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Development of Plumbing Work Practice Learning Videos In the Department of Civil Engineering Education and Planning UNY

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Abstrak: Penelitian ini memiliki kontribusi (1) mengembangkan video pembelajaran Praktik Kerja Plambing dan Sanitasi, (2) mengetahui tingkat kelayakan media video pembelajaran Praktik Kerja Plambing dan Sanitasi, (3) mengetahui persepsi pengguna terkait video pembelajaran Praktik Kerja Plambing dan Sanitasi yang diterapkan pada Jurusan Pendidikan Teknik Sipil dan Perencanaan UNY. Penelitian ini merupakan penelitan R&D dengan pendekatan model 4D (*Define, Design, Development, Disseminate*). Teknik pengumpulan data berdasarkan dari subjek penelitian dalam pembuatan produk video pembelajaran praktik kerja Plambing yaitu para ahli terkait materi plambing, ahli media. Instrumen yang digunakan menggunakan skala likert dengan mengukur tingkat kelayakan produk yang dikembangkan. Hasil yang didapatkan (1) tahapan *define* yaitu meganalisa kondisi awal, Analisa karakter peserta didik, Analisa konsep dan tujuan pembelajaran, tahapan *design* yaitu merancang skrip alur penyampaian informasi yang terdiri dari pembukaa, isi materi, penutup,, tahapan *development* yaitu proses merekam membuat video pembelajaran hingga selesainya editing video yang dihasilkan dan kemudian menguji validasi kelayakan produk oleh ahli , tahapan *disseminate* yaitu penyebarluasan secara terbatas produk yang dihasilkan dalam hal ini video pembelajaran praktik kerja plambing kepada sample untuk menilai dan mengetahui tingkat kelayakan dan kebermanfaatan produk; (2) tingkat kelayakan produk berdasarka konten materi yang dibuat bernilai 4,58 tergolong kategori “sangat layak”, sedangkan penilaiaan berdasarkan media yang dibuat bernlai 4,91 tergolong kategori “sangat layak; (3) Hasil *disseminate* yang telah dilakukan mendapatkan nilai persepsi pengguna akan produk termasuk kategori sangat tinggi diperoleh persentase kelayaan prduk sebesar 91,52% yang masuk kedalama kategori “Sangat Layak”.
Keywords: *define; design; development; disseminate*; kelayakan produk

Abstract: *This research contributes to (1) developing a learning video of Plumbing and Sanitation Practice, (2) knowing the feasibility of the Plumbing and Sanitation Practice video learning media, (3) knowing user perceptions regarding the Plumbing and Sanitation Practice learning video applied to the Department of Education Civil Engineering and Planning of UNY. This research is an R&D research with a 4D model approach (Define, Design, Development, Disseminate). Data collection techniques are based on research subjects in making video products for Plumbing practice learning videos, namely experts related to plumbing materials, media experts. The instrument used uses a Likert scale to measure the feasibility level of the product being developed. The results obtained are (1) the define stage, namely analyzing the initial conditions, analyzing the character of students, analyzing concepts and learning objectives, the design stage, namely designing a script for the delivery of information consisting of opening, content, closing, the development stage, namely the process of recording making a video learning until the completion of editing the resulting video and then testing the eligibility validation of the product by experts, the disseminate stage, namely the limited dissemination of the product produced in this case the learning video of plumbing work practices to samples to assess and find out the level of feasibility and usefulness of the product; (2) the level of product feasibility based on the material content made is worth 4.58 belonging to the "very feasible" category, while the assessment based on the media made is worth 4.91 belonging to the "very feasible" category; (3) The results of the disseminate that has been carried out obtain the*

value of the user's perception of the product which is included in the very high category, the percentage of product feasibility is 91.52% which is included in the "Very Eligible" category.
Keywords: *define; design; development; disseminate; eligible product*

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INTRODUCTION

Universitas Negeri Yogyakarta (UNY) is one of the tertiary institutions that prints and produces experts and skilled in their field of expertise and equipped with the ability to educate. One of them is the Civil Engineering and Planning Education Study Program (PTSP) of UNY which equips students with knowledge and skills in civil engineering and planning. In the PTSP UNY, all courses have been arranged in the curriculum so that students are able and have knowledge and skills in civil engineering and planning. One of them is the practicum activity in plumbing and sanitation which was carried out in the early semester as an initial step to introduce and hone students' skills in terms of plumbing/piping and installation of various sanitary equipment.

