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Motion Graphic-Based Work and Energy Physic Learning Media Development

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Abstract
Physic learning usually requires more observation to form certain knowledge and concepts. Physic does not only consist of a collection of various knowledge or facts that can be memorized, but also consists of an active process of using the mind in studying natural phenomena that cannot be explained. Physics subject is one of the keys to success in increasing the ability to adapt to change and enter the world of technology. Therefore, certain ways are needed to convey the material in science lessons, especially physics. This study aims to produce Motion Graphic-based Work and Energy Learning Media on feasible work and energy materials in terms of materials, media, and students' responses. The research method used is research and development (R&D), using the 4D model (Define, Design, Develop, and Disseminate). The subjects were conducted in class X IPA 1, which consisted of 15 students. The instrument used is a questionnaire. The results showed that media could be used as a teaching media in the physics subject of work and energy based on expert judgment with very good categories for media, materials, and students' responses. So it can be concluded that Work and Energy motion graphic media can be employed as a ground-breaking teaching tool for engaging Work and Energy physic material.
Keywords: *Development; work and energy; motion graphic*

INTRODUCTION

Science learning in schools is not enough to only prioritize facts or concepts that represent science products; it must also be able to provide experiences for students to understand how these facts or concepts were obtained (Sandra et al., 2018). Science learning usually requires more observation to form certain knowledge and concepts. Science does not only consist of a collection of various knowledge or facts that can be memorized, but also consists of an active process of using the mind in studying natural phenomena that cannot be explained (Sucilestari, 2018). One of the science lessons in high school is physics, which is one of the keys to success in increasing the ability to adapt to change and enter the world of technology (Saputra, 2018). Therefore, certain ways are needed to convey the material in science lessons, especially physics.

In the era of globalization, technological developments continue to progress. The rapid development of technology has brought major changes to many fields of life, including education (Lestari, 2018). The use of technology as a learning media is a form of technological innovation in the world of education (Tekege, 2017). The use of technology as a learning media can be a way to convey material and learning objectives to students (Rohmawati & Sukanti, 2012), so it is hoped that it will be able to improve the quality of the learning process and students' mastery of technology (Adam & Syastra, 2015).

Learning media plays an important role in the learning system components. In the process of teaching and learning, learning media are something that cannot be separated. Learning media is an alternative in the learning development process so that students can independently understand the material more easily (Purnamasari, 2019). The existence of learning media is a tool to convey material and facilitate teaching and learning activities (Cristea, 2016). The use of learning media by the teacher in the learning process can make learning less boring while also effectively conveying material to students (Firmadani, 2020), ; additionally, it is

a learning resource that can assist teachers in enriching students' insights (Nurrita, 2018). In line with this, teachers should be required to develop various kinds of learning media by utilizing existing technological developments (Firmadani, 2020).

Data in the field shows that there are problems resulting from the teacher's lack of ability to use technology to create learning media (Purnamasari, 2019). The learning process by the teacher is still relatively general, namely using only static or printed learning media, so it is less able to foster student interest in learning independently (Guntara et al., 2019). Based on the findings at SMA Negeri 3 Dompu, the learning process still uses the lecture method with the help of textbooks and LKS. Learning to only use textbooks has several drawbacks, including being able to eliminate interaction between students and the teacher, besides that the teacher cannot show the real situation of the material to be delivered (Efendi et al., 2020a). Another finding is that the average score of students' daily test results in several physics subject matter chapters, such as the work and energy chapters, is far below the KKM. This demonstrates that there are deficiencies in the learning process, which may be caused by a monotonous learning process in which students become bored, less motivated, and lose focus on the lesson, causing them to be unable to understand the content of learning (Efendi et al., 2020a).

