



The Development of Calculating Work Volume Learning Video in the Implementation of Building Construction

Sintya Andryati Nurfitriyani^{1✉}, Rini Kusumawardani², Yeri Sutopo²

¹SMK Negeri 3 Semarang, Indonesia

²Pascasarjana, Universitas Negeri Semarang, Indonesia

Article Info	Abstract
Article History : Received July 2021 Accepted September 2021 Published December 2021	The lack of learning media regarding the Bill of Quantity of Building Construction, Sanitation, and Maintenance reduces students' understanding of the learning material in calculating the work quantity in building construction process. It results in unsatisfactory students learning outcomes. The use of learning media in accordance with technological developments is expected to be a breakthrough to increase the students' interest. This study aims to develop a video-based learning media to calculate the work quantity in building construction and to analyze its effectiveness. The research method used was Research and Development with the ADDIE approach. This study used the intraclass correlation coefficients method assisted by SPSS v.19 software to analyse the adequacy and practicality validation and used the t-test to analyse the effectiveness of the video learning. The results of the development and data analysis of the video learning were stated by the content experts with a score of 4.03 (adequate) and by the media experts with a score of 4.28 (very adequate). From the practical aspect, the learning video was tested by the students with a reproducibility coefficient score of 0.9 (very practical). The data analysis results of the effectiveness test showed that the average N-Gain score for the experiment class was 56.73% (quite effective). The results of the t-test showed a significant difference between before and after using the video learning, with an increasing score of 11.23. Based on the results of the study, it can be concluded that the video learning is very adequate, very practical, and quite effective to increase the students' competence on the work quantity calculation in building construction.
Keywords: media, video learning, quantity, building, construction	

✉ Correspondence :
Jl. Atmodirono No.7a, Wonodri, Kec. Semarang Sel., Kota Semarang,
Jawa Tengah, Indonesia 50242
E-mail: sanurfitriyani@gmail.com

INTRODUCTION

Vocational High School is one of the educational institutions that prepares students with competencies based on the needs of the Business World/Industrial World as well as technological developments in order to produce work-ready graduates. One of the Vocational High School majorities is Engineering that will produce graduates with engineering competence in the form of both services and products.

The Engineering Department of Vocational High School which has the study program of Construction and Property with an expertise of Building Construction, Sanitation, and Maintenance (BCSM), studies the subject of Bill of Quantity for Building Construction, Sanitation, and Maintenance. This subject aims to give students a basic competence in calculating the quantity of work in the process of building construction. It is very important because this material becomes the basic knowledge for making a simple building plan.

The basic competence in calculating the quantity of work in building construction is considered to be a boring topic by the students of class XI BCSM because they always use the same method in learning. It reduces the students' interest in learning the subject of Bill of Quantity for Building Construction, Sanitation, and Maintenance with basic competence in calculating the quantity of work in building construction and of course, it reduces the students' learning outcomes as well. One of the factors that also influence the students' low interest and learning outcomes is conventional learning media such as worksheets which only provides limited understanding. One of the basic materials in building construction is to build river stone foundations.

The use of learning media in accordance with technological developments is expected to be a breakthrough in increasing the students' interest during the learning process on the subject of Bill of Quantity for Building Construction, Sanitation, and Maintenance with the basic competence in calculating the quantity of work in building construction. This learning media will function as a tool to clarify what is taught by the

teacher. The media will also play a role as a learning motivation support which is considered more effective and efficient for the students. In this digital era, the most suitable media for the students are computer-based media, one of which is video and visual simulations to build students' interest in the subject of Building Construction and to clarify the picture of what they will do. This learning media emphasizes on the concept of demonstration learning by the media created.

The learning media used in Vocational High Schools to deliver vocational subjects are printed media in the form of modules and jobsheet. Based on the results of observations and interviews, the printed media used could not trigger students' interest in learning. They feel a lack of interaction during the learning process. Learning using printed media focuses more on explaining the theory presented by the teacher. The delivery of subject matter using printed media is not yet fully student-centered, it makes them experience boredom during the learning. This boredom makes the vocational theory subjects not maximally achieved by the students.

