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# Feasibility Analysis of Animation Video Learning Media Based Powtoon on Lagrange Mechanics

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**ABSTRACT**
Physics learning related to mathematical equations needs to be arranged in an interesting, fun, and easy way to understand the material. Learning that is packed with fun will attract students' interest in learning more. This study aims to test the feasibility of animation video learning media based Powtoon on Lagrange mechanics material. This research is research and development using the ADDIE model design (analysis, design, development, implementation, and evaluation). The feasibility test data were analyzed using descriptive statistical analysis. The results showed that the animated video learning media based Powtoon was feasible to use in physics learning for Lagrange mechanics. The findings of this study can be used as a further reference for researchers who will conduct Lagrange mechanics learning experiments using animated videos based on Powtoon.

**INTISARI**
Penelitian ini bertujuan untuk memfasilitasi peserta didik agar mudah memahami konsep mekanika analitik serta peserta didik tidak bosan dengan penjelasan yang diberi kan. Dalam pembelajaran yang berhubungan dengan angka kita harus menyusun atau membuat pembelajaran sedemikian rupa hingga menarik dan kita dapat memahami materi tanpa rasa beban. Pembelajaran yang menarik akan lebih menarik minat siswa untuk mempelajarinya. Metode penelitian yang digunakan yaitu Research and Development atau R&D (Penelitian dan Pengembangan). Penelitian dan pengembangan pendidikan (research and development) bertujuan untuk menghasilkan produk baru melalui proses pengembangan. Prosedur pengembangan yang dilakukan pada penelitian ini adalah sebagain dari model ADDIE (Analysis, Design, Development, Implementation, Evaluation). Yang dimaksud dengan sebagian yaitu kita tidak menggunakan semua metode tersebut melainkan hanya sampai uji kelayakan. Hasil penelitian menunjukan bahwa media pembelajaran video animasi yang dibuat peneliti layak digunakan.

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## A. Introduction

Physics is one of the subjects taught in high school in Indonesia. Physics is a branch of natural science that studies physical phenomena that occur in everyday life [1]. Furthermore, physics is the study of matter and energy such as heat, sound, and light [2]. Physics is also one of the basic sciences that underlie various other sciences. The object of study studied in physics includes objects and their movements and their benefits for human life. While based on history, physics is the oldest science that begins with observing objects in the sky, their period, how old they are, and their trajectories [3]. Therefore, physics is one of the basic natural sciences and is widely used as a basis for other related sciences.

In physics, there is a branch of science that studies the motion of objects called mechanics. One of the branches of mechanics that studies the motion of objects analytically with a mathematical coordinate approach is analytical mechanics [4]. Furthermore, the study of analytical mechanics is also approached with two main approaches, namely the Lagrange and Hamilton approaches. The Lagrange approach or what is often referred to as Lagrangian mechanics is an approach in analytical mechanics that uses general coordinates and corresponding general velocities in the configuration space [5]. In addition, Lagrangian mechanics is also an analytical method in mechanics that does not consider the presence of forces in the resulting motion. The main considerations in the analysis of Lagrangian mechanics are kinetic energy and potential energy [6].

Meanwhile, Hamilton's approach or what is often referred to as Hamiltonian mechanics is an approach in analytical mechanics that uses appropriate coordinates and moments in phase space [7]. These two approaches in analytical mechanics are equivalent to the Legendre transformations of general coordinates, velocity, and momentum. Therefore, both contain the same information to describe the dynamics of an object's system. In describing the dynamics of an object system, sometimes the Lagrangian and Hamiltonian approaches are taught separately in physics lessons. This is because the two approaches contain material that is quite difficult for students to learn [8]. Although the analytical mechanics material is a study of classical physics, many students consider this material to be one of the difficult physics materials to understand [9]. This is evident from the results of the learning evaluation obtained by students for analytical mechanics material from high school to university level which is still low [10].

