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IDENTIFICATION OF STUDENTS' RESPONSES TOWARDS STEM-BASED PHYSICS LEARNING VIDEOS ON MOMENTUM AND IMPULSE MATERIALS

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Abstract :
This study aims to identify students' needs for learning media in the form of physics learning videos that are needed and needed by students, especially on momentum and impulse material. This research is a quantitative study with a sample of class XI students at SMA Negeri 3 Muaro Jambi who have studied the momentum and impulse material and the research population, namely all students at SMA Negeri 3 Muaro Jambi. The research data was obtained from filling out the students' needs questionnaire results sheet for the required learning media. The results of filling out the students' needs questionnaire sheet show that in learning physics they have not used learning media in the teaching and learning process, so that learning is not conveyed in detail, both in terms of material and visualization, and students need learning media that is able to explain learning material in detail, and provide solutions in explaining learning material.

Keywords: Learning Media, Needs Analysis, Physics

INTRODUCTION

Physics is one of the branches of Natural Sciences that receives important attention in improving the quality of education, especially in producing students who are able to think critically, creatively, innovatively, logically, and take the initiative (Astuti, 2015; Nisa & Habibbulloh, 2024; Sulaiman et al., 2024). Therefore, in learning Physics, students do not just memorize formulas, but the most important thing is to lead students to understand the concepts of Physics and understand their relevance in everyday life (Maulana, 2020; Ilyas et al., 2023; Handayani et al., 2023). However, in reality, many students do not like and are less interested in physics subjects and consider it a very difficult subject, especially in physics material, namely momentum and impulse (Samudra, 2014; Astalini et al., 2023; Harizon et al., 2023). It is hoped that this problem can be overcome and improve the learning process by paying attention to the components in the learning system, one of which is learning media (Sudjana, 2010; Saida & Auta, 2023).

Media in the learning process is an intermediary or messenger of the message source with the message recipient, stimulating thoughts, feelings, attention, and will so that they are motivated and involved in learning (Hamid et al., 2020; Almonia, 2024; Utami et al., 2024). The benefits of learning

media, first, provide guidelines for teachers to achieve learning objectives so that they can explain learning materials in a systematic order and help in presenting interesting materials to improve the quality of learning, second, can increase students' motivation and interest in learning so that students can think and analyze the learning material given by the teacher well with a pleasant learning situation and students can understand the learning material easily (Nurrita, 2018; Emi et al., 2024; Noritasari, 2024). One of the learning media that can be used is using learning videos.

Learning videos are one type of media that emphasizes the power of sound and images (Pamungkas et al., 2018; Alamsya et al., 2024; Setiawan et al., 2024). Learning videos are media that have audio (sound) and visual motion (moving images) elements. As a learning medium, videos act as a delivery of information from educators to students (Hadi, 2017; Endra & Villaflor 2024; Habibi et al., 2024). According to Kustandi and Bambang 2013) audio-visual media have interesting properties and motivate students to learn more material, the material presented in audio-visual can be used to develop listening skills and evaluate what has been seen/heard. However, learning videos available on the internet tend to use conventional learning models that only focus on educators (Karina et al., 2024; Zulkhi et al., 2024; Wirayuda et al., 2024). One of the approach models that is expected to help and facilitate students in the learning process is through the STEM approach. The STEM approach is an approach that refers to four components of science, namely knowledge, technology, engineering, and mathematics (Davidi et al., 2021; Priyanto et al., 2024; Subhan et al., 2024). STEM (science, technology, engineering, and mathematics) is an approach to learning that combines four disciplines that are useful for solving problems in real life and can develop students' creativity so that they have skills (Sukmana, 2017; Rosmawati et al., 2024; Sunia, 2024). The benefits of STEM-based learning are becoming problem solvers, creative, innovators, independent, becoming logical thinkers, and being able to connect STEM education with everyday life (Maulana, 2020; Fadhilah, 2024; Syamsiah, 2024).

Previous studies have focused on improving student learning outcomes in physics subjects through the application of the Problem-Based Learning learning model assisted by electronic student worksheet media (Kasanah, 2024; Yusipa, 2024; Ernawati et al., 2023). On the other hand, the current study takes a different direction by emphasizing the analysis of students' needs for learning media, especially physics learning videos, which have not been widely used in the learning process in the classroom. The gap between the two studies lies in their approach and focus. Previous studies have emphasized more on evaluating existing learning models, while the current study focuses on students' basic needs for learning media that have not been met. This study fills the gap in previous studies by introducing a needs-based approach that can enrich physics teaching methods, especially by utilizing relevant and detailed video media. In addition, the current study also provides new insights into the lack of effective use of learning media in the classroom, which can be used as material for evaluation and further development in physics teaching strategies.