The use of learning strategies is very necessary to facilitate the learning process to achieve optimal results. Without a clear strategy, the learning process will not be well directed. This makes the learning objectives which have been planned before are difficult to achieve optimally. In other words, the learning process cannot run effectively. In addition, learning resources are very important as well. The existence of learning resources has three main objectives, they are to enrich the information needed in compiling teaching materials, to be used by compilers of teaching materials, and to make it easier for students to learn a certain competency. According to the Nation Center for Based Training in Prastowo (2014:16), teaching materials are all forms of materials used to assist teachers or instructors in carrying out the learning process in a classroom.

The learning media should be a tool used by teachers as a means of conveying learning information to students. It plays a role to attract the students' thought, attention and learning interest and it becomes a support for the success of learning objectives. The selection of

appropriate learning media is something that needs to be considered in this case. A good learning media, according to Gerlach and Ely (in Arsyad, 2005:11), is a media that is able to build the condition of students that have knowledge, skills, and attitudes and have visual and verbal abilities in one place.

There have been many studies that reveal the advantages of using video learning as a media in a learning process. Basically, through various methods and learning media, students will be able to interact actively by maximizing all the potential they have, of course the media used in learning process aims to achieve educational goals and learning objectives effectively (Iwan Falahudin, 2014., Muhibuddin Fadhli, 2015., Lina Novita et al, 2019., Dikki Zulfikar et al, 2019., Anik Matus Sholihah, 2018).

Technology is developing rapidly and effectively in every aspect of students' life. Therefore, the video-based learning will facilitate the students learning, especially the one that contains the subject materials that is difficult to understand by the students. The use of additional teaching materials by the teachers during the teaching-learning process will help to improve the students' cognitive and affective qualities and class performance (Rashid, Kadiman, Zulkifli, Selamat, & Hisyam, 2016: 7-17).

Based on the background, the identification of the problem, and the limitation of the study, the statement of problems in this study are how is the development of video learning on Work Quantity Calculation in Building Construction in Class XI BCSM? and

how is the effectiveness of video learning on Work Quantity Calculation in Building Construction in Class XI BCSM?

METHOD

The method used in this study is Research and Development (RnD). It is a research approach used to produce certain products as well as to test the effectiveness of the products (Sugiono: 2010). The development of the learning media is carried out using the ADDIE method. This study aims to develop a product to increase the students' competence in calculating the quantity of work in building construction. This research and development aims to develop and validate a good educational product in the form of learning media that produces an educational product. Sugiyono (2009) stated that to analyze the needs and to test the effectiveness of the product, Research and Development method is used.

One of the R&D procedures developed by Dick and Carry (1996) is the ADDIE development model. According to (Warsita: 2011), ADDIE is a development model based on a system which is effective, dynamic, and supports the procedures of learning media development. Dick and Carry divides the stages of the development model into 5 stages, they are: Analysis, Design, Development, Implementation, and Evaluation. The following is a picture of the five stages of the ADDIE Development Model:

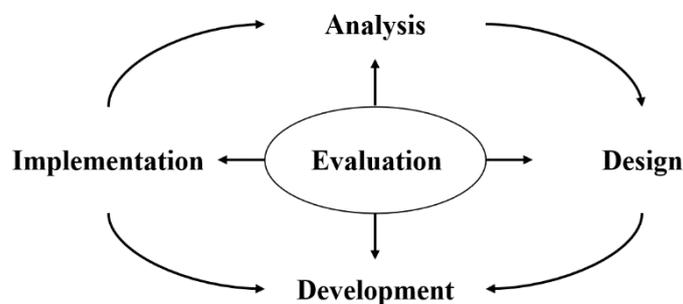


Figure 1. The procedure in developing video learning with the ADDIE approach

The Analysis Stage, the writers gathered information to collect materials for the product development. The information needed at this stage is that students lack understanding of the competence in calculating the quantity of work in building construction, students' needs for the media to be developed, and the content of learning media topics.

The Design stage aims to design the product to be developed. The development steps at the design stage are data collection, flowchart making, and storyboarding.

The Development stage is the stage of producing the product in physical form. There are seven steps in the product development stage as follows: making slides (making initial appearance of the product), mapping (making title pages and contents), database using (entering characters, images, sounds, effects), eventing (giving events or work orders on buttons), testing (testing function event on each slide), publishing (publishing media in the form of SWF), expert test (expert test by content experts and media experts).

The Implementation stage is the trial phase for users after the product has met the adequacy criteria by the expert validators. The implementation stage is used to determine whether or not the use of the developed media increases the student learning outcomes.