One of the reasons why Lagrange and Hamilton's material is difficult to understand is that both materials contain second-order differentials and integrals [11]. Another reason why physics is difficult to learn is that students have instilled the mindset that physics is difficult. This results in many students being lazy to study physics because the material is considered difficult which only struggles with numbers and formulas [12]. Meanwhile, steps that can be used to make it easier for students to learn analytical mechanics material are by developing more fun physics learning. In

developing a fun physics learning atmosphere, steps that can be taken are to create learning media that attracts interest and makes it easier for students to understand Lagrange and Hamilton's material [13]. The media used in learning has a function as a tool to clarify the material message conveyed by the teacher [14].

The use of learning media in conveying the concept of the material also needs to be adjusted to the needs of students and the readiness of supporting facilities and infrastructure. Learning media that suits the needs of today's students are computer-based learning media [15]. One of the learning media that attracts students' interest and makes it easier for students to understand analytical mechanics material is through animated videos [16]. Furthermore, the animation is a combination of three elements, namely sound, image, and text [17]. In the development of learning media in the form of animated videos, there is one free software that is often used, namely Powtoon. Learning media-based Powtoon is one of the multimedia applications that can be used as learning media because it can attract interest and make it easier for students. This is because Powtoon features handwritten animation, cartoon animation, and more vivid transition effects, and very easy timeline settings [18]. Thus, this research will develop animation video learning media based Powtoon on Lagrange mechanics material. Research on the development of animated video learning media-based Powtoon aims to facilitate students to easily understand the concept of analytical mechanics. It is hoped that students will not get bored with the explanation of analytical mechanics given by the teacher.

## B. Method

This research is a research development or R&D that is used to produce a product and test the effectiveness of the product. Each product developed requires different research procedures. The development procedure carried out in this study implements part of the ADDIE model stages (analysis, design, development, implementation, evaluation) [19]. Some of the stages of the ADDIE development approach used in this research include analysis, design, and development. The implementation and evaluation stages are not used in this development research, but only in the product feasibility test stage. Meanwhile, the product developed is in the form of learning media in the form of based animated videos based on Powtoon. The details of the product development stage in this study include analysis, design, development, and feasibility testing. The analysis phase is carried out by analyzing the teaching materials and media used in learning Lagrange mechanics. At this stage, observations were also made on analytical mechanics learning activities.

Observation activities aim to find out the obstacles that occur when students are learning, both in terms of material and analytical mechanics media used by teachers. Meanwhile, the design stage is carried out by determining the elements that will be included and developed into animated videos based on Powtoon. In facilitating the development of animated video media-based Powtoon, the steps taken are by

compiling a storyboard that contains an outline of animated video-based Powtoon content. The main part of the storyboard includes template design and Lagrange mechanics material. Meanwhile, the development stage is carried out by making an animated video based on Powtoon according to the instructions that have been compiled on the storyboard. After the animation video-based Powtoon has been developed, the next step is to conduct a feasibility test for the animated video-based Powtoon. This feasibility test phase was carried out to know whether the animated video media-based Powtoon was worthy of being used as an alternative learning media for Lagrange mechanics material or not.

The feasibility test stage is carried out using a survey to students by filling out a questionnaire developed via Google forms. The questions contained in the Google form include the initial appearance of the media, the ease of starting the media, the suitability of the typeface in the media, the display of images contained in the media, understanding the material after using the media, learning independence with the help of media, the interest in learning by using the media, whether is animated video media suitable for learning Lagrange mechanics? In addition, the reasons, and suggestions for learning Lagrange mechanics with the animated video were also asked the students. The prepared questions were given to 46 students. The questions posed to the students were based on two main indicators, namely video assessment, and material understanding by using animated video media-based Powtoon [20]. Furthermore, the details of the number of questions posed to students consisted of 10 questions with details as presented in Table 1.

Table 1. Media eligibility indicators

| Indicator | Number | Total |
|---|---|---|
| Video assessment | 1, 2, 3, 4 | 4 |
| Understanding the material using media | 5, 6, 7, 8, 9, 10 | 6 |

Based on Table 1, the ten questions contained in the questionnaire were used to collect data on the feasibility of animation videos based on Powtoon on Lagrange mechanics material. The assessment of the responses or answers given by the students on each question item refers to a five-scale assessment [21]. The five-scale assessment used in the feasibility assessment of animation videos based Powtoon on Lagrange mechanics material can be presented in Table 2.