Teachers must be able to choose learning media that are appropriate and suitable for use so that various obstacles in the learning process can be reduced with the help of learning media in order to achieve the teaching goals set by the school (Nurrita, 2018). One of them is learning media based on motion graphics. Currently, many learning media have been developed using technology using the Motion Graphics technique, some of which are the subject of research (Efendi et al., 2020; Putra, 2017; Purwanti & Haryanto, 2015; Rusdiansyah & Leonard, 2020). From the research that has been done, there is still very little application of motion graphics to science subject matter, especially physics. Physics material is material that is quite difficult because, in it, students learn abstract concepts (Azizah et al., 2015)(Rahmawati et al., 2012). For example, there is contextual material on work and energy, but nothing has been packaged in motion graphic learning media. Therefore, learning physics material needs to be supported by motion graphics-based media. According to previous research, motion graphic media can be created in a variety of forms depending on the needs. In this study, researchers developed motion graphic media that can be accessed via smartphone offline or online via Google Drive for science material, especially physics material about Work and Energy. In contrast to previous studies involving the Elementary School Level, researchers tried to apply it to the High School Level.

Based on the findings and results of the studies that have been carried out, it is considered important to carry out research and development that aims to produce products in the form of Motion Graphics-based media in physics subjects on Work and Energy.

METHODS

Research and development (R&D) using a 4D model is the research methodology employed. The four fundamental steps of the 4D development model must be completed. These parts are defined, designed, developed, and disseminate (Thiagarajan et al., 1974). The subjects were conducted in class X IPA 1 at SMA Negeri 3 Dompu, which consisted of 15 students. The end result is the Work and Energy Physics Learning Media, a tool for teaching physics concepts related to Work and Energy materials.

The instruments used in this study were questionnaires, interviews, and documents. The questionnaire was used to find the appropriateness level of media experts', material experts', and students' responses. Media experts are experts in the field of multimedia. While material experts are lecturer who are experts in physics, The response questionnaire was given to class X IPA 1 students as users of motion graphic physic learning media. The interview sheets are addressed to teachers in the physic subject to seek information regarding the needs of the media used in the development of learning media. Meanwhile, documentation is used to collect data in the form of material to be included in learning media. The data were analyzed using descriptive analysis techniques. Utilizing proven instruments to assess the feasibility of media,

materials, and student response is related to data collecting. In order to establish the caliber of the media and material, the results of the media feasibility data, materials, and students' response are sought by summing together the scores attained and turning the scores into percentages. Table 1 is the reference for converting scores into parts (Azwar, 2015); (Riduwan, 2018).

Table 1. Percentage of change in score

Intervals (%)	Category
81-100	Very good
61-80	Well
41-60	Pretty good
21-40	Not good
0-20	Not very Good

RESULTS AND DISCUSSION

1. Product Development

Audacity, ACDSee Professional, Paint, Format Factory, and CyberLink Power Director were used to create the motion graphic media work and energy material. To complete the narrative text on business and energy materials, the photographs are edited using paint and ACDSee professional software. The finished images are then incorporated into Microsoft Powerpoint. The conversational sounds of the characters narrating the material were captured using Audacity. Cyberlink Power Director program is used to integrate photos into Motion Graphic format. To enable playback on a device like a smartphone, the created Motion Graphic is then imported into FLV format using the format factory software. The display on the motion graphic media that has been created can be seen in Figure 2, Figure 3 and Figure 4.

