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The Development of Learning Videos on PowToon-based Work and Energy Topics to Support Flipped Classroom Learning

Rosa Herawati[1], Dwi Sulisworo[2], Suritno Fayanto[3]
[1,2,3](Department of Master in Physics Education, University of Ahmad Dahlan, Yogyakarta, Indonesia)
Corresponding Author: Rosa Herawati

Abstract: *The goal of this investigation was to define the validity and the interest of students towards developing PowToon-based learning videos to support flipped classroom strategies. This research is a Research and Development with ADDIE development model which consists of Analysis, Design, Development, Implementation, and Evaluation. This study uses descriptive analysis techniques by calculating the percentage of the results of validation, interests, and responses of students using questionnaire instruments. The results of media expert validation were 83%, the categories were very feasible, and the material experts were 80% very feasible, so the learning videos could be used as a medium to support flipped classroom strategies. The ARCS-based interest questionnaire results were 69% before, and 75% after using learning videos, student responses were 83%. There are differences between before and after using learning videos that learning videos can increase students interest.*

Keywords: *PowToon, Flipped classroom, Students interest, ARCS*

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I. Introduction

The development of science and technology has a considerable influence in various fields of human life. Education as an inseparable part of the process of human maturity, of course, on the one hand, has a significant contribution to the development of science and technology, but on the other hand education also needs to take advantage of the advancement of science and technology to be able to achieve its objectives effectively and efficiently **[1]**. The era of globalization has resulted in changes in the lives of society as a whole, including the education sector and employment that occurred in Indonesia **[2]**. Utilization and selection of appropriate learning and active media in the learning process dramatically affects the learning process itself **[3]**.

Flipped Classroom is a verbal preparation space as a stimulus to students, more to the preparation of students before entering the classroom and their involvement in the class **[4]**. Therefore, to support the flipped classroom learning strategy, students are given video learning to be learned before classroom learning takes place. The application of ICT into the Flipped Classroom learning process is proven to overcome the limitations of time in the classroom and improve students' problem-solving skills **[5]**. In addition, students can access learning materials flexibly **[6]**. Through videos, students are expected to be interested in learning science, practicing the ability to think about scientific phenomena that they often find in everyday life so that students' conceptual understanding can be improved **[7]**.

The results of the implementation of the physics learning process that has been taking place show that most students seem less interested **[8]**. Thus mastery of students 'concepts of physics is lacking and the need for learning media as a tool to increase students' interest in the concept of physics, because Understanding concepts is an essential element in learning physics **[9]**. Then, the purpose of this study is how much the impact of PowToon-based learning videos on the topic of effort and energy combined with various cartoon animations and musical mix to increase students' interest in learning physics with flipped classroom strategies. Questionnaire of interest used is an ARCS based student interest questionnaire (Attention, Relevance, Confidence, Satisfaction) **[10]**.

This research is essential to the students can have a better understanding of the concept of physics by applying more practical learning, which is carried out independently by students before the class started by giving the learning videos. Learning videos become a stimulus to support flipped classroom learning, which is expected to increase students' interest in learning. Flipped classroom learning is essential in its application to provide effective learning solutions when in class because students have been given a stimulus before the class takes place. By learning using blended learning, it is possible to facilitate student learning time while in class, because students no longer spend much time reading books.

II. Theoretical Framework

1.1 Learning videos

Learning media is a solution to support learning activities. Therefore it will not cause saturation, and learning media can make as creative and innovative as possible that students are more interested in learning **[11]**. Learning media by using video are widely used as learning media and as a tool in delivering teaching materials. The advantages of the video for learning media include attracting the attention of students even though it is limited in duration and lack of learning videos, including one-way **[12]**. However, the teaching process of using learning videos is quite impressive.

I.2 Powtoon

PowToon is an online web app for making animated cartoon presentations or videos quickly. PowToon has exciting animation features, including handwriting animations, cartoon animations, and more vibrant transition effects and more comfortable duration settings. The PowToon operations are almost similar to PowerPoint, Impress, or even Prezi. PowToon uses slides consisting of text and images that make it easier for the teacher to add animation and combine sounds or music provided in the application or through other external sources. **[13][14][15]**.