Table 2. Rating scale five

| Category | Value |
|---|---|
| Very Feasible | 5 |
| Feasible | 4 |
| Quite Feasible | 3 |
| Unfeasible | 2 |
| Very Unfeasible | 1 |

## C. Result and Discussion

The physics learning product developed in this research is an animated video learning media-based Powtoon to facilitate the understanding of Lagrange mechanics material. The product developed in this study refers to two main indicators of learning media development, namely video assessment, and understanding of material using media. Meanwhile, the two indicators were then formulated into ten questions that were answered by students. The questions given to students to determine the feasibility of the learning media developed were regarding the initial appearance of animated video learning media-based Powtoon. The results of student responses regarding the feasibility of the media in terms of the initial appearance of the media can be shown in Figure 1.

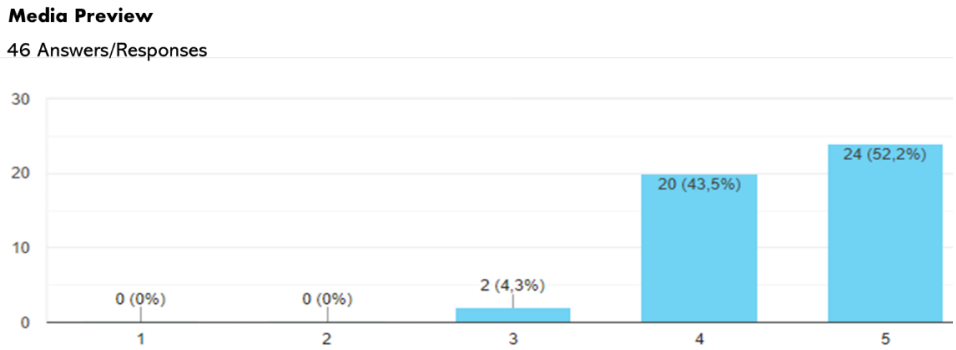


Figure 1. Student responses to the media preview

Based on Figure 1, it can be shown that the initial appearance of animated video learning media based Powtoon is generally very suitable to be used as an alternative learning media that facilitates understanding of Lagrange mechanics material. This is evidenced by 4.3% of 46 respondents who stated that it is quite feasible; 43.5% said it was feasible; 52.2% said it was very feasible. Meanwhile, the results of student responses regarding the feasibility of the media in terms of ease of starting the media can be shown in Figure 2.

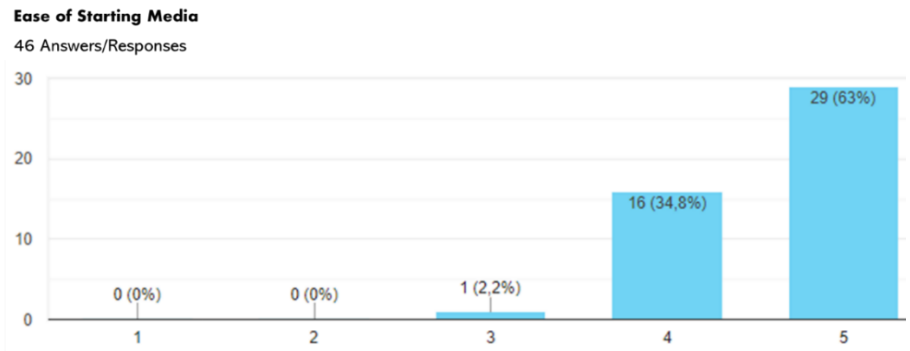


Figure 2. Student responses to the ease of starting media

Based on Figure 2, it can be shown that the ease of starting animated video learning media based Powtoon is very feasible to use as an alternative learning media that facilitates understanding of Lagrange mechanics material. This is evidenced by 2.2% of 46 respondents who stated that it was quite feasible; 34.8% said it was feasible; 63% said it was very feasible. Meanwhile, the results of student responses regarding the feasibility of the media in terms of the suitability of the typeface in the media can be shown in Figure 3.

