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DEVELOPMENT OF DILEMMA-STEAM-BASED PHYSICS LEARNING VIDEOS ON RENEWABLE ENERGY MATERIAL

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Abstract

This research aims to develop a video with Dilemma-STEAM learning model on Renewable Energy material that is feasible to be used as teaching material for class X high school physics. Dilemma-STEAM-based Learning Video is a physics learning video based on the dilemma stories and STEAM-pjbl learning model. This learning model aims to engage students in discussion and analysis of dilemma stories related to renewable energy. The method used is Research and Development (R&D) with the Analysis, Design, Development, Implementation & Evaluation (ADDIE) research model. Based on the results of an analysis of 54 students at a high school in East Jakarta regarding teaching materials at school. It was found that 93% of students need learning videos to support physics teaching materials at school. The final product of this research is a learning video design that can be accessed easily by students.

Keywords: Renewable Energy, Learning Videos, Physics, Physics Education, Dilemma Stories.

INTRODUCTION

Indonesia has now passed the covid-19 pandemic. Learning that was previously done remotely is now back to face-to-face. This is a new challenge, where distance learning makes students accustomed to learning by relying on technology. So that in face-to-face learning, technology is very important as a learning medium to help students' understanding.

The learning media developed can support materials such as Canva, Youtube, Whatsapp Group, Google Classroom and other platforms [1]. The platform can be used to fulfill the learning process in the form of attendance, assignments, videos, and materials. However, in reality, education in Indonesia has not fully utilized technology, because some educators have limited understanding and mastery of it [2].

Mastery of competence in the field of technology is something that must be owned by all professions including the education profession. This task is not easy, to realize this goal, each school must have educators who have the ability and skills to integrate technology in learning, for example in learning media such as videos. Video learning media is very effective for the learning process, especially in physics material [3]. However, in the research of Miftahuddin et al. (2021) stated that there are still many educators who do not utilize websites or free platforms as additional media [4].

This is based on the fact that many educators are not familiar with applications for learning video production.

Learning media in the form of videos is very important to stimulate students' interest in learning. Not only does it bring out creativity but there needs to be an involvement of critical and innovative thinking to foster the thinking power of students. Someone who masters critical thinking skills is someone who is able to think logically and take rational action in dealing with problems that occur. This indicates that critical thinking directs learners to take action based on the results of in-depth analysis by linking understanding, thinking and knowledge to facts and information and problems faced [5]. However, the achievement of critical thinking of Indonesian students is categorized as low. This is evidenced by the research of Wijayanti & Siswanto (2020) which obtained the results of the achievement of critical thinking of students of 46.97% or categorized as low [6].

Physics in Senior High School (SHS) is one of the subjects that is often avoided, because students rarely get good physics achievements. Physics is one of the subjects that can develop creative and analytical thinking skills in solving problems related to natural events. Physics consists of various concepts, facts, and principles that are so broad that students find it difficult and consider physics as a scary subject. Meanwhile, students can be trained to be motivated to learn physics and their critical thinking skills. So, it can be implemented with the dilemma-STEAM method that can train students' critical thinking and analyze in learning. Dilemma-STEAM is a collaboration between the Dilemma Stories approach with Science, Technology, Engineering, Art, and Mathematics (STEAM). The integration of the Science, Technology, Engineering, Art and Mathematics (STEAM) approach with the dilemma stories approach is a learning model that is considered capable of developing students' collaborative and critical thinking skills. Renewable energy material is material found in high school where this material has a fairly broad discussion. This material is very important to learn because it is included in the education curriculum and is important to learn because it is the spearhead of the human life sector [7].

METHODOLOGY

This research uses a type of Research and Development research. According to Sugiyono (2013) this research method used (Research and Development) is to make certain products and test the feasibility of the product.

This research model uses the ADDIE research model. The ADDIE research model is a development process that requires several times of expert team testing, broad scale (field) and revision to improve the final product. The ADDIE research model consists of five phases, namely analysis, design, development, implementation and evaluation.