I.3 Flipped Classroom

A flipped classroom is a learning model consisting of two parts, namely interactive learning in groups in the classroom and individual direct computer-based instruction outside the classroom **[16]**. There are various flipped classroom studies **[17]**. Among them, the Flipped classroom can improve interaction and communication skills and students' writing skills **[18]**, because the model of giving material and homework is done in reverse **[19][20][21]**. The flipped classroom is a reform in traditional teaching methods **[22][23]**. Flipped classroom emphasizes the element of applying technological emergence and requires students to prepare to study outside the classroom through online videos that have been prepared by teachers **[24][25]**. The steps of flipped classroom learning include: Before meeting their teacher face to face, students must learn independently about the subject matter to study at the next meeting by watching the learning videos that have been made by educators, during class lessons, students divided into small groups, educators have a role in facilitating the ongoing discussion. Besides that, Educators provide several questions related to the subject matter to be discussed with the group, educators give questions / evaluations to students to provide students with understanding that learning by giving videos has a relaxing effect but is still aware of learning activities like this not just a game.

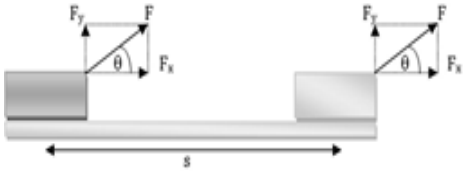
I.4 ARCS

ARCS is an extension of attention which means the same as concentration and can refer to learning interests, namely feeling happy, relevance (relevant) can interpret as the suitability of teaching materials with learning experience, confidence (confidence) that students feel competent they feel capable so that the teacher must implement several strategies in increasing awareness in learning, satisfaction (satisfaction) that is students feel happy so that they can increase students' enthusiasm for learning **[10]**.

I.5 Work

The word "work" in physics has special meaning when compared to everyday life. In physics, work defined as the force acting on objects that the object experiences displacement. Mathematically a work is defined as the product of the force component in the direction of movement with the magnitude of the displacement. Which wrote in the form of an equation,

$$W = Fs \tag{1}$$



Picture 1. Force (*F*) forms an angle to displacement *s*

For forces that form angles with displacement can be expressed in the equation $W = Fs\cos\theta$. Work is a scalar scale so that the effort carried out by various forces acting on an object obtained by adding up the usual algebraic effort made by each of these forces **[26]**.

$$W = W_1 + W_2 + W_3 + ...W_n \tag{2}$$

I.6 Energy

Kinetic energy is the energy possessed by an object because of its movement or speed. Thus all moving objects have kinetic energy. The measure of the kinetic energy of an object fulfills the equation

$$E_k = \frac{1}{2}mv^2 \tag{3}$$

The relation between work and kinetic energy:

$$v_2^2 - v_1^2 = 2as \tag{4}$$

$$as = \frac{1}{2}\left(v_2^2 - v_1^2\right)$$

$$W = Fs = ma.s = \frac{1}{2}m\left(v_2^2 - v_1^2\right)$$

$$W = \frac{1}{2}mv_2^2 - \frac{1}{2}mv_1^2 = \Delta E_k$$

$$W = \frac{1}{2}mv_2^2 - \frac{1}{2}mv_1^2 = E_{k_2} - E_{k_1} = \Delta E_k \tag{5}$$

Potential energy is the energy occupied by objects because of their place or position.

$$E_p = mgh \tag{6}$$

The correlation between work and potential energy

$$W = mgh_1 - mgh_2 = \Delta E_p \tag{7}$$

Mechanical Energy is the amount of potential energy and kinetic energy.