The Evaluation stage is the stage of evaluating the learning media that have been used by the students, whether or not it is effective for their classroom learning. It was done by providing the experiment class the final result of the video learning and testing them with pre-test and post-test related to the competence to calculate the quantity of work in building construction.

Sample is a representative or part of a population researched. Population is the entire research subject (Suharsimi Arikunto: 2010). Sample research is a research that draws conclusions as something that applies to the population (Suharsimi Arikunto: 2010). Based on these opinions, the target population in this study is the State Vocational High School 3 Semarang in the field of Building Construction, Sanitation, and Maintenance (BCSM). In this study, the writers collected the data from the teachers who

teach the subject of Bill of Quantity for Building Construction, Sanitation, and Maintenance and from the students in class XI BCSM in the academic year of 2021/2022.

Furthermore, the video learning as the developed media were analyzed for its adequacy, practicality, and effectiveness. The adequacy and practicality analysis done by the experts was carried out to determine the adequacy and practicality of the video learning that has been developed. The adequacy assessment based on table 1 for content experts and table 2 for media experts. The expert assessment criteria to measure the media adequacy aspect used the Learning Object Review Instrument (LORI), Nesbit, et al (2006).

The adequacy test was done by the writers by providing the expert validators with both the video learning and the work sheets as the research instrument to collect the data numerically. To give response of the test, a questionnaire consisting of five choices is used, they are: Very Good (VG), Good (G), Average (A), Poor (P), and Very Poor (VP). It is more representative and it can reach a wider range, faster, and easier in terms of investigation. The adequacy work sheets consist of several aspects and indicators. For the content expert, the worksheet contains content quality, learning goals, accessibility, reusability, feedback and adaptation, and motivation. While for the media expert, the worksheet contains presentation design, interaction usability, accessibility, and reusability. The scoring stage is carried out by calculating the answers based on the score of each choice and applying an outline score measurement system.

For the practical aspect, the video learning as a media in teaching was tested on the students. The media practicality questionnaire contains the ease of media accessibility, the attractive design, and the usefulness of the media learning for the students.

Analisis keefektifan video pembelajaran yang dikembangkan diuji dengan menggunakan Uji t berbantuan *software* SPSS v.19. Analisis ini dipergunakan untuk mengetahui ada tidaknya peningkatan kompetensi peserta didik dalam penggunaan media video pembelajaran, yang dilakukan dengan membandingkan nilai *pre-test*

dan *post-test*. Selanjutnya untuk mengetahui seberapa besar keefektifan media video pembelajaran yang digunakan menggunakan rumus *N-Gain*.

The effectiveness analysis of the video learning was tested using the t-test assisted by SPSS v.19 software. This analysis is used to determine whether there is an increase in students' competence after using the video learning. It was done by comparing the scores of the pre-test and post-test. Furthermore, the *N-Gain* formula was used to find out how much the effectiveness of the learning video.

RESULTS AND DISCUSSION

The Video Learning on Work Quantity Calculation in Building Construction

a. Analysis

Based on the data from pre-research observations, it was found that the analysis of the need to develop appropriate learning media was an analysis of the problems faced by the students which resulted in decreased understanding of competence. This was due to the absence of teaching materials that could attract the students' attention and could make them learning independently as well as the students' needs regarding the media that will be developed. In this case, the students need interesting learning media that can improve their achievement in learning. Besides that, this media learning can also be used by the students to study independently. It contains a complete competency-based package which is arranged systematically and the specific topics to be used as media content. The basic competencies and indicators of the expected achievement of the students are derived from the syllabus in the form of Core Competencies (KI) and Basic Competencies (KD) as an elaboration of the competency standards in the curriculum.

Furthermore, based on the observations results done by the writers, it was found that in understanding the competence to calculate the quantity of work in building construction, the students' understanding are affected by several factors, they were: The media that could not attract the students' attention, the media that can help students to be active during the teaching and

learning activities and can make them learning independently, and the media that can be used anywhere and anytime and can be operated alone without the help of others, and the more practical learning media that can be used by the students.

b. Design

At this stage, the initial stage of media design was carried out according to the needs analysis that had been prepared. Several steps in the design stage, are as follows:

- 1) *Constructing criterion-referenced tests*: At this stage, a benchmark reference test was not prepared to determine the students learning outcomes (pre-test), so the criteria for the instrument outline were drawn up for the purposes of assessing the learning media by the content expert, media expert, and also the students;
- 2) *Media selection*: The media selection was adjusted to the needs of making animated videos and also the final presentation of the media. The media for making three-dimensional animated videos was using the 2014 version of SketchUp with the basic content of an existing three-dimensional low-rise building model. The final presentation was selected using Microsoft Powerpoint software which is easy to operate;
- 3) The finished animation scene was then be exported into a video file format. The next process was the video editing process to add any text/subtitle that will appear on the video screen when it is played. The video that had been added with text/subtitle were saved in .mp4 video format. Here are the specifications and information from the video that was created:
 - a) The format of video file is .mp4
 - b) The video resolution is 1200 x 720p
 - c) The video quality is high quality
- 4) Before making a storyboard for the presentation concept of the animated video, it was necessary to make a flowchart in advance for the learning media presentation to facilitate the media production. Details of the storyboard can be seen in the appendix,

while the following is an image of the flowchart of each video.

- 5) The Initial Design: After the steps above, a media program was compiled based on the storyboard by inserting the videos and materials using Microsoft PowerPoint. To attract interest to the media presentation, it was added with a little narration in several parts such as the introduction and the main menu as well as the addition of music for both the opening and closing. After the editing process had been finished with the Microsoft PowerPoint program such as animated text, images, etc., the initial design of the animated video learning was ready using SketchUp with the content of the method of Bill of Quantity for Building Construction, Sanitation, and Maintenance.

c. Development

This stage aims to see the adequacy of the video learning that have been designed. As a follow-up to the design that has been done in the design stage, the following development steps are as follows:

- 1) Opening, it includes the narrator's words and the video title page. It starts with the subject title and the teacher's name with a duration of 7 seconds.
- 2) Basic Competencies, it is the narrator's delivery of basic competencies that will be discussed containing Basic Competencies 3.2 Analyzing the quantity of work in building construction, and 4.2 Calculating

the quantity of work in building construction with a duration of 17 seconds.

- 3) Learning Objectives, it is the narrator's delivery containing the learning objectives, that is applying how to calculate the quantity of work in building construction with a duration of 10 seconds.
- 4) The Introductory Material, it is the narrator's delivery containing the learning material on Bill of Quantity (BOQ) which will be discussed in this video with a duration of 15 seconds.
- 5) The Needs of Work Building, it is a narrator's delivery of material on the needs of work building which will be discussed in a 44-seconds.
- 6) The Main Components of BOQ, it is the narrator's delivery containing the learning materials for the main components of the Bill of Quantity (BOQ) in building construction which will be discussed in the video with a duration of 1 minute 50 seconds.
- 7) The Work Quantity, it is the narrator's delivery containing the learning materials and examples of calculating the quantity of work in building construction: foundation construction (sand fill, river stone foundations), concrete construction (sloof, columns, and ring beams), and wall construction (grouting) which will be discussed in the video with a duration of 9 minutes.

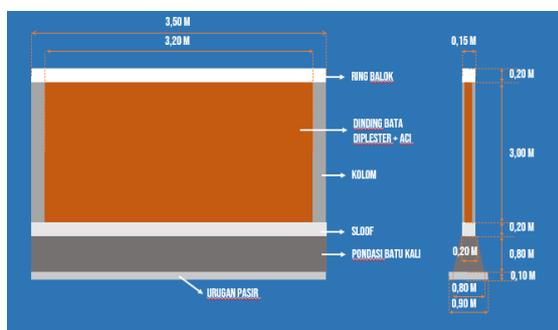


Figure 2. The Discussion Example of Calculating the Quantity of Work

- 8) **The Unit Price of each Quantity**, it is the narrator's delivery containing the learning materials on the unit price of each quantity in building construction which will be discussed in 2 minutes.
- 9) **Evaluation**, it is the narrator's delivery containing the provision of evaluation questions to calculate the work quantity in building construction which will be delivered in the video with a duration of 40 seconds.
- 10) **Closing**, merupakan penyampaian narator berisikan ucapan penutup dengan harapan video pembelajaran dapat menambah wawasan dan ucapan terima kasih. It is the narrator's closing remarks with the hope that the video learning can give students' insight and the narrator's acknowledgement.

d. Implementation

The fourth stage of this research and development with ADDIE model is the implementation stage. This can be done if the results of the expert test (adequacy test) and the practicality test (conducted by the teacher and students) have met the criteria for the adequacy and practicality. The implementation stage is the stage to play the video of the Bill of Quantity for Building Construction, Sanitation, and Maintenance, for the 15 students as the sample from the experiment class of XI BCSM 2. While the 15 students of class BCSM 1 became the sample for the control class so they were not given the treatment in the form of giving learning video of the Bill of Quantity for Building Construction, Sanitation, and Maintenance. The students then filled out the questionnaire to give their responses which could be taken into account to test the effectiveness of the video learning.

