Application of animation video to improve student learning outcomes in estimating construction costs

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Abstract. This research was conducted to improve student learning outcomes in Estimated Construction Costs at SMK Negeri 2 Garut which is still low. The low student learning outcomes may be caused by the learning process that always used static visual learning media. Thus, in this study dynamic visual application in the form of animated video is considered to be able to provide a more concrete understanding to students when compared to static visuals. The research method used in this study was the R&D method with quantitative approach, one group pretest-posttest pre-experiment. The results showed that the animation video was valid with a validation value of 88.33% by the content expert and 97.92% by the media expert that falls under very valid criteria and could be used without revision. In addition, the response of 6 students during a small-scale trial was 82.41% that falls under very good criteria. In the large-scale trial phase with 30 respondents, the animated videos application get an average score of 80.61% that falls under very good criteria. However, student’s learning outcomes after the implementation of animated videos application have enhanced, which are classified as low criteria. This can be seen from the value of N-Gain produced which is equal to 0.14.

1. Introduction
Building Modeling and Information Design is one of the study programs in Garut 2 Vocational High School. It learns about a variety of jobs in the field of construction and building design with graduates who are expected to be immediately ready to work. One way to prepare students to be ready to work after graduation is by studying the Construction Cost Estimation subject. However, based on the results of unstructured interviews conducted to the Chairwoman of the Building Modeling and Information Design Study Program is known that the Construction Cost Estimation subject was difficult for students to understand. This can be seen from the data of student learning outcomes that are low on the Mid-Semester Evenness Assessment exam in the Construction Cost Estimation subject. The average value of class XI-1 students is 65, class XI-2 is 33 and class XI-3 is 30. The learning process used in the Construction Cost Estimation subject is static visuals in the form of worksheets and explanations using blackboards, and use the lecture method. Thus, in this study the researchers tried to apply animated videos to provide variations in the learning media in an effort to improve student learning outcomes.

Based on the results of various studies it is known that dynamic visuals or animated videos have a better level of cognitive understanding compared to static visuals [1-4]. In addition, the cone theory of experience discovered by Edgar Dale in 1946 shows that information obtained through direct experience on the basis of the cone is able to present learning experiences more concretely and at the top of the
cone presents more abstract direct experiences [5]. Based on the cone theory of the experience, it is known that animated video is more basic compared to static visuals with the level of information obtained more concrete. This can be seen from the ability of animated videos that can display moving images with 3-dimensional shapes that resemble the original form. In addition, animated video can stimulate the students' sense of hearing by providing additional audio in the video. According to Artawan video animation can also make it easier for teachers to present complex information, reduce large images or enlarge small images according to needs, attract students' attention and be independent [6]. The strengths of the animated video are what underlies researchers to apply animated video to the subject of Estimated Construction Costs.

2. Method
Application of animated video to improve student learning outcomes in the Construction Cost Estimation subject using the quantitative R&D method of one group pretest-posttest pre-experiment. The instruments used in this study were pre-test and post-test questions, interviews and response questionnaires. Interviews are only conducted to take preliminary data, while the questionnaire is given to experts to test the feasibility of animated videos, in addition to the pre-test and post-test questions and response questionnaires are given to students in the process of conducting research. In this study, the animation video was tested for feasibility with several stages. At the validation stage the animated video will be validated by media experts and material experts who are then revised. After that, the media was tried out to a limited sample of 6 people to take data in the form of responses to the application of animated videos. Then, the media was revised again and then continued with the application of animated videos on a sample with a larger scale with a total of 30 students to see an increase in learning outcomes and student responses to animated videos.

3. Results and discussion
Video animation in this study, has been developed and implemented in accordance with R&D research procedures and has met the validity of the media in accordance with the validity criteria with the results given by material experts at 88.33% and media experts who have done two validations with the first validation values at 89.58% and the second validation at 97.92%. Then, based on these results, validity entering the criteria is very valid and can be used without revision. In addition, the response to the limited trial of the application of animated videos get results with an average value of 82.41% with very good criteria. The results of student responses based on aspects and indicators show that in the material aspects, animated videos have clarity and ease of delivery. In addition, the audio visual aspect that is displayed is interesting, clear, appropriate, and easy to use and display animated video. Meanwhile, in the aspect of language students strongly agree if the animated video displays the language simply and clearly. After taking responses on a trial with a small scale sample, the study continued with the application of video animation on a large scale with 30 students with the following student learning outcomes.