Plumbing and Sanitation Work Practice is one of the compulsory subjects taken by the civil engineering and planning education study program which is classified as a subject area of expertise with a weight of 2 practical credits. The implementation is in the form of providing training knowledge and skills experience to students for the use of basic plumbing work practice tools, materials for plumbing and sanitation work practices including the work of clean water pipes, dirty water pipes, vent pipes to installation of plumbing and sanitary tools (Curriculum Development Team, 2020).

The implementation of learning that is used by lecturers to deliver material in the Plumbing and Sanitation Practices course generally uses a conventional learning model. One of the conventional methods is by lecturing, which makes it difficult for students to understand the subject, because they only listen to information or explanations from the lecturer, as well as the limitations of students in taking notes on the material and lessons being taught. This learning model will make students passive, so that students feel bored in receiving learning.

Another problem put forward by Hanif (2022) is that learning that has been going on in the field of Civil Engineering Education now requires mastery of material such as mastery of skills in masonry & concrete work, mastery of basic scientific fields such as structural analysis and mastery of technology utilization such as temporary BIM applications. still limited by the time for delivering material which tends to be insufficient with the ideal material being taught.

To overcome the problems experienced, it is necessary to supplement the explanation of the material and teaching materials by utilizing various facilities and devices owned by students in the form of interactive learning videos. Triyono (2020) explains that learning media in the form of videos must contain complete and detailed content specifications, so that goals can be conveyed.

The use of interactive videos is expected to facilitate lecturers in conveying material. Learning is also more enjoyable because of the initial visualization compared to just reading books and listening to lectures delivered by lecturers, and students can study independently first and become more effective (Gazali, 2019).

With interactive video learning media, students can directly make observations, observe the process of something happening, think critically, and be able to draw conclusions. This does not mean students do not need to make observations again. Precisely by having other sources of learning, it is hoped that students will be motivated to be able to prove the truth directly both in

practical activities at school and in its application in the business/industry world.

RESEARCH METHOD

This research is a Research & Development (R&D) research with a 4D model approach, namely define, design, develop, disseminate. The selection of this model is based on systematic considerations and is based on a theoretical foundation of learning. This model is structured programmatically with systematic sequences of activities in an effort to solve the problem of a learning resource adapted to needs. The first step defines or define is the first step taken to collect the required information. the subjects that will be studied are Plumbing and Sanitation Practical Learning, especially in PVC and PPR pipe work which includes subject matter, RPS, syllabus, job sheets to be used in the media development process.

Second Step Design or Design is the step of making material that has been collected from the define stage then designed into learning scripts and videos. At the design stage there are several steps including (a) determining the material; (b) preparation of story boards and video scripts; (c) site preparation, tools and materials; (d) taking pictures and sound at the Plumbing Workshop, Department of Civil Engineering Education and Planning, Faculty of Engineering, UNY.

The third step of development or development is a step to develop learning media according to the design that has been made. Finished products cannot be disseminated and used immediately, because they need to go through the stages of testing first. Testing is carried out through the assessment of material and media experts. So we get a decent product. One of the expert assessments consists of material coverage, evaluation, skill dimensions, material organization. While the media aspect consists of the depth of the material being taught, media images, sound, appearance, duration, proportion, layout.

The fourth step is Dissemination or dissemination, which is the dissemination step which is distributed to the lecturers in the Plumbing and Sanitation Practice course and uploads it to the learning media channel based on the development results. disseminate his work through the YouTube channel to provide benefits to those in need.

Subjects in this development research were lecturers in Civil Engineering and Planning Education who were lecturers as media experts and material experts. While the object of this study is the development of the application and use of learning video-based media in the Plumbing and Sanitation Practice Course on cutting, joining, and bending PVC (Polyvinyl Chloride) and PPR (Propylene Random) pipes.