- 1) **The Pre-Test for the Experiment Class and Control Class**

The first implementation stage was giving the pre-test to the experiment class and control class which aimed to determine the initial state of the respondents before being given the video learning on the Bill of Quantity for Building Construction, Sanitation, and Maintenance Construction. This pre-test was given once by the

teacher of each study program at the beginning of the study with a questionnaire of 34 questions. The writers assumed that each question could be completed within 1 minute, so it would be 45 minutes to complete all questions in the questionnaire to find out the effectiveness of the learning video. The questionnaire filled out by the students would be directly inputted as the responses, and this result could not be seen or copied by the students.

- 2) **The Implementation**

The implementation stage in this study was done by giving the treatment to the respondents after being given a pre-test. The treatment here was done by providing the students of class XI BCSM 2, as the experiment group, the video learning of Bill of Quantity for Building Construction, Sanitation, and Maintenance. While the students of class XI BCSM 1, as the control group, were not given that treatment.

The video that was given as a treatment was based on the Core Competence and Basic Competence for the Welding Techniques. It was conducted for 2 lessons, meaning that after doing the pre-test, the students were given the treatment twice for 2 meetings before they do the post-test.

- 3) **The Post-Test for the Experiment Class and Control Class**

The last stage in testing the effectiveness of the video was to give the post-test for both the experiment class and the control class. The post-test which was in the form of questionnaire was given after the respondents had done with the pre-test before. This pre-test was given 1 time to both the experiment class that had been given treatment and the control class that was not given any treatment. The question items in the post-test are the same as the questionnaires in the pre-test items. The aim is to find out the final result of comparing the experiment class that was given video and the control class that was not given video.

e. Evaluation

The last stage in this research and development is the evaluation stage. At this stage, an improvement will be made for a better system

by processing the data from the previous stages. This evaluation was done after the four previous stages in the ADDIE model had been completed.

1) Formative Evaluation

This formative evaluation stage aims to determine the adequacy of the video learning that was created, to find out how far the program designed can take place, and to identify any obstacles. By knowing the obstacles and things that disturb the program to run smoothly, the early decision making can be prepared in advance to improve and to support the goals of the study to be achieved effectively (Scriven 1967).

The stage that was evaluated was the Development Stage which includes the development of the video learning on Bill of Quantity for Building Construction, Sanitation, and Maintenance and the instrument development of the effectiveness test questionnaire. This formative evaluation is to ensure that the expected goals can be achieved and to make improvements to the product in the form of the video learning of Bill of Quantity for Building Construction, Sanitation, and Maintenance.

2) Summative Evaluation

This summative evaluation stage aims to determine the effectiveness of the learning video on Bill of Quantity for Building Construction, Sanitation, and Maintenance. The summative evaluation leads to a decision on the achievement statement of the learning video in increasing the students' interest in learning.

The Test of Adequacy and Practicality of the Learning Video

The next stage, in the development of the video learning, the test of adequacy and practicality tests were done by the experts of both the content and media as the validator.

a) The Adequacy of the Learning Video

The adequacy test of the learning video on Bill of Quantity for Building Construction, Sanitation, and Maintenance used a video assessment sheet that has been done by the validators, the scoring of the adequacy test was done by 2 media experts and 2 teachers as the content experts. From the resulted data analysis, the following is the overall score for each aspect given by all validators: 4.03 (adequate) and 4.28 (very adequate). Based on the validation results, it can be concluded that the learning video on Bill of Quantity for Building Construction, Sanitation, and Maintenance is valid with revisions and does not require a significant modification and it is also suitable for use as teaching and learning materials.

