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Development of Special Relativity Material Learning Videos on Social Media Tiktok

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Abstract

The intensity of social media use by students is currently very high. TikTok social media is one of the social media that is often used because the videos that are presented are short and up to date. The purpose of this research is to develop physics learning videos on the TikTok platform with an introduction to physics concepts and cases in everyday life. This study uses the 4D method (Define, Design, Develop, Disseminate). The stages of the 4D method applied to this study are by analyzing needs and planning the concepts and content of video content. The product developed is in the form of a learning video on special relativity material and distributed via the social media TikTok. Media and material assessment instruments to measure validity by media experts and material experts. From the results of this study, show that learning videos on social media Tiktok is feasible to be implemented as a medium for learning physics in class 12 high school on special relativity material.

Keywords: learning video, social media, 4D, special relativity

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INTRODUCTION

Modern physics education in secondary schools around the world is growing (Palmer, 2023), (Kamphorst et al., 2019). Special relativity is one of the theories that bring changes in our understanding of the concepts of space and time (Kamphorst, 2023). Teaching approaches on modern physics topics such as quantum mechanics, nanoscience, and the special theory of relativity, were developed and included in the national curriculum (Kersting, 2018). Likewise in Indonesia, modern physics topics are taught in phase F or grade 12 in the independent curriculum. The learning outcomes expected of students are able to analyze the relationship between various physical quantities in the theory of special relativity, quantum phenomena and demonstrate the application of core physics and radioactivity concepts in everyday life and technology (Kemendikbudristek, 2022).

The special theory of relativity is a work by Einstein that was put forward in the early 20th century. Prior to the emergence of the special theory of relativity, transformations used to describe relationships between coordinates were called Galilean transformations, briefly explaining that the classical perspective failed to provide a framework within which optical phenomena could be understood. It was the failure of classical physics that led Albert Einstein to formulate the special theory of relativity (Morrison, 2020). The main difference from classical physics is that the equations of special relativity are developed based on the speed of light (Goodarzimehr, 2023). Einstein's special theory of relativity is based on two postulates put forward in 1905:

The first postulate about the principle of relativity:

"Hukum fisika memiliki bentuk yang sama dalam semua kerangka acuan inersial"

The second postulate about the constant speed of light:

"The speed of light entering a vacuum has the same value of c in all inertial frames of reference" (Krane, 2019).

The relationship between space and time in the postulate produces relativistic effects, such as time dilation, length contraction, relativity of momentum, relativity of kinetic energy (krane, 2019; Alstein, 2023).

Conveying the theory of special relativity in class is a challenge for teachers. Learning media is a tool for conveying material and as a means in the learning process so that learning outcomes can be realized (Puspitarini & Hanif, 2019). The use of interesting learning media can generate student motivation in the learning process (Yulisa et al., 2020). Of the various learning media, audio-video has a significant impact on the learning process so that it is easy for students to learn in independent learning (Pal et al., 2019). Based on the research of Novisya and Desnita (2020) the learning media that are most popular with students are Power Point and Video with a percentage value of 37.5% each.

The use of video media as an effective learning tool in conveying information, entertainment, and education. Video is a combination of moving images, audio, video, animation, and sound which are arranged sequentially to form a flow containing messages with a specific purpose (Kurniawati et al., 2021; Yunnita, 2021). The advantage of using video as a learning medium is that the message conveyed is easier to understand, understand, and stick in memory (Swandi et al., 2022). The steps in creating video content are writing narrative scripts which are then adapted to the visuals and adding interactive elements such as interactive questions (Kestin, 2022). Video has the potential as a medium to explain abstract physics concepts such as special relativity. Abstract physics concepts are turned into concrete by displaying details and slowing down or speeding up movement to facilitate students' understanding of physics concepts (Hafizah, 2020).

Social media is one of today's communication media used by people to communicate with each other in cyberspace (Pujiono, 2021). Active social media users in Indonesia according to data from (We Are Social) in early 2023 there were 167 million or 60.4% of Indonesia's total population (276.4 million). On average, Indonesians spend 3 hours and 18 minutes on social media every day. The most used social media platforms are WhatsApp, Instagram, Facebook, TikTok, and Telegram. At the beginning of 2023, TikTok is a social media platform that has grown rapidly from the previous year by 63% to 70.8%. Tiktok integrated learning videos can be accessed anytime and anywhere in accordance with the vision and mission of the 'Kurikulum Merdeka', namely independent learning.

Students are currently dominated by Generation Z, which almost all of their activities interact with devices and social media (Puspningtyas, 2020). The intensity of use and utilization in using social media in generations has a direct impact on their habits (Nasution, 2020). In the world of education, it is important for educators to have an understanding of the characteristics of each generation to set strategies so that learning runs effectively (Ministry of Education and Culture, 2021). The development of the use of

social media as a tool for disseminating learning videos continues to grow because it is integrated into everyday life so that it can attract students' attention (Pujiono, 2021; Radin, 2022).

One of the social media platforms that is currently developing very rapidly is TikTok. TikTok is a combination of two applications namely Musically and Douyin. Douyin comes from China which was released from 2017 and was released internationally on August 2, 2018 (Safitri et al., 2021). TikTok is a social media platform that provides short videos with a maximum duration of 10 minutes to interact with each other in cyberspace (Wijaya, 2022). TikTok provides several video content such as education, comedy, fashion, food, beauty, and others (Tiwow et al., 2023; Ramdani et al., 2021).