Implementation time in the semester January – August 2022 and taking place at the Plumbing and Sanitation Workshop, Department of Civil Engineering and Planning Education.

The data collection technique was carried out by using a questionnaire to assess learning media and video material that had been designed with assessment indicators consisting of material coverage, material accuracy, evaluation, skills dimensions, material organization, media images, language, color, audio, duration, motivation. The data analysis technique used in this study is using a Likert scale. The data from the questionnaire is made a percentage of each question item which can then be concluded as to its feasibility. The following shows a video feasibility analysis

$$Appropriateness\ (\%) = \frac{total\ skor}{maksimum\ skor} \times 100\%$$

The scores that have been obtained are then included in the percentage interval data as follows

Table 1. Media Feasibility Rating Intervals

No.	Kategori	Persentase
1	Excellent	81% - 100%
2	Good	61 % - 80%
3	Enough	41% - 60%
4	Bad	21% - 40%
5	Worsh	0% - 20%

RESULTS AND DISCUSSION

The development of learning video-based media carried out in the Civil Engineering and Planning Education Study Program, Faculty of Engineering, Yogyakarta State University is used and applied to the Plumbing and Sanitation Practice course with material that will be explained in the development of learning videos, namely cutting, connecting, bending PVC (Polyvinyl Chloride) pipes, and PPR (Propylene Random).

The development uses the 4D (four-D) model which has 4 stages with reference to Thiagarajan (1974) including define, design, development, and disseminate. These four stages can be explained as follows:

Define

Define aims to find out and obtain the conditions that form the basis for the development of instructional media by explaining it into five main steps of activity, as follows: First, the initial and final analysis aims to find and determine the problems that exist in the learning of plumbing work on PVC pipes and PPR course Plumbing and Sanitation Work Practice

Video media is now a medium that is often used as a reference for learning from all levels of education. This happens because video is an interesting medium, easy to understand, and easy to use. With video learning media, it is hoped that students will be more interested and comfortable in learning, and it will be easier for them to

Second, the analysis of student diagnoses about the characteristics of students according to the learning tools developed. The description of the characteristics obtained from this analysis stage include: (1) level of ability; (2) experiential background; (3) learning motivation; (4) skills. The third concept analysis is carried out to determine the subject matter that needs to be conveyed in the video

The subject matter needed is an introduction to learning and learning objectives, introductory learning materials, tools and materials used, Occupational Health and Safety, work steps for cutting, connecting, bending PVC and PPR pipes. Evaluation

Fourth, task analysis aims to examine the main tasks that students need to master in order to achieve the expected competencies. There are several steps that need to be taken in the work of Plumbing and Sanitation Practices. The material that will be discussed is about cutting, connecting, bending PVC and PPR pipes, starting from preparing materials to assembling pipe joints.

The learning outcomes for cutting, connecting, bending PVC pipes and in the Plumbing Work Practice course are: Students can prepare tools and materials to be used for cutting, connecting, bending PVC pipes and PPR, students can carry out occupational safety and health procedures during the practicum, students can determine the work steps of cutting, connecting, bending PVC and PPR pipes, students are able to cut, connect, bend PVC and PPR pipes correctly.

Fifth, the formulation of learning objectives is to summarize the results of task analysis and concept analysis for learning outcomes. Learning outcomes are structured to determine the competencies students need to achieve through learning videos.

Design

After obtaining the supporting data and determining the focus of the material and learning media, then proceed to the next stage, namely design. Designing is the stage of making designs for developed learning videos. The following shows a picture of the stages of designing a learning video.

Gambar 1. Diagram of the stages of Designing Learning Videos

The designer starts from the stages of compiling the material that will be conveyed in the video. The material chosen was plumbing work regarding cutting, connecting and bending PVC and PPR pipes. After determining the material to be achieved, it is continued to make a video script. The script is made before shooting. It contains stories and scripts that will be displayed in the learning videos. It is also important to prepare the location or setting for the practice. preparing the location, tools and materials to be used, namely the plumbing and sanitation workshops for the PTSP FT UNY Department and their facilities.