b) The Practicality of the Learning Video

The practicality test was carried out by giving a questionnaire at the development stage. Practicality test questionnaires were given to 2 teachers of building engineering and 15 students of class XI Engineering Department at the State Vocational High School 3 Semarang. This data collection was preceded by the provision of the learning video on Bill of Quantity for Building Construction, Sanitation, and Maintenance for 2 weeks. After that, the data collection was done through a questionnaire with 34 statements. The results of the practical analysis of the developed video learning can be seen in table 1 and 2 below:

Tabel 1. Data Analysis of Cr and Cs Score of the Practicality Test

Validator	Indicator	Cr Score	Cs Score
Students and Tachers	Learning Materials	0.9	1.0
	Content		
	Media		
	Navigation		
Average Score		0.9	1.0

Tabel 2. The Data Analysis of the Practicality Test

No	Response Indicator	Average	Category
1	Learning Materials	76.7%	Practical
2	Content	78.9%	Very Practical
3	Media	79.04%	Very Practical
4	Navigation	81.33%	Very Practical
Average of all Users		78.99	Very Practical

The Coefficient Reproducibility or Cr = 0.9 indicates that the video learning on Bill of Quantity for Building Construction, Sanitation, and Maintenance that has been developed is very practical to use because it meets the practical requirements of 0.9. This is confirmed in the scalability test, the Coefficient Scalability or Cs = 1, this score also meets the requirements, which is above 0.60. The results of the practicality analysis also show that the learning media developed is included in the "very practical" category with a value of $x = 90.46\%$ and it can be used as the materials in the teaching and learning process.

The Effectiveness of the Video Learning

The effectiveness analysis of the video learning on Bill of Quantity for Building Construction, Sanitation, and Maintenance was carried out by using a computerized T test using the SPSS v.22 program. The T-test was used to determine whether there was an increase in the students' competence after using the video learning. It was done by comparing the pretest and posttest scores to determine whether or not the video learning was effective to improve the students' competence. The results of the T-test calculations are as follows:

Tabel 3. The Result of the T-test

Treatment	N	Mean	STD	T	p-value*
Before	30	58.76	16.234	-11.23	0.000
After	30	81.26	6.594		

Based on the table above, there is an increase from before to after with a difference of 22.5 point and a p-value of 0.000. It means that there is a significant improvement of the students' competency before and after they use the learning video on Bill of Quantity for Building Construction, Sanitation, and Maintenance.

Furthermore, to calculate the effectiveness of using the video learning on Bill of Quantity for Building Construction, Sanitation, and Maintenance, the N-Gain test was conducted. This N-Gain test was done with the gain normalization test (N-Gain). The N-Gain test was calculated based on the difference between the Pre-Test and Post-Test scores.

Tabel 4. The N-Gain Score of the Video Effectiveness Questionnaire

Experiment Class		Control Class	
No	N-Gain Score (%)	No	N-Gain Score (%)
Average	56.7295	Average	17.4480
Minimum	35.48	Minimum	-3.85
Maximum	75.00	Maximum	37.21

Based on the calculation results of the N-Gain test, it shows that the average N-Gain score for the experiment class is 56.7295 or 56% with a minimum N-gain score of 35% and a maximum

N-gain score of 75%. Meanwhile, the control class is 17.4480 or 17% with a minimum score of -3.85% and a maximum score of 37.21%. The N-Gain scores were then classified and described to

be categorized as a high normalization value. It means that the learning video on Bill of Quantity for Building Construction, Sanitation, and Maintenance is very effective as a learning medium.

Discussion

The final product of this R&D study is a Video Learning on Bill of Quantity for Building Construction, Sanitation, and Maintenance. The process of the video production was done step by step in several stages. To produce a watch-worthy video, a series of validations were carried out by the media experts, content experts, and users. There was also a validation of the video effectiveness to users. The validation of the experts and users were done directly in the field. It was intended to obtain any data for the product revision.

The adequacy of product development needs to be reviewed in the form of the video learning so that the success of development activities can be evaluated. The adequacy of a product produced by R&D can be determined by three criteria, they are validity, practicality, and effectivity (Akker et al., 1999). The adequacy of the video learning produced by this study was based on the results of media expert observation sheets done by the two media expert lecturers. The video practicality questionnaires were from the 2 material experts while the practicality test was done by the students and teachers as the users as well as the test of the effectiveness of the video learning. The validity of the video learning includes content validity in the form of conformity between the contents presented with the concepts and theories. It also includes the construct validity, that is the suitability of the transformation or translation of concepts and theories into an operational form (Drost, 2011). The validity of a product developed can be determined based on the results of the validation activities (Azwar, 2014).

