The development of interactive learning multimedia in teaching mathematics (integer number) to junior high school students

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Abstract. This study aims to create an Interactive Learning Multimedia Product Development. This development research aims to facilitate student learning activities that are in accordance with learning principles and are goal-oriented to be achieved in the learning. This interactive learning multimedia aims to be accessible by students in a more flexible manner without limited space and time, more effectively and it is also hoped that it can be more efficient in its implementation. The research method used is R & D, this development method uses the learning development model proposed by Borg and Gall, Dick & Carrey and J. Moonen. This is done because what will be developed in this research is an interactive learning multimedia development product. The stages in developing interactive learning multimedia designs include 5 stages, namely: (1) preliminary research, (2) initial product development, (3) expert validation and revision, (4) small-scale field trials and product revisions, (5) testing large-scale field and final products.

1. Introduction
National education has the function of developing capabilities and shaping the character and civilization of the nation which is useful in order to educate the nation's life, aims to develop the potential of students to become human beings who believe in and have devotion to God Almighty, have noble character, are healthy, knowledgeable, capable, creative, independent and become a citizen of a democratic country so that he is responsible [1].

Learning media is a tool or intermediary that is useful for facilitating the teaching and learning process, in order to streamline communication between teachers and students. This really helps teachers in teaching and makes it easier for students to accept and understand lessons. This process requires teachers who are able to align learning media and learning methods.

One of the factors that determine the learning process is the use of learning media. Learning media are anything that can convey and channel messages from sources in a planned manner so as to create a conducive learning environment where the recipient can carry out the learning process efficiently and effectively [2].

Learning media serves to support learning in subjects which require additional tools to clarify the material presented. The media used has a position as a teaching aid for teachers in teaching. For example, graphics, films, slides, photos, and learning using computers. The point is to capture,
process, and reconstruct visual and verbal information. As a teaching tool, the media is expected to provide concrete experiences, motivation to learn, increase student absorption and retention.

One of the learning problems faced is the slow understanding of students towards abstract material, including mathematics. Mathematical character is having an object that is abstract. In the world of education, mathematics is a subject that has an important role [3]. This can be seen from the existence of mathematics subjects at all levels of education from elementary school to tertiary education. In addition, mathematics subjects rank second in terms of the number of hours of instruction at most. However, compared to other subjects, students' interest and learning outcomes in mathematics were always lower.

One of the reasons is that mathematics is considered a difficult and boring subject. Difficulty learning mathematics is one form of students' inability to solve a problem [4]. Learning difficulties cannot be separated from internal and external factors. One of the external factors is incomplete learning media [5].

Based on the results of the description above the writer will make an article entitled "The Development of Interactive Learning Multimedia In Teaching Mathematics (Integer Number) To Junior High School Students".

1.1. Research purpose
Creating an effective and efficient learning program (Multimedia Learning) and in accordance with the applicable curriculum for learning activities.

2. Research methods
The research method used in this research is Research and Development (R&D). Borg and Gall define development research as a process used to develop and validate educational products [6]. The research development procedure has 10 steps [7].

The Puslitjaknov team explained that the development procedure carried out by Borg and Gall can be simplified into 5 steps, these steps are simplified according to the needs of the researcher. This simplification of course refers to the provision of product development in accordance with the steps described by Borg & Gall, this simplification includes 5 main stages, namely [8]:

- Conduct preliminary research.
- Develop the initial product.
- Perform product validation.
- Conduct a trial run.
- Create the final product.

The population and sample used in this study were all students of class VII SMPN Tarogong Kidul.

2.1. Model development planning
In this study in broad outline, the procedure of developing Multimedia learning includes two stages, namely developing a media script and developing a multimedia learning product. In developing a multimedia learning script using a development model adapted from the Arif S. Sadiman procedural model and developing a multimedia learning product using the development model proposed by J. Moonen [9] at the third stage (development and implementation as well as evaluation and revision). The development procedure can be described as follows:
The steps to develop a multimedia learning script using a development model adapted from Arief S. Sadiman's procedural model, as follows:

2.1.1. Identification of needs. The first step taken by developers in developing the multimedia learning script is identifying needs through a preliminary study in the following way:

- Observation. At the school, both in implementation and examination of the results of the evaluation, as well as observations of the facilities and facilities owned by the school concerned.

