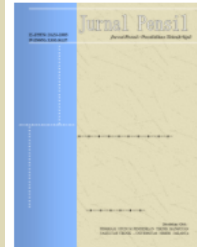


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DEVELOPMENT OF ANIMATION VIDEO LEARNING MEDIA FOR URBAN DRAINAGE COURSES IN BUILDING ENGINEERING EDUCATION

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Abstract

This study aims to obtain a video-based learning media animation development on Urban Drainage course using Adobe After Effect in Education of Building Engineering, Faculty of Engineering, State University of Jakarta. The research implementation time is April to August 2020. The development model used in this study is 4D model by Thiagarajan, which consist of define phase, design phase, development phase, and disseminate phase. The instrument used in this research was a questionnaire for need analysis, product feasibility test by experts, and product users. The result of research and product development is an animation video consisting of 4 video materials used for one semester. The results of validation by material expert get an average percentage 80% and included in feasible category. The results of validation by media expert get an average percentage 92,5% and included in very feasible category. The product assessment results by students as product users get a percentage 88,9% and included in the excellent category.

Keywords: Learning Media, Animation Video, Urban drainage

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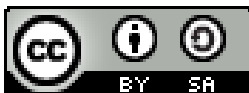
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Introduction

The development of education is always directly proportional to the development of the times (Wati, dkk., 2019). Currently, the world of education is experiencing development along with the rapid development of internet-based information and communication technology which has a major impact and even changes the pattern of life (Sari, et al., 2020). Educational institutions must be able to improve the quality of education and develop the existing potential in order to meet the demand for quality human resources in this century (Hasibuan, et al., 2019). According to (Saleh, 2019) improving the quality of education is divided into many aspects, one of which is improving the quality of educators. Educators are required to be able to provide various interesting innovations in learning in order to optimize the learning process (Mawardi, et al., 2019). In providing innovation, educators must adapt to the characteristics of students in the current era or commonly called the era of disruption (Risdianto, 2019).

The lifestyle of students in the era of disruption cannot be separated from the internet to access information, social media, or just for entertainment (Islamiy, et al., 2018). Based on the results of the APJII survey in 2018, 91% of students in Indonesia are internet users and the number is increasing every year (Asosiasi Penyelenggara Jasa Internet Indonesia (APJII), 2018). Then supported by data from Digital 2020: Indonesia Digital Overview which contains reports on internet, mobile, social media and e-commerce usage around the world, it shows that in Indonesia there are activities to access online content (online content activities) via the internet by 99% watching online videos, 79% watch vlogs, 84% listen to music online, 58% listen to online radio broadcasts, and 43% listen to podcasts (Kemp, 2020).

The use of information technology in learning leads to technology products, one of which is learning media (Gunawan, 2016).

Learning media facilitates the process of delivering information carried out by educators and becomes a tool for students to participate in the learning process (Negara, et al., 2019). One type of learning media is animated video. Learning using animated videos includes audio-visual media so that they can enter through two human sensory sensors, namely through the eyes and ears (Sanaky, 2013). According to (Daryanto, 2016) that 75% of a person's learning experience is obtained from the sense of sight (eyes), 13% through the sense of hearing (ears) and the rest through other senses. This is considered suitable for students who are passive in learning in engineering courses. (Arthur, et al., 2019)

The animated video learning media can attract the attention of students and can describe ideas or concepts so that they can obtain long-term memory (Efendi, et al., 2020). An abstract event can be explained systematically in time sequences using animated videos (Lestari, et al., 2017). Animated videos can move objects in conveying concepts (Permatasari, et al., 2019). Students' learning interest in learning that uses animated videos as learning media can increase because of the attractive visual and audio displays (Wardoyo, et al., 2015). In addition to interest in learning, animated videos can also improve student learning outcomes (Lidi, et al., 2019).

Animated video learning media can be used for classroom learning and online learning that can be accessed anywhere and anytime (Islamiy, et al., 2018). Animated videos can be uploaded so that they can be accessed anytime and anywhere by anyone (Lianto, et al., 2020) so that they have a positive effect and can be used for distance learning (Nur, et al., 2019). Especially during the COVID-19 pandemic, it requires students to learn from home so that the presence of video learning media can encourage the effectiveness and efficiency of learning activities (Batubara, 2020). This is supported by (Ferrer Torregrosa, et al., 2016) which

states that distance learning using video is more effective than using only text. Animated video media can foster an independent learning attitude with visualization that helps students to remember learning material (Kwasu, et al., 2016). In addition, (Ultay, 2015) examines the use of media and concludes that the animation media used can successfully integrate the cognitive and psychomotor domains because it has the power to integrate visual, auditory, and kinesthetic learning abilities.

