



Learning Media Development Based on 3D (3D) Animation Videos in Courses Mechanics Technique



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Article history:

Submitted: 27 Dec 2022

Revised: 18 Jan 2023

Accepted: 05 Feb 2023

Keywords:

*3D animation,
engineering mechanics;
learning media;
research and development
method;*

Abstract

This study aims to: (1) produce 3-dimensional (3-D) animated video-based learning media in the Engineering Mechanics course. (2) Knowing the feasibility level of 3-dimensional (3-D) animated video-based learning media in the Engineering Mechanics course. This research employed to research and development methods to develop learning media based on 3-dimensional (3-D) animation videos. The learning media development procedure is carried out through (1) the preliminary study stage, which consists of a literature review and a field study; and (2) the development stage, which is carried out by making a draft of a model design that is divided into three parts, including: compiling materials, making scripts, preparing 3-dimensional (3-D) animation videos, and editing animation videos. Furthermore, validation of assessments by material experts, media experts, and learning experts, as well as limited trials to assess the feasibility of the learning media created; (3) The evaluation stage is the final stage of the development process related to the final model of 3-dimensional (3-D) animated video-based learning media in the Engineering Mechanics course. The results of the Study show that 3-dimensional (3-D) animated video-based learning media in the Engineering Mechanics course get a feasibility level based on the assessment of media experts, with a percentage of 97% showing it is very feasible, learning experts with the percentage of 84% showing it is very feasible, and material experts with a percentage of 93% showing it is very feasible. The results of a limited trial of 30 students showed a percentage of 88%, indicating that it was feasible.

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1 Introduction

Engineering Mechanics science balance is one discipline of knowledge that must be mastered by students Civil Engineering Department. The objective eye studying Engineering Mechanics is to learn characteristics and structure. From a Civil Engineering perspective, the traits structure above is characteristic features of base planning construction. During the learning process, students were taught how to determine the direction force, the force acting, and the necessary calculations (Wu & Chiang, 2013; Iwasa, 2015). However, based on the experience of the researchers in the class, most students need help understanding the information lecturer. Sometimes, media and methods are used to prevent lecturers. No, complete the learning process taught in class. Students' inability to understand the material presented by the lecturer, the inactivity of students in class, and the lack of Spirit Study caused by the use of media and techniques less teaching creative. Therefore, the achievement mark for student eye studying Engineering Mechanics in the Department of Civil Engineering at Pontianak State Polytechnic got seen as follows:

Percentage of Final Course Grades Mechanics of Technique Student Semester I Year Academic 2021/2022

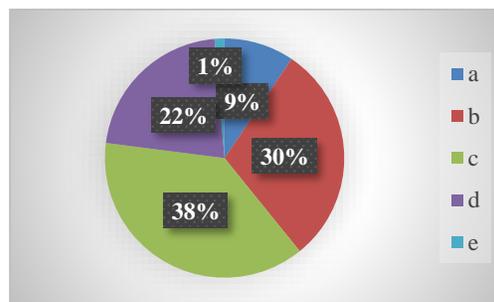


Figure 1. Achievement of Student Values

What is meant by "learning media" is all something used in activity learning to awaken students' ideas, feelings, interests, and concerns so that the interaction communication educative between lecturers and students can happen in a manner effective and efficient. Because of technological progress, they are learning media video-based 3D animation is one of the current learning media breakthroughs. Compared to media like modules or books, animation videos increase the imagination and curiosity of students because, in a manner, cognitive students are stimulated to imagine how animated movies indeed serve. With increasing enthusiasm, students and facilities understand the Study and believe the results study they will increase (Mayer, 2002; Pichler & Hellmich, 2011).