After the validity test, it was concluded that the Video Learning on Bill of Quantity for Building Construction, Sanitation, and Maintenance has become the final product of this R&D and it is very suitable for use by the students to increase their interest in learning. This video

learning was validated by the 2 media expert lecturers and 2 content expert teachers. The validity test from the media experts, it was done by the lecturers of Media Learning from the Civil Engineering Department, Faculty of Engineering, Semarang State University. The Video size indicator got a score of 4.3 with very adequate criteria.

Akker et al. (1999) pointed out that one of the goals of R&D is to promote the scientific and practicality of the final product. The level of practicality of teaching materials can be measured according to the purpose of development and ease of use in learning activities (Nieven et al., 2006). Based on this definition, the practicality test of this video learning was done by the teachers and students of State Vocational High School 3 Semarang as the users of the video learning.

At the user validation stage, the validity test was done by the teachers and students of the Mechanical Engineering Study Program of State Vocational High School 3 Semarang. The interest indicator got a score of 84.80% with very practical criteria, the materials indicator got a score of 90.77% with very practical criteria, the content indicator got a score of 93.14% with very practical criteria, the media indicator got a score of 93.14% with very practical criteria. In addition, it was also included the aspect of student responses. From the results above, the average score of the validity test was 90.46% with very practical criteria.

The video effectiveness is related to the ways, efforts, techniques, and strategies used in achieving goals optimally, precisely, and quickly (Sudjana, 1990: 50). The effectiveness of the video developed is related to the purpose of developing the video, which is related to improving the quality of learning and solving classroom problems. The study that aims to increase students' interest is based on the results of student response questionnaires as test subjects, and the research questionnaires in class will be discussed in the application of this video for development purposes. Through the feedback of students answering the questionnaire, the effectiveness of the development video can be found. The results of data analysis show that the video learning is effective to be applied in teaching and learning activities.

At the stage of testing the effectiveness of the Video Learning, based on the table of independent sample T-test, it can be seen that before being given the treatment using the Video Learning on Bill of Quantity for Building Construction, Sanitation, and Maintenance, the experiment class (XI BCSM 2) and the control class (XI BCSM 1) were just the same or homogeneous. There was no difference between the two classes. The distributed data in this study, after being tested by the T test, showed that it was quite effective and significant. Based on these results, it can be concluded that the Video Learning on Bill of Quantity for Building Construction, Sanitation, and Maintenance is categorized very appropriate, very practical, effective, and significant enough to increase students' interest in learning.

CONCLUSION

Based on the results of the study on the development of the Video Learning on Bill of Quantity for Building Construction, Sanitation, and Maintenance, it can be concluded that:

1. The Research and Development of the Video Learning on Bill of Quantity for Building Construction, Sanitation, and Maintenance with the ADDIE model development was done through several stages, they were: (1) The analysis stage included three stages: needs analysis, video needs analysis, and interest analysis; (2) The design stage which included the preparation of the Video framework, collection and selection of references, video design, and preparation of the Video response instrument; (3) The development stage included the development of the Video Learning on Bill of Quantity for Building Construction, Sanitation, and Maintenance, the validation of media experts, content experts, and users (teachers and students), revisions according to validator input, and the instruments development to test the effectiveness of the video; (4) The implementation stage included the pre-test for both the experiment class and control class, the implementation of the video

learning in the experiment class, and the post-test for both the experiment class and control class; (5) The evaluation stage included the formative evaluation which evaluated the development section and the summative evaluation which evaluated the implementation section. The final product of this development research is the Video Learning of Bill of Quantity for Building Construction, Sanitation, and Maintenance.

2. The Video Learning of Bill of Quantity for Building Construction, Sanitation, and Maintenance that was developed is very adequate to use to support the learning process. This is based on: The responses given by the media experts who gave very adequate criteria; The responses given by the content experts who also gave very adequate criteria; The responses given by the users (teachers and students) with very practical criteria; and the scoring from the video effectiveness test by the students of class XI Building Construction, Sanitation, and Maintenance (BCSM). Based on the scores obtained from the study, this video learning was proved very feasible, very practical, quite effective and significant to be used to increase students' interest in learning.

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