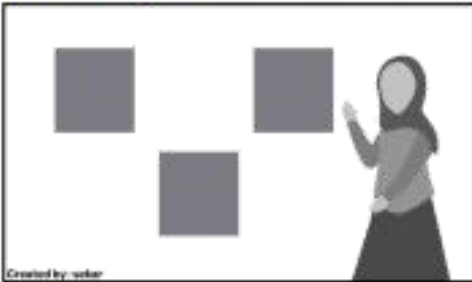

Figure 1. Development Stage Of Learning Video Media

Analysis

At this stage, a needs analysis was carried out on students by distributing questionnaires through Google Form to high school students in grade X as many as 54 students. From the needs analysis that has been carried out by researchers, the results obtained are as many as 72% of students have difficulty in understanding physics lessons on renewable energy material. The results of the needs analysis also prove that as many as 93% of students agree that physics learning media presented in the form of videos is needed.

Design

At this stage, designing videos as learning media and creating storyboards. At this stage, the design is carried out by searching for information materials related to renewable energy material and implementation in everyday life.

No.	Rancangan	Keterangan
1.	<p>Halaman Awal</p> 	<p>1. Judul 2. Identitas diri 3. Identitas Universitas</p> <p>Durasi : 1 menit Aksi; Perkenalan</p>
2.	<p>Halaman Judul</p> 	<p>1. Judul materi 2. Nama pengembang 3. Karakter zepeto</p> <p>Durasi : 1 menit Aksi; Pembukaan materi</p>
3.	<p>Halaman Pengantar</p> 	<p>1. Gambar 2. Nama pengembang 3. Karakter zepeto</p> <p>Durasi : 1 menit Aksi; Memberikan pengantar materi Energi Terbarukan</p>
4.	<p>Halaman KD</p> 	<p>1. CP ATP 2. Penjelasan CP ATP 3. Nama Pengembang 4. Karakter Guru</p> <p>Durasi : 1 menit Aksi : Menjelaskan CP ATP Materi Energi Terbarukan</p>
5.	<p>Halaman Materi</p>	<p>1. Judul 2. Penjelasan materi 3. Nama pengembang 4. Karakter zepeto</p>




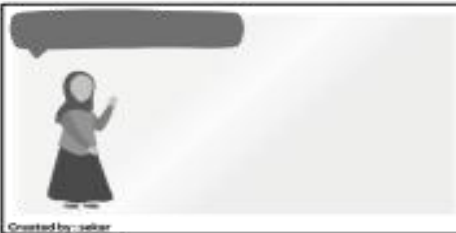
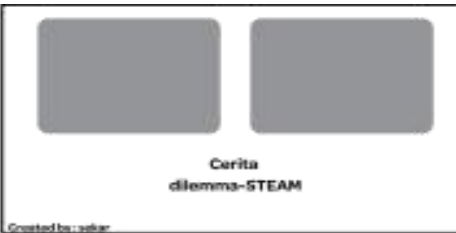
		Durasi : 6 menit Aksi: Memaparkan isi materi Energi Terbarukan
6.	<p>Halaman Ilustrasi Materi</p> 	<p>1. Judul 2. Penjelasan video 3. Nama pengembang 4. Karakter zepeto</p> <p>Durasi: 2 menit Aksi: Menyajikan ilustrasi terkait materi Energi Terbarukan</p>
7.	<p>Halaman contoh soal</p> 	<p>1. Judul 2. Karakter zepeto 3. Soal 4. Nama pengembang</p> <p>Durasi: 3 menit Aksi: Memaparkan contoh soal beserta pembahasan.</p>
8.	<p>Halaman latihan soal</p> 	<p>1. Judul 2. Karakter zepeto 3. Soal 4. Nama pengembang</p> <p>Durasi: 1 menit Aksi: Menyajikan soal beserta pembahasan.</p>
9.	<p>Halaman soal <i>dilemma</i>-STEAM</p> 	<p>1. Judul 2. Karakter zepeto 3. Soal 4. Nama pengembang</p> <p>Durasi: 2 menit Aksi: Menyajikan soal <i>dilemma</i>-STEAM</p>