2 Materials and Methods

The method used in the Study is the method of research and development (*Research and Development*). The research will be developed as a learning medium based on a 3-dimensional (3D) animation video. Steps Study *Research and Development* follow the method Sugiyono (2013), which is explained in the following picture:



Figure 2. Stages Study Research and Development

Draft activity study this is only up to the learning media of feasibility test eye studying Engineering mechanics continued with final model evaluation. With this, the three-step simplification method research conducted by researchers that is with share study becomes three-part, namely: stage studies introduction, stage media development, and stages evaluation described in Figure 3.2 as follows:

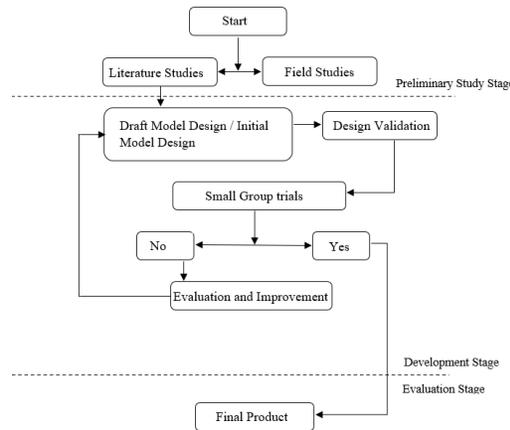


Figure 3. Procedure Flow Development

Research instruments are tools used to measure phenomena naturally or to measure phenomena observed socially. The data collection tool referred to in the Study. This is an interview with several experts and students as media users. Assessment of learning media-based animation given to one expert material, one media expert, and one expert learning. After evaluation by experts, revision following results evaluation from experts. After the revised test, try to return in a manner limited to the student (Königsberger et al., 2018; Mayer, 2003). In studying this, the researcher makes 1st-semester students for become subjects Study for trial limited. Thirty students will make a sample in Study. This is what follows eye studying Engineering Mechanics. To evaluate the feasibility of learning media that has been made, then used scale measurement with the use of scale *Likert*. Variables that will be measured and described become indicator variables. The indicator variable is a point reject to compile instrument items that can form statements and questions. Answer every instrument item that uses a scale *Likert* has gradation from very positive to very negative (Van Oosterom, 2013; Xiaobo et al., 2008).

Likert scale based on opinion Sugiyono (2013) is explained in table 1 and table 2 as follows:

Table 1
Criteria Evaluation appropriateness

Categories Research	Score
Very Worthy	5
Worthy	4
Worthy Enough	3
Not Worthy	2
Very Unworthy	1

Table 2
Interpretation of Feasibility Results Study

Category Study	Interpretation
Very Worth it	Material experts, media experts, and experts learning state that learning media-based 3D animation is very decent used as a learning medium
Worthy	Material experts, media experts, and experts learning state that learning media-based decent 3D animation used as a learning medium
Enough Worthy	Material experts, media experts, and experts learning state that learning media based enough 3D animation worthy used as a

	learning medium
No Worthy	Material experts, media experts, and experts learning state that learning media-based 3D animation is not worth using as a learning medium
Very No Worthy	Material experts, media experts, and experts learning state that learning media-based 3D animation is not very worthy of being used as a learning medium

The calculation process percentage done with the method compares the score obtained with the expected score. Percentage counted with use formula as following:

$$\text{Percentage} = \frac{\text{Scores obtained}}{\text{Expected score}} \times 100\%$$

3 Results and Discussions

A study was done in 3 stages, namely;

Studies introduction

At this stage, this is done studies literature and studies field. Studies literature looked for several references and libraries related eye studying Engineering Mechanics. Studies field with method do observation and identification of existing problems.

Stage Development

Stage this consists of some parts:

- We are drafting material Engineering mechanics based on the RPS in the eye studying Engineering Mechanics.
- Production 3 -of dimensional (3D) animation according to the material eye studying existing engineering mechanics with the user device hard (Laptop) with the help of *SketchUp software*
- and the animation will be implemented in an *e-module* interactive as learning media.
- Editing 3-dimensional (3D) animated videos using software like Prezi video, *canvas*, and *sketchfab*. At a stage, This generated *output* is an *e- module* interactive eye studying Where Engineering Mechanics is? Inside, it is accompanied by an explanatory video with a visualization 3-of dimensional (3D) animation on the material Engineering Mechanics. The contents of the e- module as below this:



Figure 4. Cover page e- module

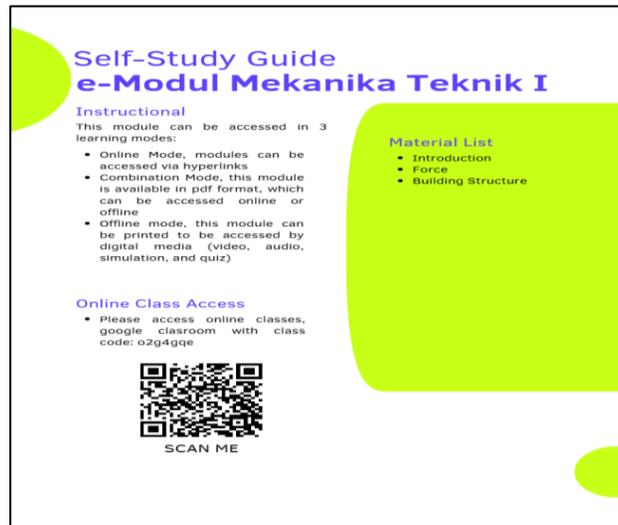


Figure 5. Study guide e- module

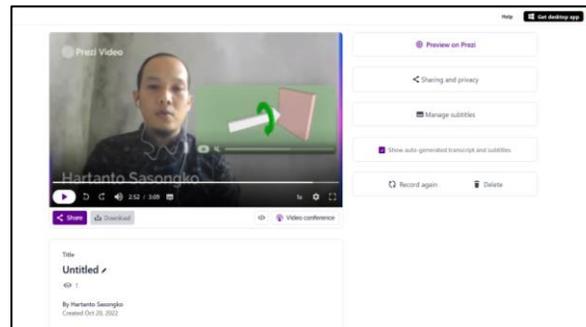


Figure 6. Explanation of 3D animation videos

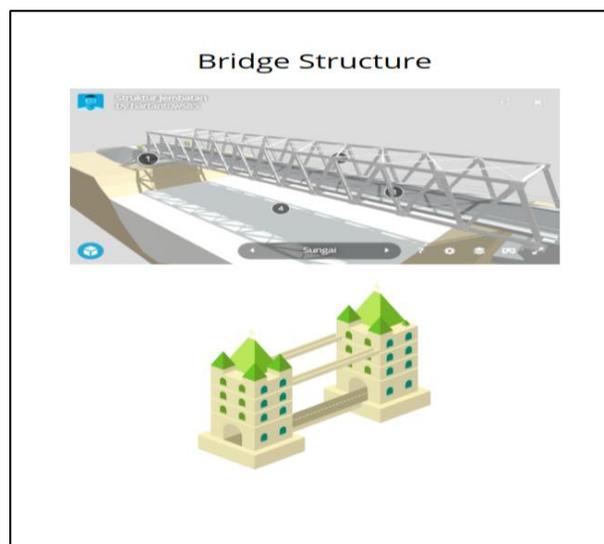


Figure 7. 3D animation of structures

To reach the results of good teaching media, so will do learning media validation based on 3-dimensional (3D) animation on the eye studying Engineering Mechanics. Validation process development of learning media performed

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by experts, i.e., an expert in the media field, an expert in field learning, and an expert in field material, as well for support validation so reinforced by responses students on learning media based 3 -dimensional (3D) animation on the eye studying Engineering Mechanics that has made (Chan, 2015; Huda & Maulana, 2022).

e. Learning media validation

Media Expert Validation

Media experts who become validators in learning media-based 3D animation are Lecturer Pontianak State Polytechnic, Department of Electrical Engineering, informatics Engineering Study Program, which has skill in the electronic media field.

