Developing mathematics video assisted by powtoon application in contextual learning approach

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Abstract. The purpose of this research and development was to develop an instructional media assisted by PowToon application in a contextual learning approach on statistical material for eighth-grade students of SMP Muhammadiyah 1 Kalianda and MTs Negeri 1 Bandar Lampung. The study was conducted to test the feasibility and attractiveness of the developed learning media. ADDIE model was used as the development model (Analyze, Design, Development, Implementation, and Evaluation). The developed media was categorized as feasible based on media and material expert validation. Sixty respondents on a small scale and large scale trials stated that the developed learning media was very interesting with the obtained percentage of 87%. It can be concluded that the developed media produced good results in its implementation.

Keyword: Contextual Learning, Learning Video, PowToon

1. Introduction

Indonesia is one of the countries that prioritize the importance of education for the advancement of its society [1]. Education, knowledge, abilities, and high human resources have become a shield to survive and compete in the modern era to overcome poverty [2]. A subject that has an important role in education is mathematics [3]. This statement is supported by the learning hours of mathematics subjects that are more than any other subject, as well as one of the subjects that are used as the standard tested to enter the next level of education [4]. Mathematics education plays an important role in the development of science and technology [5]. Innovation is needed in the world of education to keep pace with the rapid development of technology, one of which is by developing technology-based learning media [6]. In solving various educational problems, technology is needed because education is an activity with broad dimensions, complex, and affect many variables [7].

Currently, media is widely used in the educational process as an intermediary to increase efficiency and effectiveness in achieving learning goals [8]. Learning media is anything that can be used as a means of conveying messages from the sender to the recipient so that it can stimulate feelings, thoughts, attention, and interests as well as abilities in such a way as to achieve learning objectives effectively [9]. One of the learning media that can take advantage of technology is learning media in the form of video. Video is a non-printed teaching material that is complete and rich in information because it is delivered directly to the participants so that the retention of the learning material increases significantly through hearing and sight [10]. The advantages of video as a learning medium
are being able to attract attention for short periods, save time, able to observe moving objects more closely, and clarify the delivery of messages so that they are not too verbalizes (in written, verbal, or verbal form) [11]. In making learning videos, researchers used the PowToon application. PowToon is a fun software because it supports animations [12]. PowToon is one of the ideal applications for teachers to present their material [13]. This is because PowToon is interactive, covers all aspects of the senses, practical, can be used in large groups, can provide feedback between teachers and students, can be used whenever and wherever independently, and can produce products that have high-quality animations, sounds, and images [14]. PowToon can present material with unique, varied, and fun presentations based on the imagination, substance, communication power, and creativity of teachers. The information from the material is easy to remember [15]. The researchers used the contextual approach in compiling instructional videos. The contextual approach is a learning concept that helps teachers in correlating the concept of the material with real-life. It influences students to create a relationship between their knowledge and their application in everyday life [16]. Students who get a contextual approach have better understanding results than those who apply another approach [17].

Based on the results of needs analysis, many students experienced difficulties in learning mathematics. Teachers in both schools also emphasized that the mathematics teaching materials were lacking, except for printed books specifically on statistics. From the results of the analysis on 57 students regarding the development of mathematics learning videos, it was obtained that the accumulative results of the two schools were 69.93%. Students welcomed and gave positive responses to the development of mathematics learning videos.

Research on the development of interactive learning media had been carried out by Marta Dwi Pangestu and Achmad Ali Wafa in an article entitled "Development of Interactive Multimedia PowToon in Economic Subjects on Monetary Policy for Class XI IPS at SMA Negeri 1 Singosari", then Izomi Awalia, Aan S. Pamungkas, and Trian P. Allamsyah also researched wrote an article entitled "Development of PowToon Animation Learning Media in Mathematics Subject for the students of elementary school". The research shows that the PowToon software obtained good responses from students and is worthy to be used to develop learning media, especially for mathematics subject [21,18]. Based on the results of previous research, the researcher developed instructional videos with the help of the PowToon software with the contextual leaning as the approach to statistics material of mathematics subject. The objectives of this study were developing a mathematics instructional video using PowToon with the contextual learning approach on statistics material and finding out feasible of the developed learning media.