Development of animated video learning media using software to create animated video products (Apriansyah, et al., 2020). The software used for developing this animated video is using Adobe After Effects CC software in making animations and transitions to support animated videos from the visual aspect (Nurhardian, et al., 2015). Adobe After Effects CC according to (Maharani, et al., 2017) is an animation and special effects software that has full features so that it can make it easier for professional animators and graphic designers. Adobe After Effects CC has many special effects that can be downloaded on its website to produce dynamic animation movements (Supriyadi, 2019).

Urban Drainage is a subject in the S1 Building Engineering Education study program, Faculty of Engineering, State University of Jakarta that must be taken by students. In general, drainage is defined as a branch of science that studies the engineering of excessive water flow in certain areas or areas (Supriyani, et al., 2012). Teaching materials in the form of e-modules are used in the Urban Drainage course developed by (Wulandari, et al., 2020). The learning media used is PowerPoint presentation slides.

According to the data from the needs analysis survey conducted on 35 2016 students who have passed the Urban Drainage course, it shows that the interest and ease of understanding the material with the help of existing learning media is 2.45 out of a scale of 4. Respondents stated that 88, 57% stated that

the learning media that needed to be developed were animated videos. In addition, 31.43% chose presentation slides, 25.71% chose infographic posters, and 14.29% chose printed books. In this case, as many as 57.14% of respondents can choose more than one type of media that is suitable for use in the Urban Drainage course.

A lot of research and development of animated videos has been done before. The research entitled Development of Adobe After Effect-Based Animation Video Learning Media Material Hydrology Cycle for Class X Geography Subjects at SMA Negeri 1 Tawang Sari, Sukoharjo Regency which was developed by (Izza, 2019) with the results of an assessment that animated videos are suitable for use in learning with an average value the average eligibility of material experts and media experts is 94%. In addition, there is also a study entitled Development of Animation-Based Video Learning Media for the Building Materials Science Course at the Building Engineering Education Study Program, Faculty of Engineering, State University of Jakarta, which was developed by (Apriansyah, et al., 2020) with appropriate results for use in learning with an average percentage the average eligibility of material experts and media experts is 82.5%.

Based on the description above, a research entitled: "Development of Animated Video Learning Media in Urban Drainage Course in Building Engineering Education Study Program, Faculty of Engineering, Jakarta State University will be conducted".

Research Methods

This type of research is research and development (research and development). This research and development was carried out at the Building Engineering Education study program, Faculty of Engineering, State University of Jakarta. This study involved several students in the study program who took part in learning urban drainage courses

in 2020 (semester 112). The time for this research is from April to August 2020.

The targets of this research and development product are students of the Building Engineering Education study program, Faculty of Engineering, State University of Jakarta. Students as users of animated video learning media contain explanatory material to support learning for Urban Drainage courses.

The model used in this research is the 4D model which consists of 4 main stages, namely define, design, develop, and disseminate. However, due to the limited research time, the stages carried out only reached the develop stage.

This research and development uses a non-test type of instrument in the form of a questionnaire with a Likert scale measurement scale. The Likert scale according to Sugiyono (2015) is a scale that measures positive and negative responses to a statement in the questionnaire. The following is the Likert measurement scale used in the questionnaire in this study.

Table 1. Rating scale

Evaluation	Scale Value
Strongly Disagree	1
Do not Agree	2
Doubtful	3
Agree	4
Strongly Agree	5

The instrument created is used for the product validation process by experts on the animated video learning media product that was developed. In this study, two instruments were made, namely instruments for material experts and instruments for media experts. The following is a grid of instruments for material experts that will be used in product validation.

Table 2. Material expert instrument grid

Component	Aspect	Quantity
Learning	Learning Objectives	3
	Submission of Material	6
Material	Material Selection	4
	Material	
Number of items		13

The following is a grid of instruments for materials experts to use in product validation.