On July 3, 2018 Tiktok social media was blocked in Indonesia by the Ministry of Communication and Information because of the many complaints and reports about this application. However, in August 2018 Tiktok reopened with a minimum user age limit of 11 years (Mana, 2021). On the other hand, TikTok has the advantage that students like it by displaying interesting content and becoming a forum for students so as to develop student creativity (Ramdani et al., 2021).

Learning videos that are integrated with the TikTok social media platform are an alternative for explaining abstract physics concepts. Special relativity is one of the first modern physics materials to be introduced to grade 12 students or in phase F. The purpose of this research is to help students and TikTok social media users learn modern physics concepts such as special relativity.

METHOD

As described, a learning video developed to explain special relativity has an abstract concept. This study uses the Research and Development (R&D) method (Amelia et al., 2022) with a development model, namely definition, design, development, and dissemination (Permana et al., 2021). The dissemination stage is uploaded to Tiktok social media. The next section describes the 4D steps in more detail.

Defining is determining what will be developed and what components will be the constituent elements of the video (Amelia et al., 2022). Design or design is the activity of designing a product that has been determined. Development or development is an activity to change the design into a product by testing the validity of the product by experts. Dissemination is the activity of disseminating products that have been made to the target.

RESULTS AND DISCUSSION

The learning videos in this study used the 4D model proposed by Thiagarajan, Semmel & Semmel. The first stage is defining, designing, developing, and disseminating. This development has gone through these 4 stages with validation by material experts and media experts.

1. Define
   Needs analysis based solely on literature studies was carried out to review curriculum information currently used in Indonesia, especially on special relativity material. Analysis of needs based on the curriculum, namely students are expected to be able to analyze the relationship between various physical quantities in the special theory of relativity in everyday life and technology. The learning objectives in developing this video are structured based on an analysis of studying the independent curriculum to achieve learning outcomes and the profile of Pancasila students who are independent and think critically. In addition, the researchers also searched Tiktok accounts which discussed the special theory of relativity and identified deficiencies in the videos that had been spread. It then develops the first video plot focusing on two of Einstein's postulates in the special theory of relativity.
2. Design

In the development of learning videos, the design stage begins with creating a video script. Next look for videos and images as background that are in accordance with the topic discussed, namely special relativity. In previous studies, videos were used to support physics learning and help solve problems by Amalia, et al [12] and Juliana, et al [13]. This product is different from existing physics learning videos. This learning video includes a short drama about the application of special relativity, theories, formulas, and phenomena that exist in everyday life about special relativity.

3. Develop
   Development or development is an activity to change the design into a product by testing the validity of the product by experts. Based on the design that was late made, the design was done by shooting videos, and video editing by adding music and text. This learning video product has gone through a validation test by experts, due to limited time in the research.
4. Disseminate
   Dissemination is an activity of disseminating products that have been made to the target. This last step is done as a form of promotion. Based on the title, the distribution of this learning video is through social media, namely TikTok.

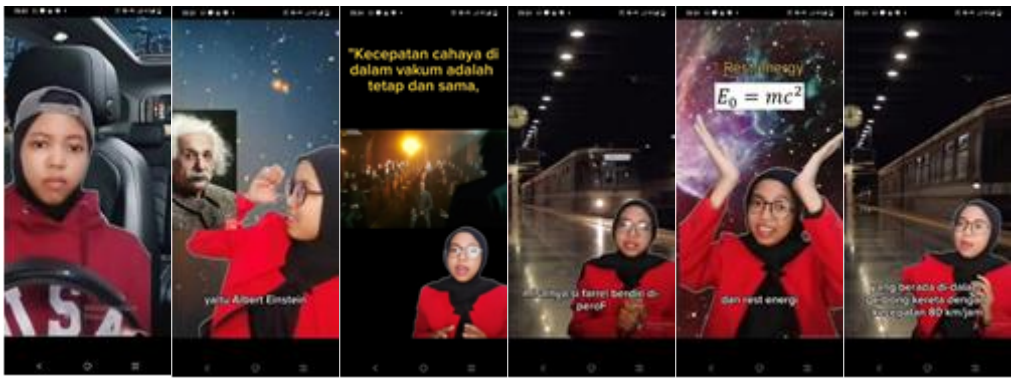

FIGURE 1. Some parts of the video.

"Physics dubidu" is an account name created specifically to provide physics content, especially modern physics. For now, researchers are focusing on building physics content on special relativity material. Through social media, TikTok viewers can interact directly with video owners because the comment and like fields are activated. So that viewers can give their opinions about the video in the form of suggestions and criticisms or just support. The researcher took some of the comments from the audience in the video. For example, there is one viewer who comments 'creative' or 'cool'.

This video was uploaded on June 23, 2023, at 14.00. The number of views of this learning video has reached 283 views. One of the reasons for the large number of views is that viewers share videos with myelin links. This can be seen in the arrows with the number of shares, namely 6. The number of likes is less than the number of views, namely 92 likes. The audience also reacted by giving comments. In addition to the suggestions and criticisms that have been mentioned, there is one viewer who answered correctly the question at the end of the video.

CONCLUSION

This research makes a learning video about physics material, namely Einstein's special relativity which is integrated with the social media Tiktok. This first video focuses on Einstein's two postulates and how the phenomenon and its application in everyday life. With a short drama at the beginning of the

video, it can attract viewers to watch the video until the end. This can be seen from the number of views (283), likes (92), and shares on the video (6). Finally, this video has been validated by material experts and media experts at 83% and 93%, respectively. Based on the validation results, it shows that video microlearning is feasible to be implemented as a medium for learning physics in class 12 high school on special relativity material. Suggestions for further research include adding classical physics material or other modern physics and providing examples of calculation problems with their discussion.

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