2. Method
The method used in this research was Research and Development. It aims to produce products that can provide effectiveness in learning through needs analysis and product testing [19]. The research and development steps in this study referred to the ADDIE model which consisted of five steps, namely: analysis, design, development, implementation, and evaluation [20]. The ADDIE stages can be seen in Figure 1.
Figure 1. The Development Model

The first stage ADDIE development model was analyzed. At this stage, students were interviewed to analyze their learning needs and material that needed to be developed. At this stage, observations during learning and interviews with teachers were conducted. The data obtained then evaluated and concluded to complete the analysis. The second stage is the design stage focused on four activities, namely selecting materials that are tailored to the characteristics of the students, determining the concepts and strategies, determining the forms and methods of assessment, and evaluating the product based on the results of the validation. The third stage was the development stage where the researcher prepared all the aspects needed to be developed as material such as various kinds of images and background. After the developed product had been completed, the next step was validating the product to the validators, namely material experts and media experts. The last stage was the implementation stage. At this stage, the developed product was tested to find out its application in the learning process. Then, the students filled out a questionnaire regarding the developed learning media. The product testing is composed of two kinds of trials, namely small-scale trials and large-scale trials. The subjects of the small-scale trial consisted of 10 students from each school. The sampling technique used in this study was the simple random sampling technique as practiced in the previous research conducted by Dian Susilowati [21]. Simple Random Sampling is taking a random sample without paying attention to the strata in the population. The results obtained from the small-scale trial were then analyzed so determine whether the developed media was interesting or not. The large-scale trial had been carried out to confirm the data and determine the attractiveness and effectiveness of the product in a broad sense. The subjects of the large-scale trial consisted of one class from each school with a total number of 40 students. A questionnaire had been distributed to determine the response of students toward the developed learning videos. The trials were aimed to obtain information regarding the developed learning media.

The data in this study were obtained through interview and questionnaire instruments. The questionnaire was used to analyze the needs and responses of students to the development of mathematics learning videos assisted by the PowToon application with the contextual approach. The questionnaire instrument employed the Likert scale with four answer choices. The material expert validator questionnaire was used to collect data regarding the feasibility of content, presentation, and implementation. The media expert validator questionnaire instrument was used to collect data about video quality, video design, and video display.

The qualitative data analysis was done based on the results of observations and interviews while the quantitative data analysis was done based on the validation results and trials.
2.1 Expert Validation Data Analysis
The data for expert validation had been obtained from the questionnaires related to the feasibility of the content, material, and the harmony of the video design.

2.2 Product Trial Analysis
The questionnaire had been filled by the students. Each statement of the questionnaire had different scores based on the suitability of the product to each user.

3. Results and Discussion
This research and development produced a teaching media in the form of statistics learning videos. The following are the data obtained from five stages of development.

3.1 Analysis Stage
The results of the needs analysis served as the preliminary data for the development of mathematics learning videos assisted by the PowToon application. The needs analysis data had been obtained from the results of interviews and questionnaires.

3.1.1 Requirements Analysis
Teaching material is very important in every learning process. The existence of instructional materials is needed for fluency in the teaching and learning process. Video is very flexible and easy to use media. Learning video is needed in the learning process because one of the characteristics of learning video is that it can attract students' learning interest, especially animated videos. Learning videos make it very easy for students to learn in class or independent learning. The material presented in the video can also make it easier for students to learn independently without asking repeatedly to the teacher because it can be repeated from any part. Not only the material presented in the video, to facilitate students' understanding of statistics material, and to work on any form of problems, the developed media had been provided with examples of problems consisted of regular questions, HOTS questions, and National Examination Questions.

3.1.2 Analysis of Student Characteristics
Based on the interview and questionnaire, the students had difficulty in understanding statistical material and the learning was teacher-centered. Mathematics learning videos with animation can make students more interested in learning and can be used for independent learning. Teachers needed media that can connect learning material with real-life so that students could better understand the material.

Based on the results of the analysis of students' needs and characteristics, the researcher developed the mathematics learning video-assisted by the PowToon application with the contextual approach. The learning video aimed to overcome existing problems so that students can learn more easily and fun because the material presented in the video can foster curiosity and enthusiasm in the learning process.