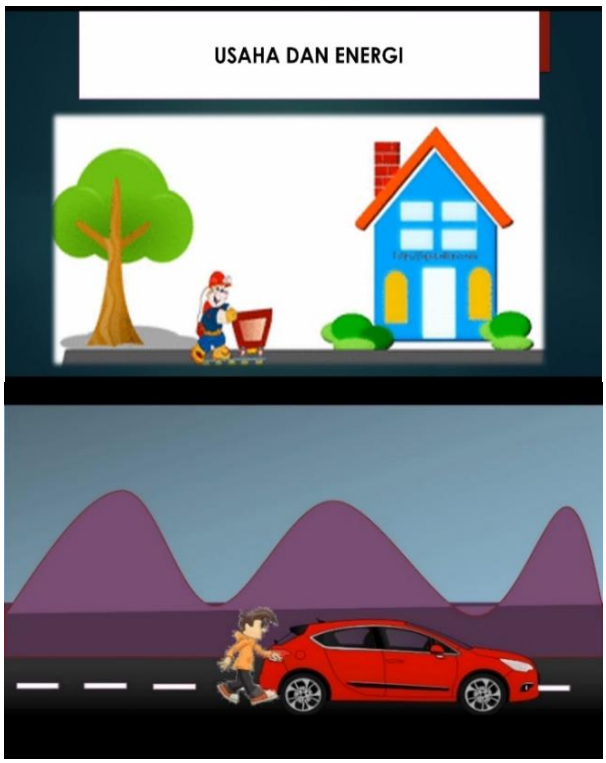

Figure 2. Cover Display

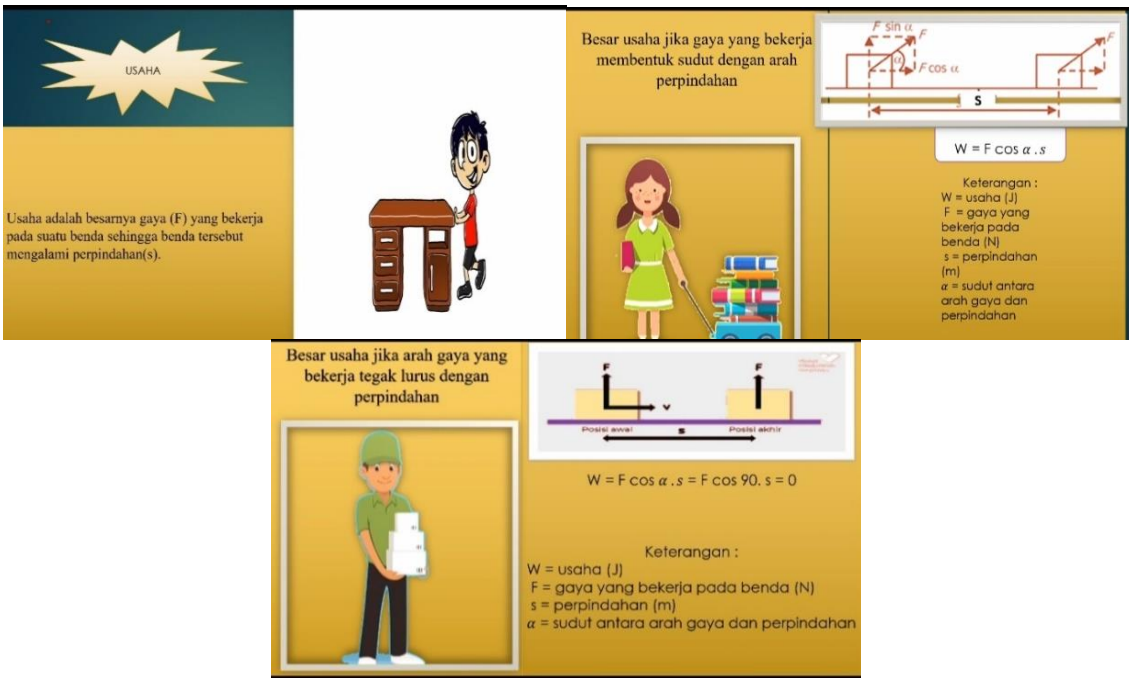

Figure 3. Work materials display

Figure 2 is an example of the cover page display of the Motion Graphics learning media material on the physics of business and energy. An example of the display of the work material is shown in Figure 3, which contains three views, consisting of an explanation of the definition of work, an explanation of the magnitude of the work if the force acting forms an angle with the direction of displacement, and an explanation of the magnitude of the work if the force acting is perpendicular to the direction of displacement. An example of a material display about energy is shown in Figure 4, which contains an explanation of the definition of energy, an explanation of potential energy, and an explanation of kinetic energy.

