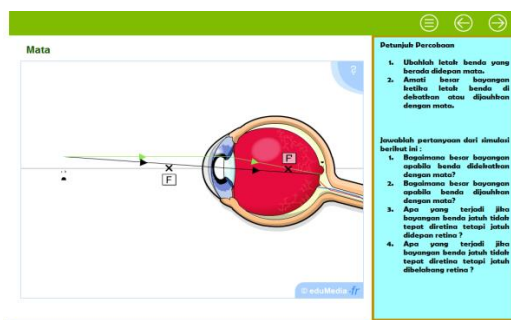
Figure 3 display Competence

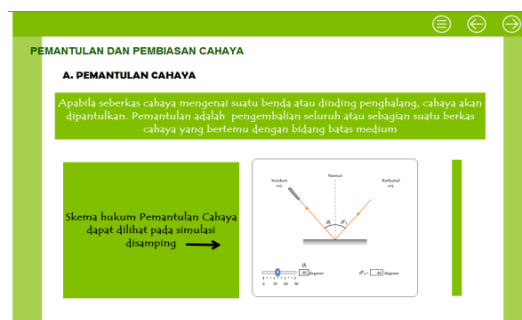**Figure 4** Display Problem-Based Learning

Figure 5 Creative View On Multimedia

Figure 6 Display one question on multimedia   **Figure 7** Display one question on multimedia

3. Validation Results

Based interactive learning multimedia products Lectora Inspire Problem Based Learning model is validated by a validator is based on areas of expertise, namely material experts and media experts. Validator experts each field of expertise consists of two validators on each field. Validator and media material composed of professors of physics, professors of education, and expert in technology education.

a. Validation results by material experts

Validation is done by filling matter expert validation sheet consisting of six aspects of evaluation. Point statement on the basis of six criteria given instrument is shown in the following the figure.
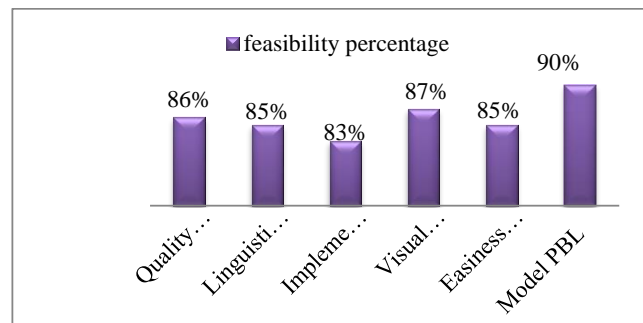

Figure 8 The Results of Validation Material Experts

b. Media expert validation results

Validation is done by filling out matter expert validation sheet consisting of five aspects of evaluation .. Item statement on the instrument is given based on five criteria are shown below.
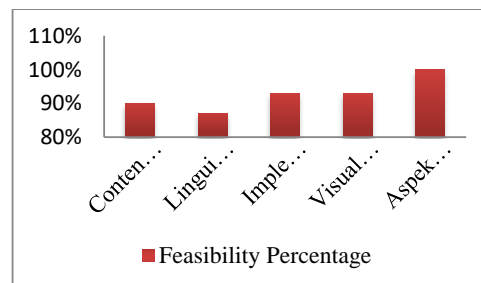

Figure 9 The Results of Validation Media Experts

4. Results of Trial Products

There are three tests on this research, including testing the attractiveness of the teachers, the small group testing and field testing.

a. The attractiveness of the test by a qualified practitioner (teachers)

Test the attractiveness of education practitioners in this matter physics teacher fill out a questionnaire conducted with ratings of five aspects of evaluation that is, the content quality aspect, the aspect of the display module, technical quality, and demonstrated the following aspects of the language.
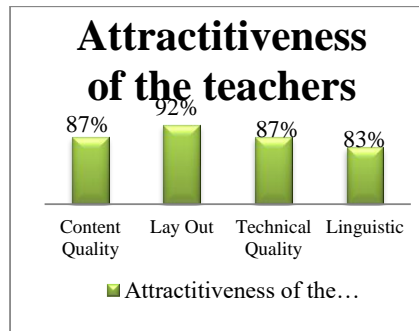

Figure 10 Test chart attractiveness of the teachers

b. Small group testing

The small group testing conducted at 30 students by filling out a questionnaire sheet valuation. Questionnaire data of the small-group testing can be seen in the following figure:

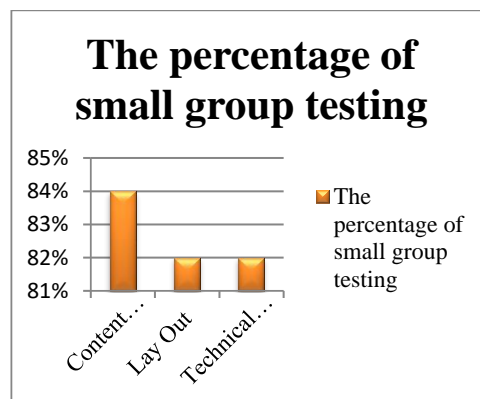**Figure 11** The Result of Small Group Testing

b. Field Trial

The field trials conducted to 67 learners by filling out a questionnaire sheet valuation. Questionnaire data are presented as follows.
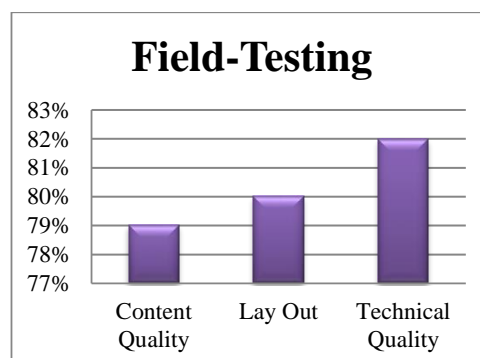

Figure 12 The Result of Field Testing

The attractiveness of the percentage difference was not significant by both the trial and each earns a percentage of $\geq 80\%$. It can be concluded that in general show trials assessment based on product quality is well worth the educator, small group and field.

5. Discussion

Presentation of the results of this development aims to answer the problem formulation. The data presented is a description of a process of development, the results of the feasibility and validation of test results.

Rating by subject matter experts in the form of tables and graphs. From the data validation results matter experts in each aspect namely the quality of the content aspect 1 percentage gain eligibility by 86%. In the second aspect of linguistic obtain eligibility percentage of 85%. In the third aspect of the feasibility and application get a percentage of 83%. In the fourth aspect of the visual display gets a percentage of the feasibility of 87%. In the fifth aspect of ease of use puts the percentage of eligibility by 85% and 6 models aspects of problem-based learning gain eligibility percentage of 90%. On average rating validator matter experts that the eligibility percentage of 86% with very decent criteria.

Category very decent on the side of good material because the material content of problem-based learning, learning materials, and evaluation systems are in accordance with the content standards and in accordance with the syllabus of class XI physics.

Media expert assessment by questionnaire the average percentage of the feasibility of the product is 93%, which is included in the category of very decent. Learning multimedia products is very feasible because based on the quality of content, enforceability, visual and sound aspects very well. There is a general indication of multimedia usage, problem-based learning (problem-based learning) that stimulates learners to think critically and understand the concept of learning as play an active role during the learning takes place. Part of problem-based learning (problem-based learning), as well as learning materials, are simulated so that there is a virtual experiment to increase the knowledge of learners. There are also pictures and videos clarify the concept of matter.

Test the attractiveness by education professionals (teachers) earn an average percentage yield of 87%. Thus the developed instructional multimedia otherwise very attractive to use as a medium of learning for students. Based on the quality aspects of the material contained in accordance with the basic competencies and material to support the achievement of learning objectives. Aspects of multimedia display, the appearance of elements of layout and color selection on proportional and exciting multimedia, text, video presentations and interesting images, simulations presented efficiently to improve thinking and understanding of learners.

The technical quality of multimedia can be used easily, is interactive and participatory. The language used in accordance with the development of learners and language rules.

The next test of the attractiveness of the small group, the attractiveness of the response obtained an average 83% categorized as very attractive and the attractiveness of the field test to elicit a response by an average of 80% with a very interesting category.

Based on exposure to the research, development of multimedia-based interactive learning Lectora Inspirelectoras using problem-based learning models on the material optical instruments have a very decent quality as well as attractive to use learners, especially in class XI. Here is a graph of the results of either study or test the feasibility assessment attractiveness.
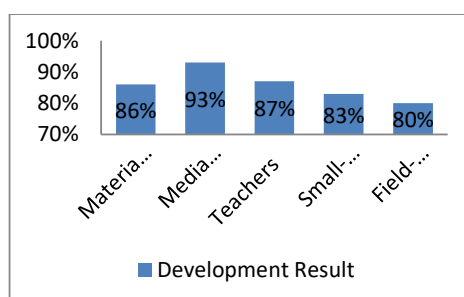

Figure 13 The Result of Development Results

The result of this development in line with the results of previous development that received a very decent product rating as well as very interesting [36], This development differences with the previous development, in this multimedia development combined using a model of learning is problem-based learning. The implications of this study can be used in the multimedia learning process as a result of innovation researcher for learning interesting, effective and not monotonous. With the steps of problem-based learning models in multimedia can further optimize the active role of learners in the learning process.