Next, Take Video or take pictures. Taking pictures (shooting videos) is carried out at the Plumbing workshop using an iPhone 13 camera and the narration is recorded separately, namely by the dubbing process. After shooting, proceed to video editing where video editing activities are carried out using the Wondershare Filmora application. Wondershare Filmora is used to join multiple video clips, add sound, set transitions, speed up and slow down video clips, and so on.

In editing videos using the Wondershare Filmora software, there are several stages, namely: (1) combining sound and images into a video part; (2) combine all parts of the video into a complete video; (3) combine video with background or music. Ispring application for converting presentation files, a form commonly used in e-learning. With the completion of video editing, the learning video is finished and ready to be tested. The edited video is saved in a format that all devices can open, such as mp4.

Development

The development stage is the stage in knowing the level of feasibility of using learning video media which is developed to be adjusted if there are still deficiencies. At this stage it is possible for revisions to the learning video media to be corrected according to expert directions until an assessment of the learning video media is declared fit for use and can proceed to the disseminate stage. At the development stage it is carried out by taking the following steps: Assessment of material experts in the field of plumbing and sanitation, and assessments from material and media experts who are supportive such as adding the function of K3 supporting tools. In the trial process, you must use water to see the occurrence of leaks in PVC & PPR pipes, it is necessary to pay attention to the duration of the video, adding the Ispring application. The inputs that have been submitted become material for improvement so that the resulting product is better than before.

After product improvement is then followed by an assessment to assess the feasibility of the learning video product that has been made. The following table displays the results of the material and media expert's assessment of the video produced.

Table 2. Material Expert Assessment

No.	Indicator	Number Item	Total Skor	Skor Max
1	Knowledge	11	48	55
2	Skill	3	15	15

No.	Indicator	Number Item	Total Skor	Skor Max
3	Organization	3	15	15
	TOTAL	17	78	85
AVEREGE SCORE		78/17 = 4,58		

Table 3. Media Expert Assessment

No.	Indicator	Number Item	Total Skor	Skor Max
1	Material	6	30	30
2	Media	14	68	70
3	User Benefit	4	20	20
	TOTAL	24	118	120
AVEREGE SCORE		118/24 = 4,91		

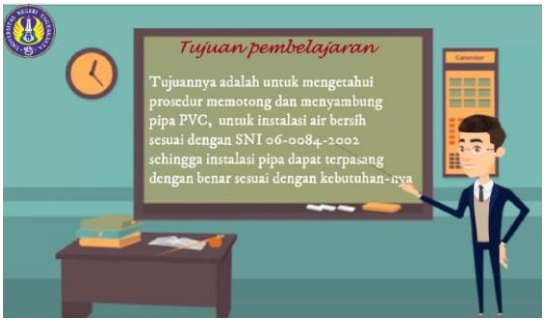
Dissemination

In the learning video dissemination stage, there are two steps including Packaging and Application. The packaging of learning video media is done in such a way as to make it easier for users to access the media. One form of packaging is done by uploading videos on channels or social media majoring in civil engineering education and planning. Application of learning video media using plumbing and sanitation practice courses as a step in making it easier for lecturers and students to learn first and foremost to be able to increase knowledge and expertise.

The product description for the video development of Plumbing and Sanitation Practices contains (1) introduction and learning objectives; (2) introductory learning materials; (3) tools and materials (4) Occupational safety and health OSH; (5) steps to cut and connect PVC and PPR pipes; (6) bending PPR pipes; (7) Closing. The divided components or content formats that will be arranged in learning videos that have a duration of 5-6 minutes are as follows; The opening section displays the agency's identity, video title, and material title. Introductory core part, learning objectives, Occupational Safety and Health OSH, work steps for cutting and connecting PVC and PPR pipes, bending PPR pipes. The closing section can be in the form of a credit line/video.