$$E_m = E_k + E_p \tag{8}$$

The conservation law of energy states that energy cannot be destroyed or created; it only can be changed from one form to another. Mechanical energy equations in positions one and two can be stated as follows **[26]**:

$$E_{m_1} = E_{m_2} \tag{9}$$

III. Method

2.1 Research Model

This research is a research development of R&D (Research and Development) which aims to produce a product. The procedure of this study adaptation the ADDIE (Analysis, Define, Design, Implementation and Evaluation) development model, namely the development model is consisting of five stages which are Analysis, Design, Development, Implementation and Evaluation. The subject of this research is class X students. The method of data collection in this study was to use a questionnaire. Instruments for media experts relate to language, effects on learning strategies, program processing, and appearance. Instruments for material experts that contain material relevance, organizing material, evaluation, language, and effects on learning strategies. Instruments for ARCS-based student interest consist of attention, relevance, confidence, and satisfaction. The student response instrument consists of students' statements on the learning video. The questionnaire method is used to measure the quality and response to the learning media developed.

2.2 Techniques of analysis

Calculates the percentage of each sub-variable using the formula **[27]**

$$NP = \frac{R}{SM} \times 100\% \tag{10}$$

Where,
NP = score percentage
R = number of scores
SM = maximum score

The assessment criteria in the learning video can be seen in Table 1.

Table 1. Media Assessment Criteria **[28]**

No	Interval (P)	Feasibility Criteria
1	80% – 100%	Very Worthy/Very good/ Strongly Agree
2	66% – 79%	Decent/ Good/ Agree
3	56% – 65%	Less Worthy/ Less Good/ Less Agree
4	0 – 55%	Not Worthy/Not Good/Not Agree

IV. Result

The results of the validation of media authorities shown in Figure 2 and the results of the validation of material experts shown in Figure 3.

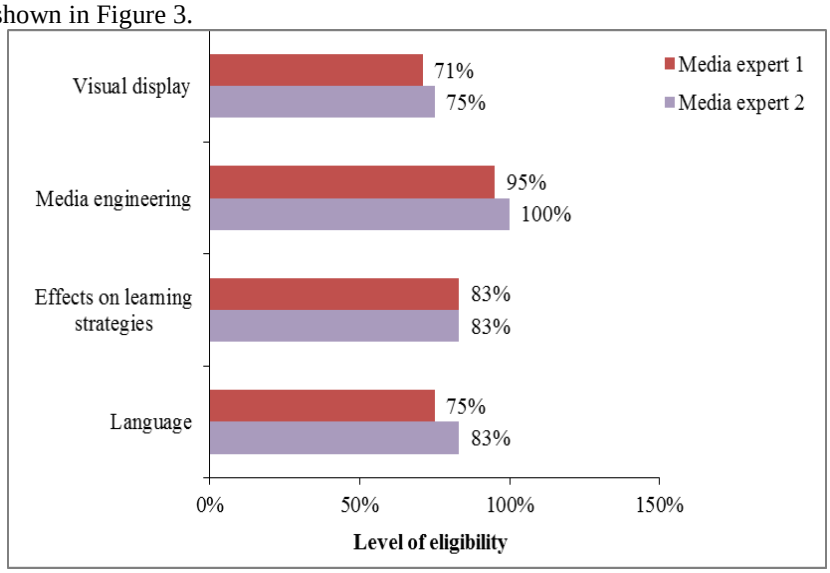


Figure 2. The percentage of media expert analyst results

Based on the results of the validation of 2 media experts, which can be seen in Figure 2 , the average percentage is 83%. Based on the analysis of media experts, learning videos are very feasible to be used to help the process of learning physics in business material and energy.