Here are the steps of learning using problem-based learning models [37]:

a.   The orientation of learners to the problem (learners)

In the first step, based on the phenomenon that is displayed in the multimedia, learners understand the problem and the conditions shown, observation, investigation of the condition of the problem and understand the purpose of learning.

Figure 14 Orientation of Students Against Eye Problems

Figure 15 Orientation of Students Against Problems in Lup

b. Organize students to learn

In the second step, the students as the problem, study the relevant reference sources in multimedia or other source material for discussion and problem resolution.

c. Helping independent inquiry and group

In this step, the students plan to solve problems through experimentation contained in the multimedia (virtual experiment), discussion and division of tasks within the group, carrying out experiments and gather, analyze and conclude the data.
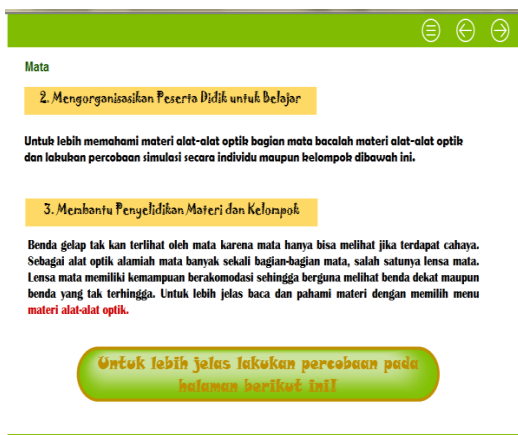

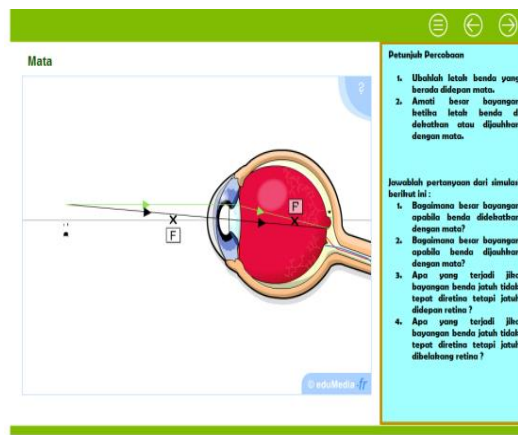**Figure 16** Organizing Students To Learn On Currency

Figure 17 Helping independent investigation and the group of the eye

d. Develop and present the work as well flaunt it
In this step, learners show the workgroup discussions in class and are associated with knowledge and experience of everyday life.
e. Analyze and evaluate the problem-solving process
In this step, learners communicate with the friend's group, inter-group, and masters of their findings, receive feedback and communicate with friends group, inter-group, and teachers for its findings. Evaluate solutions and make conclusions and carry out the test questions on the menu to the evaluation questions.
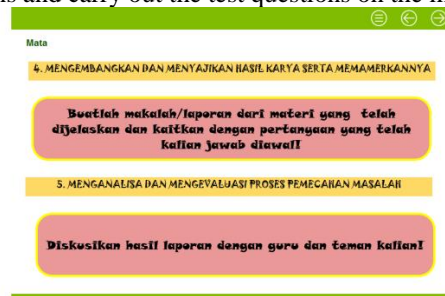

Figure 18 The fourth and fifth steps of problem-based learning

Excess interactive multimedia Lectora Inspire is able to present a problem-based learning, interesting material good pictures, video and animation on optical devices, multimedia comes to the problems varied to test the ability of learners and multimedia is very practical because it is a computer software that can be stored in a compact disk and removable disk [38-39].

5. Conclusions And Suggestions
5.1 Conclusions
Based on the results and discussion can be concluded that: 1) The study produced the product in the form of multimedia-based interactive learning Lectora Inspire model Problem Based Learning on the material optical instruments of class XI; 2) Quality and appropriateness according to the experts is very worthy of validation results in materials with an average percentage score of 86%, the percentage of 93% of media experts; 3) The attractiveness of the response by educators with an average percentage of 87%, the response of students to the attractiveness of the multimedia very attractive to the average percentage on a small scale and large scale were obtained an average score of the 83% and 80%.

5.2 Suggestions
The advice to users and further research are: 1) Research and development need to be followed up again for research in the field of multimedia development better; 2) Multimedia-based interactive learning Lectora Inspire using Problem Based Learning developed can be used in schools as one of supporting learning and so helpful; 3) Multimedia-based interactive learning Lectora Inspire using Problem Based Learning only on the material optical equipment for eleventh class, then needs to be further developed for other materials with more varied content.

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