Table 1. Storyboard Of Learning Video

Development

At this stage, researchers will make learning videos about renewable energymaterial, namely finding information related to renewable energy material, setting learning objectivesbased on CP and

ATP, making the right arrangement so that learning videos are made to attract the attention of students and the language used must be easy to understand, placing titles, determining the type of writing and using the chosen color scheme must be considered, making learning videos using the Canva application, and the results of the final product are validated by three experts including media experts, material experts and learning experts and if necessary improvements will be made.

Implementation

The final result is a learning video that will later be tested on high school students in class X and will be carried out pretest and post-test to determine the level of understanding of students in learning Physics related to Renewable Energy Material.

Evaluation

At this stage, an evaluation will be carried out at each step related to the learning video that will be developed by the researcher. Researchers analyze and follow up on the evaluation of each suggestion given and make improvements to the product. The final goal of this stage is to produce a product, namely a Dilemma-STEAM-based Learning Video that can increase the level of understanding, interest, and critical thinking of students in learning Physics, especially on Renewable Energy material.

RESULT AND CONCLUSION

Mastery of competence in the field of technology is something that must be owned by all professions including the education profession. It is expected that every educator has the ability and skills to integrate technology in learning, and can access, manage, integrate, assess and create information that is useful for learning.

The existence of students who have difficulty understanding the material and the lack of understanding of students' analysis of renewable energy material, so the need for alternative learning media that can stimulate students' interest in learning.

In preliminary research, a needs analysis was carried out by conducting a survey using Google Form to high school students in class X and collected as many as 54 students as follows:

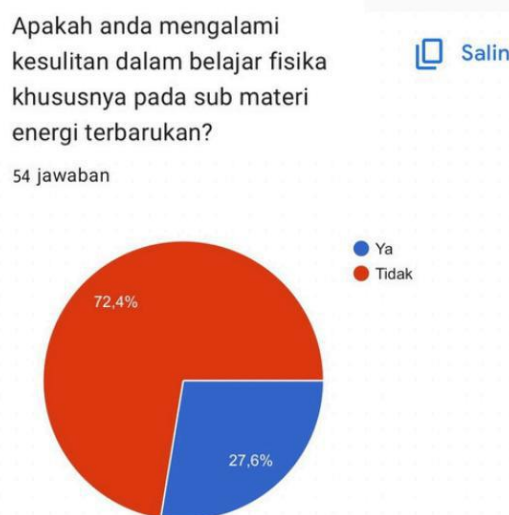


Figure 2. Requirement Analysis Understanding Physics Lessons On Renewable Energy Material.

From the needs analysis that has been carried out by researchers, the results obtained are as many as 72% of students have difficulty in understanding physics lessons on renewable energy material.



Figure 3. Requirement Analysis For Students.

The results of the needs analysis also prove that as many as 93% of students agree that physics learning media presented in the form of videos is needed.

After conducting a literature review on previous research such as searching for journals and articles and looking for relevant research, it can be concluded from previous research that learning media is needed in the form of Dilemma-STEAM-based videos to increase students' understanding, interest, and analytical thinking to learn Physics renewable energy material.

Learning Stages	Activities Performed
Reflection	Given a dilemma story related to issues that occur regarding renewable energy, students reflect on the values in the dilemma story.
Exploration	Given a dilemma story related to an issue that occurs regarding renewable energy at school, students determine the focus of the problem and solution to be assigned with the STEAM project.
Elaboration	Given a brief material related to energy, students can relate the case study on dilemma stories to the material provided.
Integration	Given a STEAM project description, students design a STEAM project on solar power generation in groups.
Transformation	Evaluation of the learning process and reflection on attitudes and knowledge values through learner worksheets and interviews.