3.2 Design Stage
After the results of the analysis had been obtained, the next stage was the design stage. The design stage consisted of the following steps:

3.2.1 Selection of Teaching and Learning Materials
The learning material contained in the developed media had been connected to real-life problems. It had been designed to be flexible and can be used independently since it can be used anywhere and whenever. The material discussed in the developed media was statistics because students found it difficult to understand and work on the questions.
3.2.2 Initial design
The videos had been made with the PowToon application assisted by the Filmora application. The contents of the initial design consisted of cover, Al-Qur'an verses, a brief introduction of the identity of the author, the title of the material, learning objectives, greetings, the contents of the material, sample questions (regular, HOTS, national exam), and discussion of questions.

At this stage, the developed video was revised because the contents were too simple. Thus, the contextual learning approach was added.

3.2.3 Designing an Assessment Instrument
The developed product had been evaluated by the media experts and material experts based on each aspect of the evaluation questionnaires.

After the experts had finished validating the product, then the trials were conducted to students. The learning video quality assessment instrument was in the form of checklist questionnaires aimed given to the material experts, media experts, and students. The initial step of the assessment instruments design was the preparation of the questionnaires’ specifications. Furthermore, the questionnaire was given to the experts to find out the quality of the learning video. It was also distributed to students to find out their responses.

3.3 Development Stage
At this stage, the learning videos were developed based on the design at the design stage. This stage consisted of the following steps:

3.3.1 Media Development
The activities at this stage were selecting the material, choosing the avatar, image, symbol, back sound music, and recording the sound to be inserted in the explanation of the material.
3.3.2 Media Validation
The experts who validated the developed videos were those who are experienced in their field and had a master's degree. The following are the results of the validation.

3.3.2.1 Material Expert Validation
The validation by the material experts was conducted by two lecturers who were experts in their fields. They were a mathematics education lecturer at UIN Raden Intan Lampung and a mathematics teacher at MTs Negeri 1 Bandar Lampung. The assessed aspects of material validation were the appropriateness of the content, the appropriateness of the presentation, and the feasibility. The results of the validation are presented in figure 6.

Based on figure 6, the average presentation of each aspect in the second stage was higher than in the first stage. The content aspect increased from 84% to 87% in the highest feasible category. The presentation aspect increased from 80% to 85% in the highest feasible category. The implementation aspect increased from 80% to 87% in the highest feasible category. Overall, the developed videos were in the highest feasible category and can be applied in the field.

3.3.2.2 Media Expert Validation
Media experts assessed the video quality, video design, and video display. The experts who validated the developed videos were a lecturer of Mathematics Education of UIN Raden Intan Lampung and a mathematics teacher at SMP Muhammadiyah 1 Kalianda.

The comparison between the first stage and the second stage of validation can be seen in figure 7:
Based on Figure 7, the aspect of video quality in the first stage obtained a percentage of 90% with a highly feasible category and in the second stage, it obtained a percentage of 94% with a highly feasible category. In the aspect of video design in the first stage, an average value obtained was 81% with a highly feasible category, and in the second stage, it obtained an average value of 85% with a highly feasible category. The aspects of the video display in the first stage obtained an average value of 77% with a highly feasible category and in the second stage; it obtained an average value of 84% with a highly feasible category. Therefore, the developed videos had been declared feasible and valid and do not need to be revised.

3.3.3 Product Revision
The suggestions for improvement from the validators were as follows.

3.3.3.1 Suggestions for Improvement from the Material Experts
The developed videos were lacking in terms of the completeness of the presentation. The material should be divided into three parts (single data mean, table data mean, and mean combined data). It was also lacking in the presentation of media material that it should be divided into two parts (even data and odd data). Add descriptions to the formula, the questions were less varied, and the duration of video part 3 (mean) was too long. It should be made more concise without reducing the purpose and the learning objectives.

3.3.3.2 Suggestions for Improvement from the Media Expert
The layout of the avatar was not right and the back-sound volume in the opening should be turned down.

3.4 Implementation Stage
After the media had been validated and revised, the next step was the implementation by testing the learning media to one class from the two schools. The classes were selected using simple random sampling and the results of discussions with mathematics teachers from each school. The indicators for assessing the attractiveness consisted of the display, ease of use, language, practicality, usefulness, and response. Here are the results of small-scale and large-scale trials.