Figure 4. Energy materials Display

2. Product Assessment Results

a. Media Feasibility

Two subject matter experts evaluated the media using a verified questionnaire. The media operations, format, and design are included in the intermediate media assessment. The conclusion of the evaluation of two experts for the feasibility of the media can be seen in table 3.

Table 3. Media Feasibility

Aspect	Expert 1	Expert 2	Average	Percentage	Category
Media Design	5	5	5	100	Very good
Media Format	5	4	4.5	90	
Media Operation	5	4	4.5	90	

Based on table 3, the assessments of the two media experts gave an average of 5 with a percentage score of 100 for the Media Design aspect, an average of 4.5 with a percentage score of 90 for the Media Format aspect, and an average of 4.5 with a percentage score of 90 for the Media Operation aspect, so it can be concluded that this motion graphic learning media is in the very good category.

b. Material Feasibility

Two experts on the feasibility of the media utilizing surveys conduct this step. Based on the content provided at media, the feasibility of the material is evaluated. Table 4 lists assessment indicators for language, material construction, and material format found in media.

Table 4. Material Feasibility

Aspect	Expert 1	Expert 2	Average	Percentage	Category
Language	4	5	4.5	90	Very good
Material Construct	5	5	5	100	
Material Formats	5	4	4.5	90	

Based on table 4, the assessment of the two material experts gave an average of 4.5 with a percentage score of 90 for the Language aspect, an average of 5 with a percentage score of 100 for the Material Construct aspect, and an average of 4.5 with a percentage score of 90 for the Material Format aspect, so that it can be concluded that motion graphic learning media is in the very good category.

c. Students' Response Results

The product was limited to 15 students of class X IPA 1 at SMA Negeri 3 Dompu. Assessment Indicators related to 6 components. Table 5 shown the findings of the students' media responses.

Table 5. Student Response Results

No	Indicator	Average	Percentage	Category
1.	The theory in media is easy to understand	4.5	90	Very good
2.	Media makes it easy to understand the material	4.4	88	
3.	The media is easy to operate	4.5	90	
4.	Images in media provide an understanding fo material	4.5	90	
5.	The language used in media is easy to undersatnd	4.6	92	
6.	The combination of letter and colors in media can be interesting	4.7	94	

According to Table 5, the results of student responses to indicator 1 (The theory in media is easy to understand) received an average of 4.5 with a percentage score of 90; indicator 2 (Media makes it easy to understand the material) received an average of 4.4 with a percentage score of 88; indicator 3 (The media is easy to operate) received an average of 4.5 with a percentage score of 90; indicator 4 (Images in media provide an understanding of material) received an average of 4.5 with a percentage score of 90; indicator 5 (The language used in media is easy to understand) received an average of 4.6 with a percentage score of 92; and indicator 6 (The language From the results of student responses) received an average of 4.7 with a percentage score of 94, it can be concluded that the Motion Graphics learning media is in the "very good" category.

According to a review of research data, media is practical to use because it scores highly in terms of media, material, and students' responses. Based on the findings of expert analysis, it is possible to draw the conclusion that media is a media breakthrough in the learning process for physics subjects, work materials, and and energy that can be used.

The findings of this study are in line with previous research by Efendi et al., (2020), which indicated that motion graphic learning media is a learning medium that is appropriate for use in the learning process. The application of motion graphics is an alternative that can make learning material look more visually appealing, thereby increasing students' desire to learn (Puji et al., 2021). The results of Syah and Harsono's research (2020) show that the use of motion graphics can significantly improve student learning outcomes. Based on other research conducted by Amali et al., (2020), it was found that learning with motion graphics has a positive influence on learning outcomes and can be applied to students.

CONCLUSION

The discussion leads to the conclusion that work and energy motion graphic media can be employed as a ground-breaking teaching tool for engaging work and energy physic material. In addition, media has also been declared media and material feasible based on assessments by experts in their fields and possibly based on the results of student responses.

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