Table 2. Dilemma-STEAM syntax.

The following is the appearance of the Dilemma-STEAM-based Physics Learning Video on Renewable Energy material which is currently still in the development stage by researchers.



Figure 4. Opening Slide

In the Figure 4, is the main display of the learning video, in this display the character in the video makes an introduction and explains the subject description, learning outcomes, learning objectives, and concept map of renewable energy material.



Figure 5. Slides Content

In the picture above, is a learning display containing a description of renewable energy material. The material description display includes the content of the material, relevant video illustrations, sample questions to support learners' understanding and solution

Figure 6. Dilemma Stories Slide

In the Figure 6, is the display of dilemma stories. Dilemma stories provide issues related to problems that create dilemmas. So that students can provide opinions and solutions through projects. In addition, this display is integrated according to the Dilemma-STEAM elements, namely reflection, exploration, elaboration, integration and transformation.

The learning videos developed were made using canva and zepeto, where canva as a medium for editing material and zepeto as a tool for creating characters and sounds in learning videos. The advantage of this video is that it can be used on three devices including cellphones, tablets, and laptops, and the appearance of the video learning media will adjust to the device used. In addition, the video will also insert images, supporting videos and audio in accordance with the material discussed.

CONCLUSION

This Physics Learning Video on renewable energy material was developed as a teaching material for physics learning in high school with a dilemma story approach aimed at overcoming students' difficulties in understanding renewable energy material and increasing students' analytical and critical thinking. This learning video was developed using the Research and Development (R&D) research model with the ADDIE approach model. In its presentation, this learning video can provide visual concepts on the topic of renewable energy by using various media such as audio, images, videos, and other supporting multimedia. The research process is still ongoing for validation by experts at the development stage, so that later the media is declared valid for use by students in the learning process.

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BIBLIOGRAPHY

- [1] F. Yuanta, "Pengaruh Media Pop-Up Book Terhadap Hasil Belajar Siswa Sekolah Dasar Tema Indahnya Keragaman Di Negeriku," *Prosiding Seminar Nasional Cendekiawan*, pp. 2–76, Oct. 2019.
- [2] R. Muskania and M. S. Zulela, "Realita Transformasi Digital Pendidikan di Sekolah Dasar Selama Pandemi Covid-19," *Jurnal Pendidikan Dasar Nusantara*, vol. 6, no. 2, pp. 155–165, 2021.
- [3] M. Haidir, F. Farkha, and D. Mulhayatiah, "Analisis pengaruh media pembelajaran berbasis video pada pembelajaran fisika," *Jurnal Pendidikan Fisika*, vol. 9, no. 1, pp. 81–89, 2021.
- [4] M. Miftahuddin, H. Syahrial, S. Sunaryo, and S. Sutrisno, "Pelatihan Pemanfaatan Media Online di SDIT Bunayya Yayasan Pendidikan Islam Al-Munawwarah Murad," *Prioritas: Jurnal Pengabdian Kepada Masyarakat*, vol. 3, no. 1, pp. 32–37, 2021.
- [5] E. Susilawati, A. Agustinasari, A. Samsudin, and P. Siahaan, "Analisis tingkat keterampilan berpikir kritis siswa SMA," *Jurnal Pendidikan Fisika Dan Teknologi*, vol. 6, no. 1, pp. 11–16, 2020.
- [6] R. Wijayanti and J. Siswanto, "Profil Kemampuan Berpikir Kritis Siswa SMA pada Materi Sumber-sumber Energi," *Jurnal Penelitian Pembelajaran Fisika*, vol. 11, no. 1, pp. 109–113, 2020.
- [7] K. Teddy, "Implementasi PjBL-STEM berbasis ESD (Education for sustainable development) pada topik energi terbarukan untuk meningkatkan kemampuan berpikir sistem," 2023.