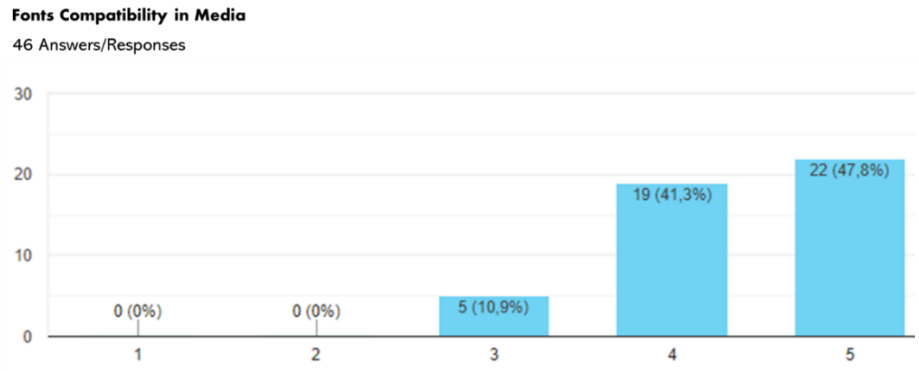


Figure 3. Student responses to font compatibility in the media

Based on Figure 3, it can be shown that the suitability of the typeface in animated video learning media based Powtoon is generally very suitable to be used as an alternative learning media that facilitates understanding of Lagrange mechanics material. This is evidenced by 10.9% of 46 respondents who stated that it is quite feasible; 41.3% said it was feasible; 47.8% said it was very feasible. Meanwhile, the results of student responses regarding the feasibility of the media in terms of the appearance of the images contained in the media can be shown in Figure 4.

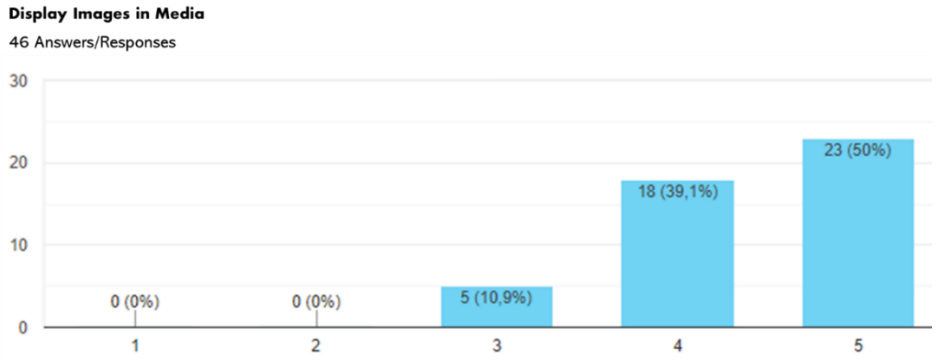


Figure 4. Student responses to the display images in the media

Based on Figure 4, it can be shown that the display of images contained in animated video learning media based Powtoon is very suitable to be used as an

alternative learning media that facilitates understanding of Lagrange mechanics material. This is evidenced by 10.9% of 46 respondents who stated that it is quite feasible; 39.1% said it was feasible; 50% said it was very feasible. Meanwhile, the results of student responses regarding the feasibility of the media in terms of understanding the material after using the media can be shown in Figure 5.