2.1.2. Formulate instructional objectives. After identifying the needs, the next step is to formulate instructional goals. The purpose is a reference in developing a learning media, therefore the developer formulates a goal that will be used as a reference in producing multimedia learning so that its use can run effectively and efficiently.

2.1.3. Formulate items about learning material. Based on the formulation of the objectives that have been developed, the next step is to formulate the items to be developed in a multimedia learning script so that the production process of multimedia learning becomes smooth. In formulating the items the developer consulted with the material experts for the selection of items to be presented in the learning activities using multimedia learning [10].

The steps of the production of multimedia learning are as follows:

- Design Stage
  - Determine the presentation format
  - Analysis of material content
  - Make flowcharts and storyboards

- Development Stage. The sequence of making these media in general is the development of the initial design, and making a few buttons / buttons needed. Next is the stage of creating content which is of course in accordance with the existing storyboard.

- Implementation Stage. At the implementation stage, multimedia learning results are tested and used in classroom learning activities involving teachers and students.
Evaluation and Revision Phase. The evaluation phase is divided into three stages, namely: (a) the multimedia learning technical test (b) formative evaluation, and (c) summative evaluation [11,12]. Technical tests are conducted before multimedia learning is developed and implemented in schools. Technical tests include the suitability of the media with the curriculum and student learning needs. This technical test is carried out by researchers when at the beginning will examine it. Formative evaluation is carried out to provide input to researchers whether the developed multimedia learning is in accordance with the design and learning objectives that have been set previously. Formative evaluation is done by asking the opinion of the teacher concerned, media experts and students themselves as users of this multimedia learning user. To try out this multimedia learning that has been developed, several stages are carried out, namely [5]: expert judgment (expert judgment), one to one evaluation, small group, and field tests (1 class). Summative evaluations are conducted when the multimedia learning program is fully completed and has been used by teachers and students. The purpose of this summative evaluation is to find out the impact educative from the media.

3. Results and discussion

3.1. The stages of the research results
Stage of conducting preliminary research:
- Analysis of learning media needs. The analysis of learning media needs is used as reference data for media development.
- Analysis of student characteristics needs. Student Characteristics Needs Analysis was carried out to determine the obstacles faced by students.

3.2. Initial product development stage
The stages of multimedia design for learning Arabic include:
- Flowchart design.
- Interface design.
- Create a storyboard.

3.3. Validation stage and product revision
- Product validation by media experts.
- Product revision.
- Product validation by material experts.
- Product revision.

3.4. Trial phase
- Small-scale field trials.
- Product revision.
- Large-scale field trials.

3.5. Final product manufacturing
The results of the feasibility of multimedia learning in Mathematics at SMP 2 Tarogong Kidul can be concluded as follows:
- Assessment from media experts gets a score of 92% in the Very Appropriate category,
- The assessment from material experts gets a score of 93% in the Very Appropriate category,
- The functional suitability test shows that multimedia learning can function properly,
- Portability testing shows that multimedia learning can be run on different versions of Windows,
• Usability testing data generated from small-scale trials get a score of 80% in the Eligible category, and large-scale trials get 89% in the Very Appropriate category.

4. Conclusion

Based on the findings and discussion that have been described, it can be concluded, The development of multimedia learning in Mathematics refers to the development model of Arief Sadiman and J. Moonen which is simplified into 5 steps, namely (1) conducting preliminary research, (2) developing initial products, (3) conducting product validations, (4) conducting trials, (5) make the final product.

The results of the feasibility of multimedia learning in Mathematics in class VII SMPN 2 Tarogong Kidul based on the results of the analysis can be concluded as follows:

• Assessment from media experts gets a score of 92% in the Very Appropriate category,
• The assessment from material experts gets a score of 93% in the Very Appropriate category,
• The functional suitability test shows that multimedia learning can function properly,
• Portability testing shows that multimedia learning can be run on different versions of Windows.

Usability testing of data generated from small-scale trials got a score of 80% in the Eligible category, and large-scale trials got 89% in the Very Eligible category.

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