3.4.1 Small-Scale Trial
The subjects consisted of 10 students from class VIII G of MTs Negeri 1 Bandar Lampung. To find out the attractiveness, the videos were sent as well as the Zoho form link to find out students’ responses. The following is the small-scale trial data analysis:

| No | Respondent’s Name | Score obtained | Maximum Score | Final Score |
|----|-------------------|----------------|---------------|-------------|
| 1  | R.1               | 68             |               | 71%         |
| 2  | R.2               | 74             |               | 82%         |
| 3  | R.3               | 88             |               | 98%         |
| 4  | R.4               | 84             |               | 93%         |
| 5  | R.5               | 70             | 90            | 78%         |
| 6  | R.6               | 74             |               | 82%         |
| 7  | R.7               | 84             |               | 98%         |
| 8  | R.8               | 77             |               | 86%         |
Based on the result of the trial, the developed product was appropriate to be used with an average percentage of 82% in the very interesting category.

## 3.4.2 Large-Scale Trial

After conducting a small-scale trial, a large-scale trial was then conducted to 20 students of class VIII G of MTs Negeri 1 Bandar Lampung. The following is the large-scale trial data analysis:

### Table 3. Large-Scale Trial Results of MTs Negeri 1 Bandar Lampung

| No | Respondent’s Name | Score obtained | Maximum Score | Final Score |
|----|-------------------|----------------|---------------|-------------|
| 1  | R.1               | 83             |               | 92%         |
| 2  | R.2               | 82             |               | 91%         |
| 3  | R.3               | 82             |               | 91%         |
| 4  | R.4               | 89             |               | 91%         |
| 5  | R.5               | 84             |               | 93%         |
| 6  | R.6               | 76             |               | 84%         |
The trial obtained an average percentage of 90% in a very interesting category. The researchers also conducted a large-scale trial in class VIII A of SMP Muhammadiyah 1 Kalianda. The results can be seen in table 4.

Table 4. Large-Scale Trial Results of SMP Muhammadiyah 1 Kalianda.
The trial obtained an average percentage of 89% in a very interesting category.

3.5 Evaluation Stage
The evaluations were based on the analysis of students' needs, preparation of designs, validity, and the attractiveness of products. It can be categorized as appropriate teaching material and are suitable to be applied in learning. The purpose of the evaluation stage was to review the activities of each stage to produce an even better product.

3.5.1 Product Strength of the Developed Products
The developed media had been presented with animations that support the material so that it could help the students to understand the content of the material. The learning materials were related to daily-life. It had been equipped with three types of sample problems (regular questions, HOTS, and national exam questions). This media is very flexible and efficient because it can be an independent learning material.

3.5.2 The weaknesses of the developed Product
The material had been constructed specifically for junior high school statistics. It requires an LCD projector for in-class learning. For out of the class use, students need to copy it into their laptops or Android devices which require internet connection.

The developed learning media are considered feasible and interesting because it uses the PowToon application with the contextual approach as the basis. The material is easy for students to understand because students who get a contextual learning approach have a better understanding than the regular approach [17]. This is relevant to the explanation proposed by Martha Dwi Pangestu and Achmad Ali Wafa in their research that the videos produced by the PowToon in the form of animation, music, and sound dubbing can make students more motivated and enthusiastic [22]. It is also in line with the explanation from Izomi Awalia, Aan S. Pamungkas, and Trian P. Alamsyah in their research. They explained that the learning media presented in the form of video can provide long-term memory to students because it is displayed in the animated format. Media in the form of videos has the potential to be preferred by students. This is because, through video, students can imagine and watch what is displayed during video playback. Therefore, the existence of learning videos can make students easily understand the learning objectives to be achieved [18].

4 Conclusions and Suggestions
Based on the results of the research and discussion, the learning video developed with the ADDIE development model had been declared feasible and interesting. The product's feasibility can be seen based on expert validation. The material and media experts stated that the developed product was valid and feasible. The attractiveness of the product can be seen from the students' responses to the small-scale and large-scale trials. The developed media was considered very interesting. Thus, the mathematics learning video assisted by the PowToon application with the contextual approach is
appropriate to be used in the learning process. Based on the research, several suggestions can be made, namely, the developed media can be further improved and refined to produce higher quality products. The developed learning media needs to be developed for other materials by adjusting the needs in the field so that learning activities can take place effectively and attractively. The trials can be conducted with different research subjects.

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