Development of sparkol videoscribe on mathematical representation

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Abstract. This research aims to develop sparkol videoscribe based animation videos on mathematical representation. This research and development use the ADDIE development model (analysis, design, development, implementation, evaluation). This animated video was validated by education experts and media experts, then limited testing was carried out on junior high school students. The results showed that sparkol videoscribe based animation video is a mathematics learning media that has been validated and gets positive responses from students so that it can be used in the process of learning mathematics. Also, the test results of students after learning to use sparkol videoscribe based video animation showed that as many as 7 students obtained a percentage of 28% with incomplete categories, while for 18 students obtained a percentage of 72% with complete categories. Therefore, sparkol videoscribe based animation videos provide good learning outcomes for students' mathematical representation capabilities as seen from the percentage of students in achieving a KKM value of 72% with effective criteria.

1. Introduction
In the world of education the use of technology is an effort to be creative and systematic in creating student learning experiences so that in the end it will produce quality graduates [1]. Like the use of interactive multimedia applications or media in learning mathematics which is one form of innovation (product technology) in education [2]. Creative use of media will increase the likelihood of students learning more, understanding what is taught better, and increasing performance in applying skills by learning objectives [3]. One of the media that can be used for learning is Sparkol VideoScribe. Sparkol videoscribe is one of the learning media that can present an interesting mix of images, sound, and design in learning content to attract students' attention and interest in the learning process [4]. The features that have been provided by sparkol videoscribe are very diverse so that they can become learning media that are tailored to the characteristics of children and learning goals. Also, users can create animation designs, graphics, and drawings that suit learning needs and then import them into the software [5]. The use of animated videos in mathematics learning is a factor that can improve students' mathematical abilities [6]. One important mathematical ability to be improved by students is the ability of mathematical representation.

Representation is something that cannot be separated in mathematics learning. According to NCTM, a set of five standard processes must be mastered by students such as representation. Mathematics needs representation because one can get mathematical ideas that one of them is through representation [7].
The need for mathematical representation because mathematical representation is essential for students to find out and build a means or thinking path in communicating mathematical constructs from an abstract concept into a concrete one, so it is easily understood [8]. Therefore, the ability of mathematical representation is one of the abilities that are very important for students to have. However, in reality, students' mathematical representation ability is still relatively low. Based on the results of research by The Trend in International Mathematics and Science Study (TIMSS) in 2015, Indonesia is far below the international average by getting a ranking of 46 out of 51 countries with a score of 379, the low student mathematics learning outcomes are related to the low ability of students' mathematical representation [9]. Also, based on information from one of the eighth-grade junior high school teachers in the Bekasi Regency, it is known that students' understanding of mathematical representation is still relatively low. One of the factors is because students lack motivation and interest in learning mathematics which affects students when the learning process takes place. This is also shown from the relatively low-grade VIII student test scores on mathematical representation indicators such as visual, symbolic, and verbal representations, where most students have grades below average or even incomplete.

The existence of the problems faced by the students mentioned above must be done by learning innovations conducted by educators. One of them is utilizing technological developments, namely by using animated videos when learning mathematics. The use of media in the form of animated videos developed using sparkol videoscribe software can be an effective way to enrich student learning experiences in class. Videos can be used to spark discussion, complete key concepts, provide real-life examples, and show problem-solving. With sparkol videoscribe, we can present long, concise, and meaningful material with more varied learning [10]. The presentation of mathematical material with an attractive appearance is expected to be able to attract students' interest in learning mathematics [11]. Because the learning process grows more interesting and becomes more interactive when student-friendly media is used [12]. Based on the explanation above, the purpose of this study is to develop sparkol videoscribe based video animation in mathematical representation.

2. Methods
This type of research uses Research and Development (R&D) research with the development model as the reference in this study is the ADDIE model. The ADDIE model consists of analysis, design, development, implementation, and evaluation. In this study, the data collected was qualitative data and quantitative data. The data collection techniques in this study used a validation questionnaire for media and material experts, limited trials, and mathematical representation ability tests.

3. Results and discussion
Based on the research results of the development of the Research and Development (R&D) method with the ADDIE development model consisting of five stages, namely analysis, design, development, implementation, and evaluation as follows:

3.1. Discussion of analysis result
Based on observations made in one junior high school in Bekasi Regency, the curriculum used in one of the junior high schools in the Bekasi Regency refers to the 2013 revised 2017 curriculum, in the 2013 curriculum which has been revised Pythagorean theorem material taught in the second semester of eighth grade. Students who are made into research have low mathematical representation abilities in visual, symbolic, and verbal representations based on initial tests conducted by researchers. Also, based on an interview with one of the eighth-grade students, it was stated that in learning the students paid less attention to the teacher because the learning undertaken did not attract students' attention. In these schools, the use of instructional media in the form of animated videos has never been used when learning mathematics, even though the facilities and infrastructure owned by the school are quite adequate, such as the presence of infocus, laptops, and speakers which if properly utilized can make learning effective and innovative.
3.2. Discussion of design result
The design used is multimedia-based. Multimedia-based design is a method developed from the design of filmmaking using storyboards. A storyboard is a description of each scene (display), by including all multimedia elements such as animation, text, images, and videos [13]. The storyboard developed for this research is shown in Table 1 below:

| SCENE   | VISUAL                               | AUDIO                                | PICTURE                                    |
|---------|--------------------------------------|--------------------------------------|--------------------------------------------|
| 1 Intro | Matematika SMP 8th grade Semester 2  | Instrumental Music                   | The Logo                                   |
| 2 Subject | Theorem Pythagoras                  | Instrumental Music                   | The Logo                                   |
| 3 Indicator | Indicator TEKS                        | Instrumental Music & editor’s voice | The Logo                                   |
| 4 Material benefits | The Benefits TEKS                   | Instrumental Music & editor’s voice | The Logo                                   |
| 5 Theory | History TEKS                          | Editor’s voice                       | Picture of Pythagoras and the right triangle |
| 6 Theory | Proof of Theorem Pythagoras TEKS     | Editor’s voice                       | Picture of a square and the right triangle |
| 7 Theory | How to determine the sides of a right triangle TEKS | Editor’s voice | Picture of the right triangle |
| 8 Example | Example of theorem Pythagoras        | Editor’s voice                       | Picture of the right triangle |
| 9 Exercises | Exercises of theorem Pythagoras      | Editor’s voice                       | Picture of the right triangle |
| 10 Closing | Motivation                           | Instrumental Music & editor’s voice | -                                          |