The learning videos can be run on all devices, both on cellphones and on laptops. The revised and corrected learning videos are uploaded on the department's YouTube channel so that they can be opened anywhere and anytime. The file format is mp4 with a file size of 50 MB to 120 MB and has a video resolution of approximately 1080p (1920 x 1080 pixels) so that the file size doesn't take up a lot of data packets and the image resolution doesn't break. Making the use of media more optimal in improving the learning process to achieve a learning goal.

The developed learning videos do not require any special expertise in playing them. This video learning media has a maximum duration of 6 minutes, so that students do not take too long to study the material presented. This video focuses on connecting PVC and PPR pipes. Not all of the plumbing material is delivered so that the duration and aesthetics of the video can be varied in terms of models, shapes and other formats. The following shows a screenshot of the video that has been made



Gambar 2. The Introduction section contains learning objectives

Gambar 3. The Occupational Safety and Health section explains K3 and its functions

Gambar 4. Example of a PPR pipe work explanation video

Based on the explanation that has been presented, the learning video products that have been produced make it more effective for students to be able to study independently before lectures as explained by Musfiqon (2012: 28) that learning media can be used as an intermediary between teachers and students in understanding learning material so that it is effective and efficient.

The process of developing learning video media with the 4D approach is in line with what has been explained by Rusman (2012: 168) where the selection of learning media goes through the stages that are considered, including: 1) Determining learning media based on identification of learning objectives or competencies and characteristics of the lesson to be studied. 2) Identifying the characteristics of learning media must be in accordance with the level of students' abilities, their use is controlled by the teacher, the equipment in the school, easy to use and increase student creativity. 3) Designing its use in the learning process how the stages of its use become a complete process in the learning process. 4) Evaluate the use of learning media as a feedback material for effectiveness. Stage 4 D (define, design, development, disseminate) is in accordance with the stages described in making learning media.

The development and production of this plumbing and sanitation learning video has taken into account the criteria put forward by Cheppy (2007: 11-14). First, the type of video media material that is suitable for the subject matter is to describe a certain process, a demonstration flow, a concept or to describe something. Namely explaining the techniques in PPV and PPR pipe work. The duration of both video media has a duration of no more than 20-40 minutes, in contrast to films which generally last between 2-3 hours. Considering that human memory and concentration abilities are quite limited, between 15-20 minutes, and this learning video is 6 minutes long. The three video presentation formats Films are generally presented in a dialogue format with more dramatic elements. Loose films are mostly imaginative and unscientific. This video presents explanations and demonstrations aimed at mastering the material. The four technical provisions for video media cannot be separated from the technical aspects, namely taking pictures and sound.

The use of learning videos provides many benefits, namely (a) training creativity, (b) assisting educators in visualizing material (c) enriching teaching materials, (d) increasing educators' personal branding as video creators (content creators), (e) increasing copyrights and (f) become a complement in understanding the lessons continuously.

CONCLUSION

Based on the explanation from the results of developing learning videos, it can be concluded that development using the 4D model results as follows: Development of learning videos for Plumbing and Sanitation Practices using the 4D model starts from the Define Stage to find out the information.

Plumbing practice learning process is needed. The Design Stage is the process of compiling materials for making learning

media such as creating scripts and media formats to be used. The initial design process produces learning videos with a total duration of approximately 43 minutes for 2 videos with FHD quality (1920 x 1080 pixels). The Development stage determines the feasibility level of the media developed through validation tests from material experts and media experts as well as user tests. The feasibility of the developed learning video-based media will be given an assessment from the expert until it is in a feasible condition. Expert suggestions and input are accommodated in the videos made. The Disseminate stage is distributing learning videos to users using various platforms such as the Department's Youtube channel, social media, etc.

(2) The feasibility level of the learning video media for Plumbing and Sanitation Work Practices that has been developed obtained a score of 4.58 from the maximum score scale of 5.00 so that it can be stated that the delivery of material in learning video-based media is "Very Eligible" for use in the learning process. (3) The user's perception of the Plumbing and Sanitation Work Practice learning video applied to the Department of Civil Engineering and Planning Education at UNY is in the high category. This was proven based on the assessment of students of the 2018 PTSP FT UNY Department of the learning videos developed which were obtained in the "Very Eligible" category.

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