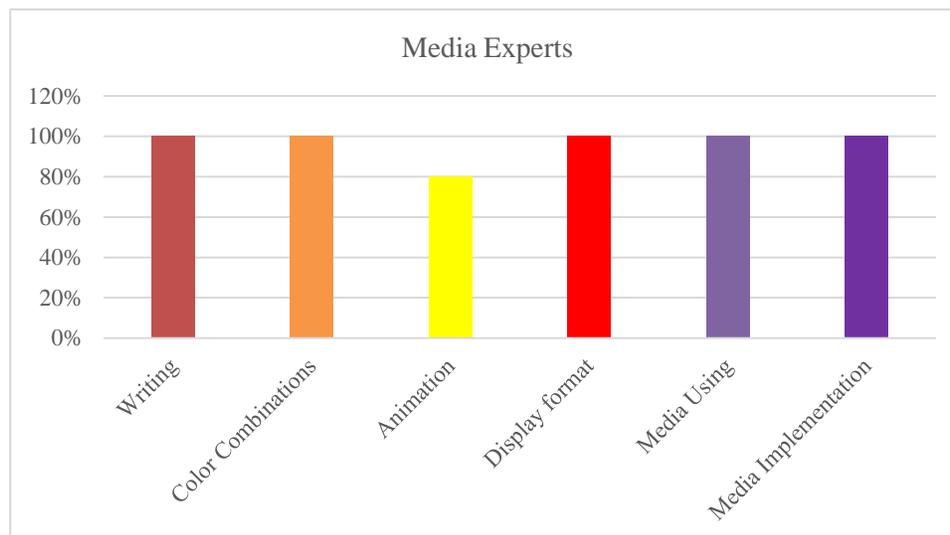


Figure 8. Chart Media Expert Assessment

Based on the above results, percentage validation carried out by a media expert's average presentation with a value of 97% indicates a very decent category used. As for suggestions and input from the given Media Expert is as follows: 1) For material more developed Again For level carry on kindly general Media Experts provide the above suggestions to improve learning media so that you can use it in a manner maximum. After considering the achievements of the value above, the Media Expert concluded that learning media-based 3D eye animation while studying Engineering Mechanics is "Very Feasible used".

Learning Expert Validation

They are learning Expert Validation from the Lecturer at Pontianak State Polytechnic in charge of field education. In matter, this is Learning Expert do learn media validation stale 3D eye animation studying Engineering Mechanics.

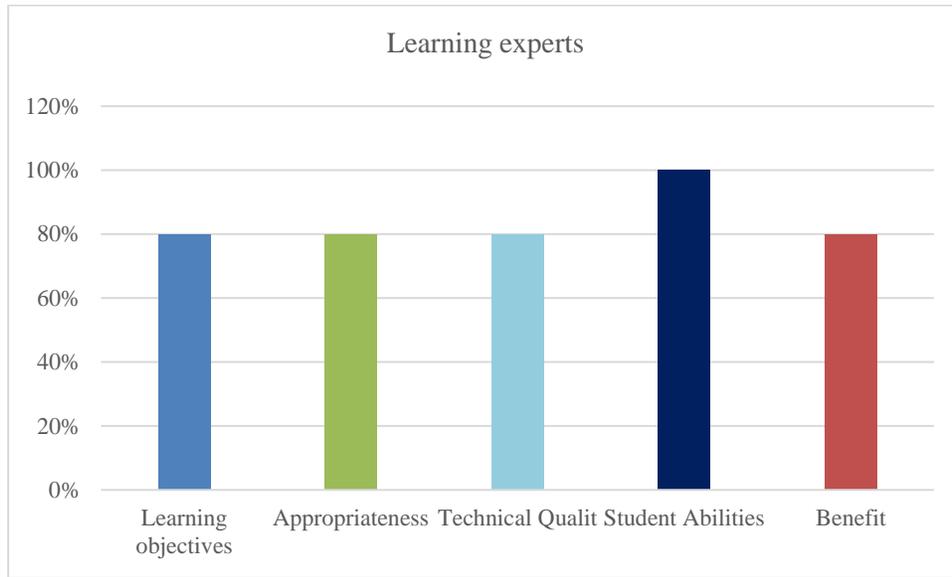


Figure 9. Chart Learning Expert Assessment

Based on the chart above, validation carried out by Learning Experts gets an average presentation with a mark of 84%, showing a very decent category used. As for suggestions and input from Learning Experts is as follows: 1) Learning media need to be combined with SCL (*Student Learning Center*) so that development material is more concrete and included in the environment strategy in West Kalimantan. Kindly General Learning Expert, provide the suggestions above to improve learning media so that you can use it in a manner maximum. After considering the achievements grade above, Learning Expert concludes that learning media based 3 -dimensional (3D) animation on the eye studying Engineering Mechanics " Sangan Worthy used" (Trujillo, 2019; Suarez et al., 2018).

Material Expert Validation

Lecturer Pontianak State Polytechnic does Material Expert Validation. This is Material Expert learning media validation stale 3 -dimensional (3D) animation on the eye studying Engineering Mechanics.