| No Resp. | Pre-Test Score (X1) | Post – Test Score (X2) | Gain (X2-X1) |
|----------|---------------------|------------------------|--------------|
| 1        | 29.41               | 47.06                  | 17.65        |
| 2        | 70.59               | 70.59                  | 0.00         |
| 3        | 35.29               | 29.41                  | -5.88        |
| 4        | 47.06               | 76.47                  | 29.41        |
| 5        | 47.06               | 29.41                  | -17.65       |
| 6        | 35.29               | 35.29                  | 0.00         |
| 7        | 47.06               | 58.82                  | 11.76        |
In this study it is known that an increase in student learning outcomes by using a gain test of 6 children has decreased, 6 children at a fixed value and 18 children have increased learning outcomes. The gain value obtained does not take into consideration the diverse student's initial knowledge, so the gain must be normalized in advance. The result of normalized gain is entering the low category. This can be seen from the results of the N-gain value of 0.14. Although, the N-gain result is low, it is known that the average value of student learning outcomes rose from 56.86 to 62.75. In addition, based on Figure 1 it is known that students with grades above standard minimal score increased from 26.67% to 36.37%. This means that the application of video animation in this study can increase student graduation with grades above standard minimal score by 10%.

![Figure 1. Percentage of Student Learning Outcomes with a value above standard minimal score.](Source: Research Document, 2019)
In this large-scale trial phase, it is also known that students' responses to the application of animated videos with an average value of 80.69% with very good criteria. Based on the results of the response in limited trials and trials widely can be seen that the animated video that is applied to the material aspects has clarity and ease of delivery. In addition, the audio visual aspect that is displayed is interesting, clear, appropriate, and easy to use and display animated video. In the aspect of language students strongly agree if the animated video displays the language simply and clearly. However, there are some students in the comments column who complain if the audio isn't heard clearly.

The low increase in learning outcomes can be caused by several factors such as opinions expressed by Betrancourt and Tversky factors that can cause a low increase in learning outcomes of animated videos compared to static visuals, namely in the process of learning video animation requires the process of practicing understanding of images, other than that Other causative factors can be caused by the characteristics of each student who has a level of understanding of the image, cognitive level, and expertise of different subjects [7]. Based on this opinion, the process of practicing in understanding animation can be done with reinforcement in the form of repetition of animated video playback, in addition to strengthening it can also be done with exercises to train students' cognitive intelligence of the animated video that is displayed. In this study, the question exercises have been given to students during the animation video playback process at the end of the explanation, but this question exercise needs to be added to be able to increase students' understanding of animated videos. In addition, other factors that cause the low increase in student learning outcomes get the same treatment in the application of video animation. This, shows the character of each student in understanding the picture and the different cognitive levels of students influence on student learning outcomes. Student learning outcomes that decline during the post-test can be caused by the type of questions given in the pre-test and post-test is multiple choice. MCQs given using a system with a wrong answer is 0 not a minus. The main concern in this grading system is that students can answer questions correctly through guessing [8,9]. In addition, another thing that can be a factor causing the low student learning outcomes is based on some of the results of the responses of students who think the audio sound from video animation is less clear.

Based on these causative factors, the next research is recommended to use interactive media. Thus, students can further process animation that is learned independently and the media can adjust to the background of different student characteristics, and the audio sound produced can be improved, because the media can be heard and accessed privately. In addition, students can also be more effective in doing exercises to explore the material. The multiple choice practice questions that are given can be turned into a system with incorrect answers given negative values. The basic idea behind this assessment is that students admit they will lose value with wrong answers. In addition, the question exercise can use another alternative model system found by Traub et al by assigning negative values to wrong answers and assigning values to the answers left blank. This is done to avoid students guessing the answers [9].

However, there is one thing that must be considered in the selection and making of media that can affect the improvement of student learning outcomes, namely the weakness of the media itself. Artawan suggests that the weaknesses of animation media require sufficient creativity and skills to design animations that can be effectively used as learning media and require special software to open them [6]. Based on this opinion, then when making animated videos or interactive media instructors must have creativity, skills and a number of applications to create these media. This can be possessed by teachers by conducting training to create media with a variety of supporting applications.

4. Conclusion
Based on the findings and discussion of the application of video animation to improve learning outcomes in the subject of Estimated Construction Costs at SMK Negeri 2 Garut, it can be concluded several points as follows:

- The development of video animation is in accordance with R&D procedures and meets the validity criteria. This can be seen from the results of the validity by material experts and media experts with very valid criteria and can be used without revision.
- Student response is very good. This can be seen from the results of filling out the questionnaire
responses by students, both in limited tests and in the implementation of animation videos with very good criteria.

- Improved learning outcomes after the application of video animation is low. This can be seen from the results of the N-gain value entering the low category. The low learning outcomes can be caused by several factors, namely the characteristics of different students, the cognitive level of students, students need a process to understand images, multiple choice systems that are used and the quality of video animation that is applied.

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