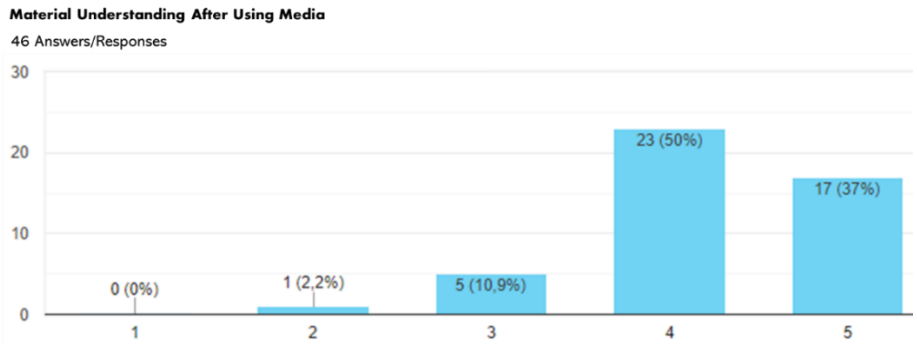


Figure 5. Student responses to material understanding after using the media

Based on Figure 5, it can be shown that understanding the material after using animated video learning media based Powtoon is generally feasible to use as an alternative learning media that facilitates understanding of Lagrange mechanics material. This is evidenced by 2.2% of 46 respondents who stated that it is not feasible; 10.9% said it was quite feasible; 50% declared eligible; 37% said it was very feasible. The results in this aspect are only in the appropriate category and make this aspect the lowest response to the questions asked to the respondents. This is because students still argue that Lagrange mechanics remains a difficult material to understand [22]. Furthermore, with variations in learning media in the form of animated videos based on Powtoon, it does not necessarily make Lagrange material an easy level material, but only makes it easier to understand the material. Meanwhile, the results of student responses regarding the feasibility of the media in terms of independent learning with the help of the media can be shown in Figure 6.

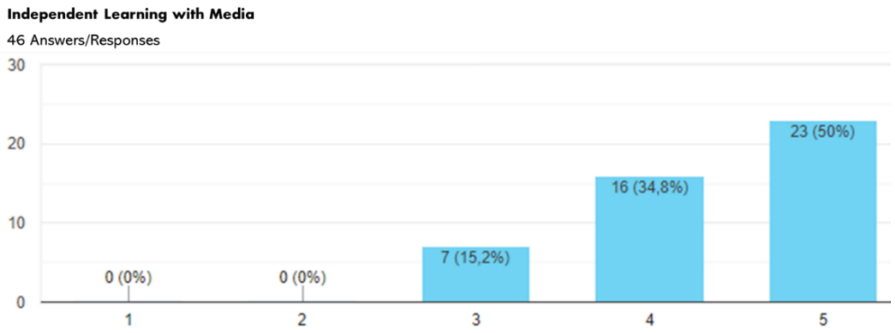


Figure 6. Student responses to independent learning with the media

Based on Figure 6, it can be shown that independent learning with the help of animated video learning media based Powtoon is generally very suitable to be used as an alternative learning media that facilitates understanding of Lagrange mechanics material. This is evidenced by 15.2% of 46 respondents stating it is quite feasible; 34.8% said it was feasible; 50% said it was very feasible. Meanwhile, the results of student responses regarding the feasibility of the media in terms of attractiveness in learning using media can be shown in Figure 7.

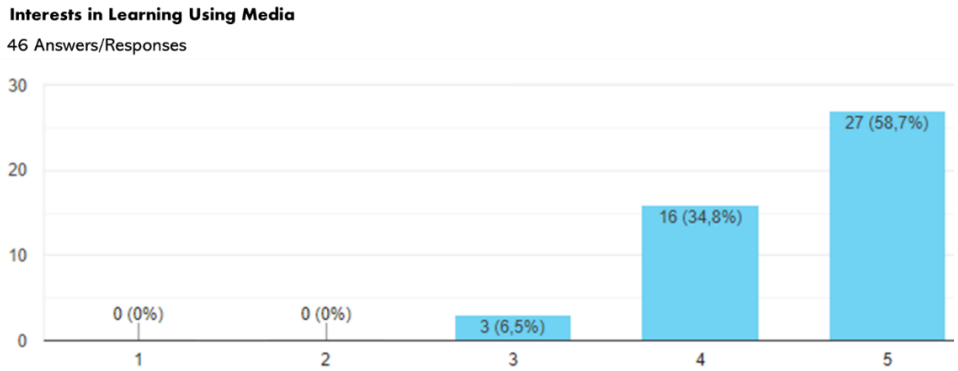


Figure 7. Student responses to the interest in learning using media

Based on Figure 7, it can be shown that the interest in learning by using animated video learning media based Powtoon is generally very feasible to be used as an alternative learning media that facilitates understanding of Lagrange mechanics material. This is evidenced by 6.5% of 46 respondents who stated that it was quite feasible; 34.8% said it was feasible; 58.7% said it was very feasible. Meanwhile, the results of student responses regarding the feasibility of media from a summary of the ten questions posed to students can be shown in Figure 8.