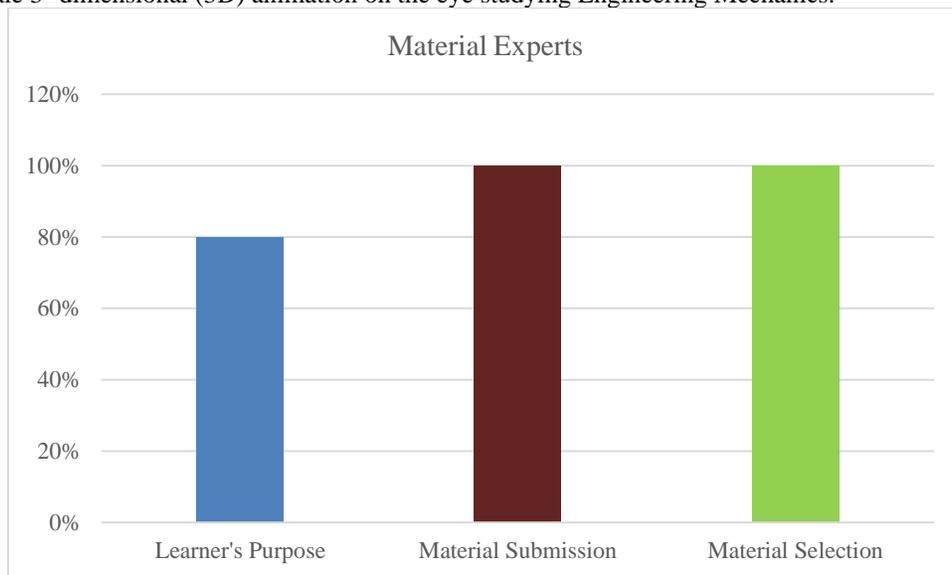


Figure 10. Chart Material Expert Assessment

Based on the table, the above-average percentage validation carried out by Material Experts gets an average presentation with a value of 93%, which shows a very decent category used. With consider several achievements valued above, Material Experts conclude that learning media based 3 -dimensional (3D) animation on the eye studying Engineering Mechanics "Very Feasible used".

Trial Results Student

Students evaluate learning media-based 3D animation that follows the eye studying Engineering Mechanics I. Trial This is done at the time eye studying Engineering Mechanics I in progress by as many as 30 students.

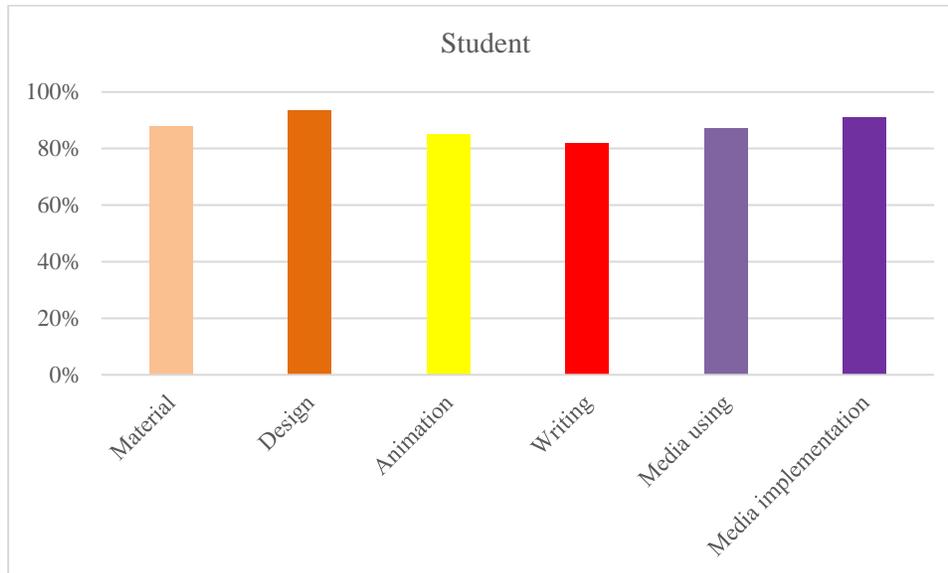


Figure 11. Chart Evaluation Student

Based on the table, the above-average percentage validation carried out by students gets an average presentation of 88%, which shows a very decent category used. The responses and suggestions from the student for repairing learning media products made, namely as follows:

1. Learning media implemented in the e- module only can be accessed online, preferably the file size of the e- module created. It no too big.
2. Explanatory video material is reproduced again with added duration.
3. Material on the e- module can share before eye studying starts to prepare the internet data package (network).
4. 3 -dimensional (3D) animation designs are created more interesting again.