Table 3. Grid of media expert instruments

Component	Aspect	Quantity
Learning Media Display	Text	2
	Color combination	2
	Animation	5
	Serving format	2
Media Usage	Media usage	2
	Media implementation	2
Number of items		15

The data analysis techniques used in this research and development is a mixed descriptive analysis technique between quantitative and qualitative descriptive analysis. Quantitative descriptive analysis techniques were used to process the data obtained from the assessment scores of the questionnaires filled out by material experts and media experts in the product validation process. Meanwhile, qualitative descriptive

analysis techniques were used to process the data obtained from suggestions and input from material experts and media experts. For the calculation of the percentage of quantitative data using the following formula:

$$\text{Tingkat Validitas} = \frac{\text{jumlah skor validasi}}{\text{jumlah skor maksimal}} \times 100\%$$

The number of validation scores is the sum of the assessment scores of all indicators given by the expert in the questionnaire. The maximum score is the maximum score of all indicators in the questionnaire. The measurement scale used as a reference for interpreting the media feasibility level is as follows:

Table 4. Rating Measurement Scale

Evaluation	Scale Value
Very Inappropriate	0%-20%
Not Feasible	21%-40%
Decent Enough	41%-60%
Worthy	61%-80%
Very Worthy	81%-100%

Results and Discussion

Material expert validation was carried out in the second week of July 2020 by filling out instruments. The material expert validator for the product being developed is a lecturer in the field of environmental science at the State University of Jakarta in Building Engineering and a lecturer in the field of environmental science at the Gunadarma University in Building Engineering. Data from validation results in the form of percentage scores of assessment instruments in the form of questionnaires obtained from the two validators (v1 and v2) material experts based on assessment aspects can be presented in the table 5:

Table 5. Material Validation Results

Aspect	V1 (%)	V2 (%)	Average Percentage
Learning objectives	80	80	80
Submission of material	83,3	76,6	80
Material selection	80	80	80
Total average percentage			80

Several indicators in the validation results above are included in the agree category and several indicators are included in the agree category. In addition to providing scores on the instrument, the validator also provides suggestions and input for the developed animated video learning media, including: 1) Add a description of the video maker, video editor and others at the end of the video. 2) The learning objectives should be stated in detail at the beginning of the video. 3) In the hydrology material video, include the requirements for using the regional average rainfall calculation method and examples of calculations for each hydrological aspect.

Based on the explanation, material expert validators provide constructive assessments and suggestions so that the product can be used optimally. From the assessment scores and suggestions, it can be concluded that the animated video learning media is feasible to use.

Media expert validation was also carried out in the second week of July 2020 by filling out instruments. The media expert validator for the product being developed is a lecturer in Education Technology at the State University of Jakarta and a media expert lecturer at Gunadarma University. Data from the validation results in the form of the percentage score of the assessment instrument in the form of questionnaires obtained from the two validators (v1 and v2) media experts

based on the assessment aspects can be presented in the table 6:

Table 6. Material Validation Results

Aspect	V1 (%)	V2 (%)	Average Percentage
Text	80	100	90
Color combination	90	100	95
Animation	90	100	95
Serving format	80	100	90
Media usage	80	100	90
Media implementation	90	100	95
Total average percentage			92,5

Several indicators in the validation results are included in the category of strongly agree and several indicators are included in the category of agree. In addition to providing scores on the instrument, the validator also provides suggestions and input for the animated video learning media that has been developed, which is to reduce the volume of the background music slightly.

Based on the explanation, media expert validators provide constructive assessments and suggestions so that the product can be used optimally. From the assessment scores and suggestions, it can be concluded that the animated video learning media is very feasible to use.

After the animated video learning media for the Urban Drainage course was validated by media experts and material experts, the product was revised. The validation process and results have been described in the previous sub-chapter. After the product revision, the next step in the development stage is development testing where at this step the product is tested on students.

This trial was carried out on 5 students who took the Urban Drainage course in

semester 112 or even semester of 2020. This trial was carried out on July 14, 2020 through an online platform in the form of Google Classroom and filling in student responses via Google Form. The following are the results of student assessments as users in the trial of learning media products in the form of animated videos that were developed.

Table 7. Student Assessment Results

Aspect	Average Percentage
Interest	87%
Material	88%
Design	89%
Animation	91%
Media usage	90%
Media implementation	88%
Average	
	88,9%

Based on the explanation, students give an assessment so that the product developed can be used optimally. From the total percentage of the average score of 88.9%, it can be concluded that the animated video learning media is very feasible to use.

In addition to student assessments, this trial also conducted a limited pre-test (initial test) and post-test (final test). The pre-test (initial test) contains 10 multiple choice questions to get students' initial scores before using learning media. The post-test (final test) contains 10 multiple choice questions with the same difficulty after students use learning media. The results of the pre-test (initial test) and post-test (final test) are presented in the table 8:

Table 8. Score of pre-test and post-test

No	ID	Pre-test	Post-test
1.	1503617022	80	100
2.	5415162755	60	70
3.	5415163145	60	80
4.	5415163154	70	90
5.	1503617058	80	90
Rata-rata		70	86