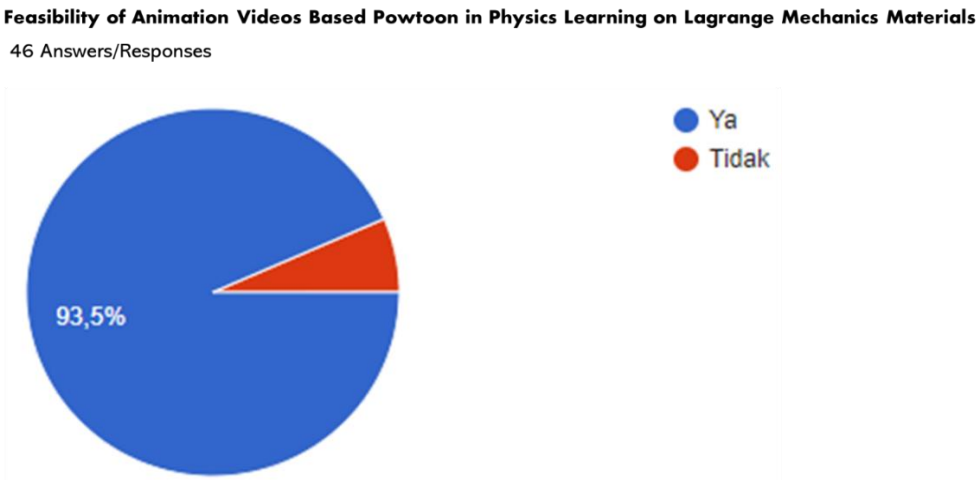


Figure 8. Feasibility of animation videos based Powtoon in Lagrange mechanics

Based on Figure 8, it can be shown that animated video learning media-based Powtoon is generally feasible to be used as an alternative learning media that facilitates understanding of Lagrange mechanics material. This is evidenced by 93.5% of 46 respondents or about 43 respondents stating yes or worthy of being used as a medium for physics learning on Lagrange mechanics material. Meanwhile, 6.5% of 46 respondents or about 3 respondents stated that it was not suitable to be used as a medium for physics learning in Lagrange mechanics material. The learning media developed in this study has several advantages.

The advantages contained in the animation video learning media-based Powtoon used in physics learning on Lagrange mechanics material include more colorful video displays, making them more interesting to watch. This animated video is also made creatively so that students are more interested in using it. In addition, the Lagrange mechanics material in this animated video is made simpler. This is intended to make it easier for students to understand Lagrange mechanics material. The variety and innovation used in each lesson can certainly make learning fun [23]. This is strengthened by the argument that students sometimes experience boredom in participating in learning that only uses printed books [24]. Students also want to learn physics and get different experiences both in the use of models and learning media. This will later affect the interest, motivation, and learning outcomes of students [25]. This statement is certainly by the results of student responses which revealed that the learning media developed in this study was very suitable to be used in facilitating Lagrange mechanics material.

## D. Conclusion

Based on the findings in this study, it can be concluded that animation videos based on Powtoon on Lagrange mechanics material are feasible to use in making it easier for students to learn Lagrange mechanics material. These findings can be seen from the responses given by students to aspects of video assessment and understanding of the material by using media which shows a very feasible response to be used in physics learning on Lagrange mechanics material. However, there are slightly different results from the ten questions given to students, namely on questions about understanding the material after using the media. On these questions, students only gave responses that were on a scale of four or appropriate. While on the other questions, the students gave very appropriate responses on a scale of five. This is because the variety of learning media in the form of animated videos based on Powtoon does not change the status of Lagrange mechanics material as easy-to-understand material but only makes it easier to help understand the material.

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