(Modification of Kariadinata (2007))

3.3. Discussion of development result
At this stage, the researcher continues to make media based on the storyboards that have been made. The first stage is to collect teaching material to be displayed in the learning video, the second stage is to collect multimedia elements that will be used, such as pictures, sounds, and composing text. After everything is ready, then proceed with the editing process on sparkol videoscribe and finally the refinement/revision. Revisions were made to the contents, methods, presentations, illustrations, and others. The following is a partial description of the animation video developed.
Figure 1 and Figure 2 is a preliminary display on the animated video that has been developed, there are also achievement indicators on the animated video.

Figure 3 and Figure 4 are some examples of the core display of animated videos that have been developed.

Also, there are examples of questions seen in Figure 5 and practice questions in Figure 6 that are displayed in the animated video.

Figure 7 and Figure 8 are the closing part of the developed animation video, which are motivational words for students and references.

Animation videos based on sparkol videoscribe that have been developed must be tested in advance by a competent validator by their fields in terms of both material and media. The following are the results of the validation of material experts and media experts to sparkol videoscribe based animation videos.
Table 2. Result of media expert judgment.

| No | Media Expert | Aspect  | Score | Max | %   | Criteria         |
|----|--------------|---------|-------|-----|-----|------------------|
| 1. | Expert 1     | Display | 28    | 30  | 93.33| Very Valid       |
|    |              | Program | 21    | 25  | 84.00| Very Valid       |
| 2. | Expert 2     | Display | 26    | 30  | 86.66| Very Valid       |
|    |              | Program | 23    | 25  | 92.00| Very Valid       |

Table 3. Result of material expert judgment.

| No | Material Expert | Aspect | Score | Max | %    | Criteria         |
|----|-----------------|--------|-------|-----|------|------------------|
| 1. | Expert 3        | Material | 33   | 35  | 94.28| Very Valid       |
| 2. | Expert 4        | Material | 34   | 35  | 97.14| Very Valid       |

Based on the results of the validity test conducted by material and media experts, the experts stated that the animated video developed was very valid so that it was suitable for use in mathematics learning.

3.4. Discussion of implementation result

Sparkol videoscribe based video animation that has been developed and declared worthy of testing by the validator (material expert and media expert lecturer) was subsequently tested on several students in one of the junior high schools in Kab. Bekasi then conducted interviews with several students. The results of interviews with 6 junior high school students who took part in a limited trial showed that students enjoyed learning mathematics through the animated videos that researchers gave during the trial. Students like and give positive opinions on the video animation provided, although there are some disadvantages such as students sometimes have difficulty watching animated videos at home if they do not have internet access to learn them again on YouTube, then the questions given are still few.

Animated videos that have been tested on a limited basis, are then given to students with more students to see the effectiveness of animated videos on students’ mathematical representation abilities. Animated videos are said to be effective if the percentage of student’s completeness reaches 51%. The following data are student learning outcomes.

Table 4. Student test result.

| No | Score | Category   | Frequency | Percentage % |
|----|-------|------------|-----------|--------------|
| 1. | 0−72  | Not Complete | 7         | 28%          |
| 2. | 73−100| Complete    | 18        | 72%          |

Based on Table 4, the test results of students after learning to use sparkol videoscribe based video animation showed that as many as 7 students obtained a percentage of 28% with incomplete categories, while for 18 students obtained a percentage of 72% with complete categories, the KKM value is 72 which has effective criteria meaning that the use of animated videos in mathematics learning can provide good learning outcomes on students’ mathematical representation abilities.

3.5. Discussion of evaluation result

Based on student interviews on animated videos, there are several advantages and disadvantages to the video that has been developed. The advantages of this video are (1) this video can be viewed through cellphones, computers, and laptops that have video player applications, (2) animated video can be used as a medium of independent learning, which means students can use it anytime and anywhere, so it is very flexible. (3) This animated video is equipped with interesting animations, so that it can attract the attention of students, and (4) The use of learning videos is also very easy to do. The disadvantages of this video are (1) If you do not have a video privately, then this video can be accessed via YouTube which requires internet access when accessing the video, and (2) The material and questions provided in the video are limited, so more learning resources are needed to further deepen the material.
Furthermore, this sparkol videoscribe based animation video has a very validity level and affect student learning outcomes towards mathematical representation abilities. So it can be concluded that the video animation for learning mathematics is feasible to be used by students.

4. Conclusion
The process of developing sparkol videoscribe based animation videos with the ADDIE model passed well to produce a product that is suitable for use in learning mathematics in school. Based on the results of the validation test conducted by material and media experts, the experts stated that the animated video developed was very valid so that it was appropriate to be used for mathematics learning and received positive comments from students about the animation video used during learning. Then, sparkol videoscribe based video animation gives good learning outcomes towards the mathematical representation ability of students as seen from the percentage of students in achieving a KKM value of 72% with effective criteria.

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