Based on the table 8, the average pre-test score is 70, and the average post-test score is 86. Then, the normality test, homogeneity test, and paired t-test were carried out to test the hypothesis with evaluation criteria using SPSS version 22 software. The following are the results of the normality test of the pre-test scores and post-test scores as follows:

Table 9. Normality Test

<i>Kolmogorov-Smirnov</i>			
	<i>Statistic</i>	<i>df</i>	<i>Sig.</i>
<i>Pre-Test</i>	,241	5	,148
<i>Post-Test</i>	,237	5	,200

Based on the table 9, the significance of the pre-test value = 0.148 and the post-test value = 0.200. Both of these significance values are greater than = 0.05 then the data is normally distributed. The following are the results of the normality test of the pre-test scores and post-test scores as follows:

Table 10. Homogeneity Test

<i>Levene Statistic</i>	<i>df1</i>	<i>df2</i>	<i>Sig.</i>
,060	1	8	,812

Based on the table above, the significance obtained is $0.812 > 0.05$, so it can be concluded that the data obtained are homogeneous from the same variation. The following are the results of the paired T-test from the pre-test scores and post-test scores as follows:

Table 10. Paired T-Test

	<i>t</i>	<i>f</i>	<i>Sig. (2-tailed)</i>
<i>Pair 1</i>	<u><i>Pre-test</i></u> <u><i>Post-test</i></u>		
	6,532		0,003

The significance value (2-tailed) obtained based on the table above is $0.003 < 0.05$, so it can be concluded that there is a significant difference between the pre-test score and the post-test score. The t value obtained from the table above is -6.532. The t-count value is negative because the average pre-test score is lower than the post-test average score. In this context, it means that the average post-test score is higher than the average pre-test score. However, the results of this trial were only limited to a few students, so it was necessary to test the effectiveness of using media on a larger scale for a more accurate analysis.

The product of learning media development in the form of animated videos for the Urban Drainage course aims to provide a visually sustainable interaction response so that understanding of teaching materials can increase (Lestari, et al., 2017). In addition, the development of animated video learning media is made so that students are more active, have a higher curiosity, are more motivated, and are enthusiastic in learning (Sudiarta et al, 2016; Sastradika et al., 2021). The product developed is in the form of 4 (four) videos with a duration of 7-10 minutes containing basic concepts of urban drainage, hydrological aspects of urban drainage systems, drainage complementary buildings, and operation/maintenance of drainage systems.

A good animated video media must meet the criteria for a feasibility assessment by experts (Sulistiyowati, et al., 2018). The feasibility assessment or validation was carried out by two material experts and two media experts from the State University of Jakarta and Gunadarma University. The total percentage of the average score from the validation results by two material experts is 80% so that it can be interpreted that the Urban Drainage learning media product is suitable for use in learning. The total percentage of the average score from the validation results by two media experts is 92.5% so that it can be interpreted that the Urban Drainage learning media product is very suitable for use in learning. In a limited trial, the product was assessed by students as product users. Assessment from students get a percentage of 88.9%. In addition to assessing the product, students also did a pre-test and post-test and obtained a significant increase in the average score.

This animated video learning media product has several advantages and disadvantages. The advantages of this learning media product, among others, have attractive visuals so that students who use animated video learning media tend to be more active, have higher curiosity, are more motivated, and eager to learn (Sudiarta et al, 2016; Rosdiana & Ulya, 2021) so that student learning outcomes can increase (Rohmawati, 2018). This learning media can also convey the concept of object imagination in the material (Permatasari, et al., 2019) and provide continuous interaction responses so that understanding of teaching materials can increase (Lestari, et al., 2017; Ratnawati et al., 2020; Sugiharti et al., 2020). Animated video learning media can be used for classroom learning and online learning that can be accessed anywhere and anytime (Islamiy, et al., 2018). Animated videos can be uploaded to be accessed anytime and anywhere by anyone (Lianto, et al., 2020; Szofia Szeszak, et al., 2015) so that it has a positive effect and can be used for distance learning (Nur, et al.,

2019). The shortcomings of this learning media product include, the material presented in the animated video is limited so it requires the use of e-modules in learning (Bambang Eka Purnama, 2013). In addition, if the video learning media is distributed by uploading it to the internet, it will require a large internet quota fee for students to access it (Batubara, et al., 2020).

Conclusion

The development of animated video learning media for the Urban Drainage course in the Building Engineering Education Study Program FT UNJ has been carried out through several stages according to the 4D development model, namely define, design, develop and disseminate. The animated video learning media was declared suitable for use from the material aspect and declared very suitable for use from the media aspect. In a limited trial, this animated video learning media was declared very suitable for use by students as product users.

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