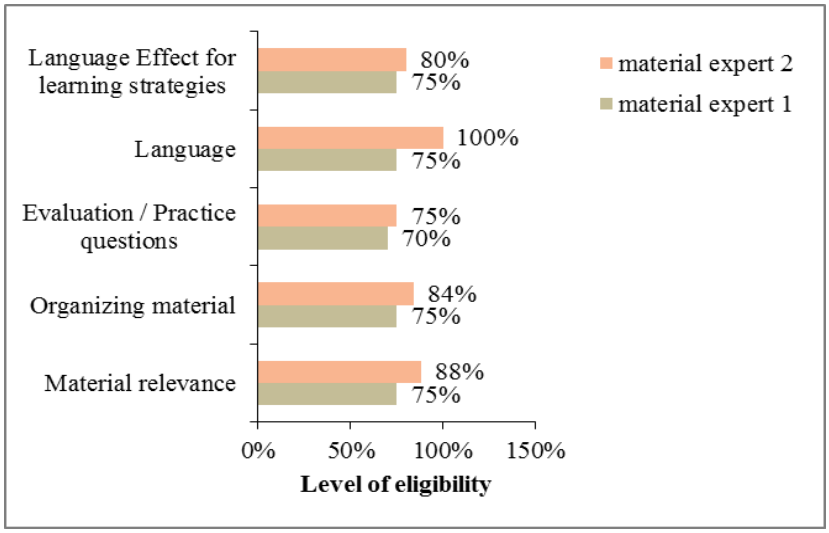


Figure 3. The percentage of material analyst results

Based on the results of the validation of 2 material experts who can be seen in Figure 3, the average percentage is 80%. Based on the analysis of material experts, learning videos are very feasible to be used to assist the process of learning physics in the business and energy metrics. Based on the measurement of student interest before and after using the learning video using the ARCS-based interest questionnaire, the results are as follows.

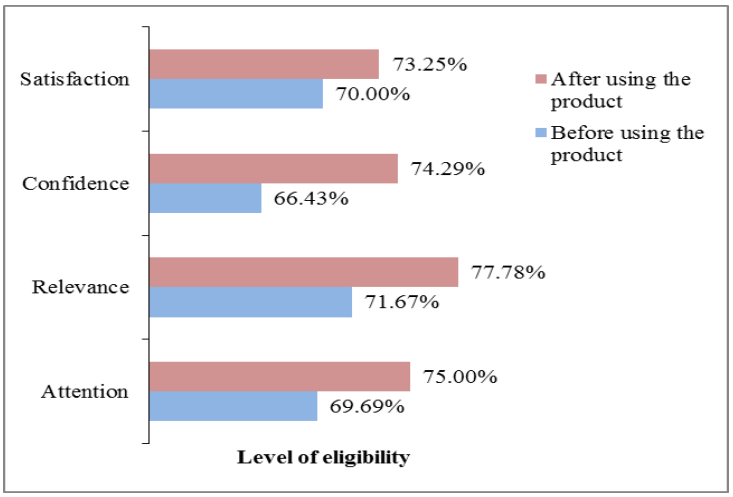


Figure 4. The percentage of students' interest based on ARCS

Based on the results of the research that has been carried out using an ARCS-based questionnaire which can be view in Figure 4, the results are 69.45% before using the learning video and 75.08%. After using the learning video. There is a difference within before and after using the learning video. The following is the percentage of student responses to learning video:

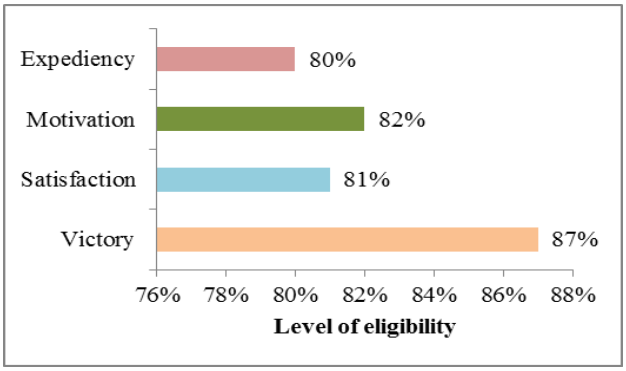


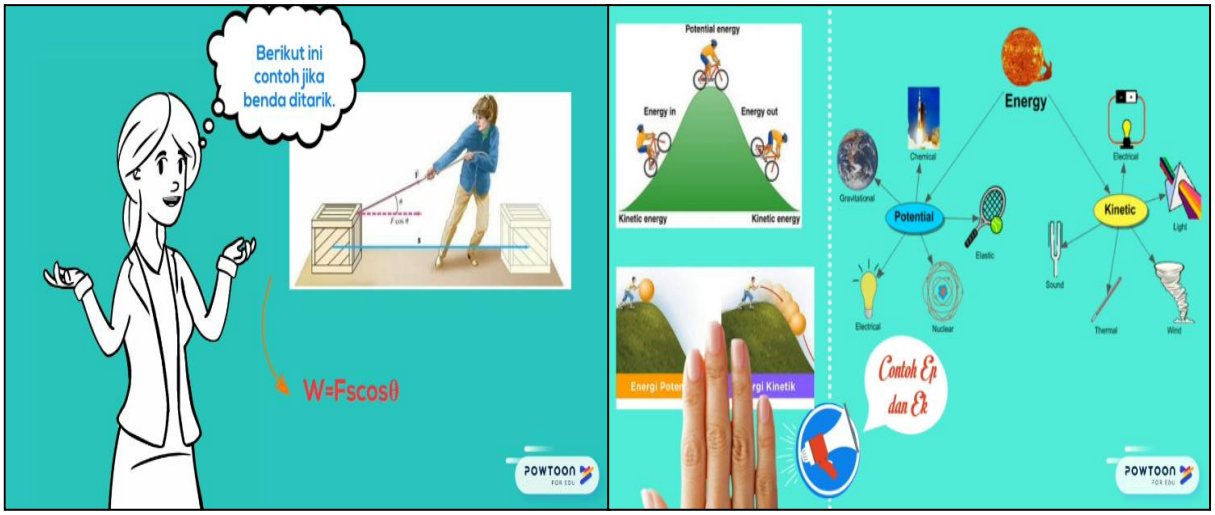
Figure 5. The percentage of Students' respond to the product

Based on student responses to products that have developed, it can be view in Figure 5 that obtained by using a response questionnaire consisting of aspects of benefit, motivation, satisfaction, and attractiveness of learning videos and analyzed to obtain an average percentage of 83%. Based on the results of the analysis of student responses, the learning videos developed get responses in very good categories used to help the learning process.

V. Discussion

The product that produced in this development is a PowToon-based learning video designed and created by accessing www.powtoon.com. The research on ADDIE model development was carried out until the evaluation stage with the aim of researchers to be able to develop valid learning videos based on the validator's assessment and usage test to measure how students' interest in the learning video developed. The stages of this research are: the analysis phase done by material analysis and media analysis. It is necessary to develop a media and teaching material that is able to help or facilitate the task of the teacher in order to facilitate and motivate students to understand a physics lesson **[29][30].** Based on the material analysis, it was found that business material and energy still needed media to assist learning with flipped classroom strategies. Therefore, learning videos can help students learn independently so that they are better prepared to learn the material. The design stage is done by designing the display of related videos and questionnaires to test the validity of media experts and material experts. The development stage is done by making learning videos that have been previously designed using PowToon. The researcher will test the learning video by conducting validation by two media experts and two material experts and then will be tested by students. Suggestions from validators include formula writing referring to International System, examples of business in everyday life, extended video

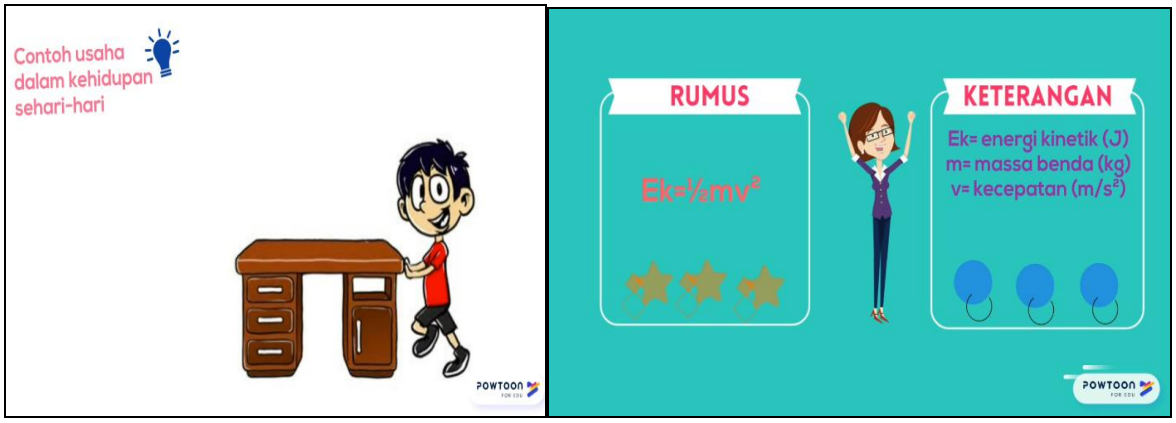
duration and font color selection on video. Examples of the initial display of learning videos shown in Figure 4 and examples of display of business material shown in Figures 6 and 7.