Response student provides the suggestions above: To improve learning media so that you can use it in a manner maximum. After considering the value of the achievement above, the student chose to learn media based 3 -on dimensional (3D) animation on the eye, studying Engineering Mechanics "Very Feasible used."

Stage Evaluation

The final model is a learning media based on a 3D (3D) animated video validated by experts and revised according to expert input. The development of learning media based 3 -dimensional (3D) animation aims To help the student understand eye material studying Partial Engineering Mechanics ample the material needs logic and calculations in analysis style on the structure because with use 3D (3D) animation can help the student visualize form structure construction as well as directions the force acting on the structure (Ridayanti & Sumarjo, 2017; Setiawan, 2015; Titania & Widodo, 2020). One advantage of learning media This that it is combined in an e - module interactive, which is very easy to use with a design that is attractive and accessible. E- module this Can be accessed by students quickly from anywhere with the use of *smartphones* or laptops. On the e- module, there is description-related material. There is also explanatory video-related material accompanied by 3D animation with an attractive display,

so that material easy understood and not dull. The combination of e -modules, videos, and 3 -dimensional (3D) animations make learning media very helpful in distributing information (Isjoni, 2010; Moreno & Mayer, 2010).

According to Oetomo (2002), commonly interpreted multimedia as a combination of text, images, art graphics, animation, sound, and video. The various media combined become One unity work to produce something information that is not only can see as a results mold but also can hear, formed simulation and animation that can awaken interest and have mark art high graphics in presentation. Ariani & Haryanto (2010) argued that multimedia is divided into linear and interactive categories. Linear multimedia is not equipped with a tool controller, whatever the user can operate. This multimedia walks sequentially (in order). Interactive multimedia is an equipped multimedia with a tool controller that can be operated by the user so that the user can choose what is desired for the following process. Development of learning media based 3 -dimensional (3D) animation refers interactive multimedia category, namely learning media that is equipped tool controller that the user can control (Apriansyah, 2020; Aunurrahman et al., 2012).

4 Conclusion

Based on the results of research and discussion on the Development of 3 Dimensional (3D) Animation-based Learning Media in Engineering Mechanics Courses, it can be concluded that:

- a. Compiled a learning media based on 3 -dimensional (3D) animated videos on e - modules Engineering mechanics
- b. Media experts conclude that learning media-based video 3 -dimensional (3D) animation on the eye studying Engineering Mechanics is very suitable to be used as a tool in the learning process as a variation and easily understood by students.
- c. Learning experts concluded that 3-dimensional (3D) animation-based learning media for Engineering Mechanics courses is appropriate for the learning process for Engineering Mechanics courses to suit SCL (Student Center Learning).
- d. The material expert concluded that 3-dimensional (3D) animation-based learning media for Engineering Mechanics courses were appropriate for the learning process for Engineering Mechanics courses to make them easier to understand and increase student learning motivation.
- e. The results of the trial of 3-dimensional (3D) animation-based learning media in the Engineering Mechanics course in the Civil Engineering Department, which were conducted on 30 students, it can be concluded that student responses regarding 3-dimensional (3D) animation-based learning media show that this media makes it easier for students understand the material, effectively reduce boredom, and increase student learning motivation, this is following the results of student trials categorizing 3-dimensional (3D) animation-based learning media as very suitable for use in the learning process.

From the several stages of assessment and testing, learning media based on 3-dimensional (3D) animation in the Engineering Mechanics course at the Pontianak State Polytechnic Civil Engineering Department is very suitable for learning.

Conflict of interest statement

The author(s) declared that (s)he/they have no competing interest.

Statement of authorship

The author(s) have a responsibility for the conception and design of the study. The author(s) have approved the final article.

Acknowledgments

Acknowledgments are primarily addressed to research funders or donors. Thank-you notes were also conveyed to parties who assisted in the implementation of the research.

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