(a) (b)

Figure 6. (a) Work main subjects in learning videos; (b) Examples of potential energy and kinetic energy in learning videos

In Figure 6a, it illustrates the primary material developed in this study. The main material developed is material business and energy. Figure 6b illustrates the example of potential energy and kinetic energy in learning videos that we often encounter in everyday life, such as pedaling a bicycle and rolling a ball from a high surface to a low surface. In Figure 6b, it also illustrates some differences in examples of kinetic energy and potential energy. In addition to some material descriptions and examples of energy in the learning video, there are also animated examples of the application of business and animation of material presentation, which can be seen in Figure 7a and 7b.



(a) (b)

Figure 7. (a) The example of animation in learning video; (b) The example of animation in learning video with formula

The researcher analyzed the advantages of PowToon in making learning videos, including various available choices of impressive cartoon animations that create creative effects and present a variety of various musical choices. PowToon provides freedom for service users, including various animations, images, desired music that is not available in PowToon can be downloaded using other applications and can be directly inserted into the learning video. In Figure 7(a), it illustrates an animation example of the application of business in everyday life. Animations that have download can be incorporated into learning videos with practicality. In Figure 7(b) it illustrates cartoon animation to support the attractiveness of material presentation. The animation in Figure 7(b) is created using the features provided in PowToon. The slides displayed are text and images that can be added, but also allow animation and merging of sounds or music available in the same application or through external sources. The result is a product that is a combination of the appearance of a PowerPoint

Presentation with a comic book **[13]**. PowToon is one of the right solutions for making learning videos as a stimulus for students before entering the classroom in a flipped classroom strategy, so students already understand the material first, and the teacher can make several class activities such as joint discussion, discussion of questions, question and answer and students themselves who will convey the subject to discuss with his classmates. Especially from some of the advantages of PowToon, there are shortcomings of PowToon, namely setting a limited duration and the unavailability of Islamic animation.

In addition, students values some limitations obtained in PowToon account which is free as a real problem for a lot of features which can only be accessed through a paid subscription **[13]**. So, the products from PowToon, which are in the form of learning videos, have various obstacles in the development process. Moreover, from several advantages of PowToon, there are some shortcomings that must be overcome in order to produce a decent video to be used in the learning process to help *flipped classroom* learning. The researcher has developed and produced a decent learning video to be used by using the features available in PowToon with several validator assessments about the lack of learning videos which is one of the shortcomings of PowToon which is a limitation of researchers in this study.

From the results of the discussion, it can conclude that this study consists of the stages of analysis, design, development, implementation, and evaluation. The product produced is in the form of learning videos designed using PowToon. PowToon is an online web for designing learning videos. PowToon has advantages and disadvantages in designing a learning video. The video produced is expected to be able to support flipped classroom learning. The flipped classroom is a process of learning that requires supporting media in its application so that the learning video can use as a stimulus in understanding the material to be learned.

VI. Conclusions

From the results of the research that has been done, it can be concluded that Learning videos on the topic of PowToon-based on work and energy to support the Flipped Classroom learning for high school students of class X is declared feasible to use as a medium for learning physics. Learning videos on the topic of PowToon-based work and energy to support Flipped Classroom learning for class X high school students can increase student interest.

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