This study has novelty in the context of implementing STEM (Science, Technology, Engineering, and Mathematics)-based physics learning that focuses on momentum and impulse material, by utilizing video media as the main tool. In today's digital era, the use of learning videos is becoming increasingly important, but there is still little research that specifically examines students' responses to STEM-based learning that uses videos, especially on the complex concepts of momentum and impulse. This study seeks to fill this gap by not only evaluating the effectiveness of learning videos, but also identifying how STEM elements in the videos affect students' understanding and engagement. This is expected to provide new insights into more effective and innovative learning strategies in teaching physics in the digital era. The urgency of this research lies in the urgent need to improve the quality of physics learning in schools, especially in facing the challenge of low student interest and understanding of abstract concepts such as momentum and impulse. In the context of Indonesian education, where STEM learning is starting to be widely integrated, the development and utilization of effective learning videos is crucial to support a curriculum that is increasingly focused on 21st century skills. This research is expected to make a significant contribution by identifying students' responses to this method, so that more relevant and engaging learning strategies can be produced. The implications of this study include increasing the effectiveness of physics learning, which will not only improve students' understanding but also arouse their interest in science, technology, engineering, and mathematics, which are important foundations in building superior human resources in the future (Yunita, et al., 2024).

The purpose of this study is to determine and identify how students respond to STEM-based learning videos at SMA Negeri 3 Muaro Jambi. Meanwhile, the formulation of the problem in this study is how students respond to STEM-based learning videos at SMA Negeri 3 Muaro Jambi.

RESEARCH METHOD

Research Design

This research is a type of quantitative research. Quantitative research is research that involves theory, design, hypothesis and subject determination supported by data collection and data analysis before drawing conclusions (Syaiful, 2021).

Research Target/Subject

This study targets students of grade XI at Senior High School 3 Muaro Jambi who have studied Momentum and Impulse material. The study population includes all students of grade XI at Senior High School 3 Muaro Jambi. To determine the research sample, a purposive sampling technique was used, namely the deliberate selection of samples based on certain criteria that are relevant to the research objectives. In this case, the sample was taken from grade XI who had studied Momentum and Impulse material, with a total sample of 60 students. The purposive sampling technique was chosen to ensure that the samples taken have adequate experience and knowledge of the material being studied, so that the data obtained are more accurate and relevant.

Research Procedure

The research data was obtained from filling out the needs questionnaire sheet for the learning media desired by the research subjects. The needs questionnaire is an instrument that researchers use to find out the follow-up efforts to handle the problems expected by the research subjects regarding the learning media to be developed, so that researchers can provide appropriate solutions and in accordance with the wishes of the research subjects.

Instruments, and Data Collection Techniques

Instruments are tools such as questionnaires and observation guidelines used to collect data in research (Sugiyono, 2016; Asmororini et al., 2024). The data collection instrument in this research and development uses an assessment instrument in the form of a questionnaire. The questionnaire is in the form of questions and statements about the media being developed.

Table 1. Research instrument grid

No.	Question Item
1.	What do you think about Physics learning?
2.	What model/method does your teacher apply in the learning process?
3.	Is the model/method that your teacher uses effective?
4.	What learning method do you want?
5.	What reference books do you have?
6.	Do you have other learning resources?
8.	Is the teacher's explanation enough for you to understand difficult material?
9.	Has your teacher ever used multimedia in explaining the material?
10.	If so, how often?
11.	What media does the teacher use in the learning process?
12.	What do you think about the availability of existing Physics learning media?
13.	What do you think, is it necessary to develop learning media for existing Physics lessons?
14.	Do you want learning media in the form of videos?
15.	What is the picture of the Physics learning media that you expect

Data analysis technique

The research instrument in the form of a questionnaire sheet for learning media needs will produce research data. The data obtained is quantitative data. Then the data is processed using the help of Google Form.

RESULTS AND DISCUSSION

Research on the analysis of students' needs for learning media that can support learning in Physics subjects was carried out using a data collection instrument in the form of Google Form containing questions and statements. The instrument was given to students as a sample of the research subjects. The arrangement of the data from the student needs questionnaire sheet can be seen in table 1. Based on the results of distributing the learning media needs questionnaire to students, the majority of students stated that Physics was difficult to understand. One of the factors that causes students to dislike Physics is that in their view Physics is only a theory and formula that must be memorized (Jannah, 2019; Fauziyah et al., 2023; Huda et al., 2023). To overcome this problem, teachers use various learning methods such as lectures, group discussions and demonstrations. However, these efforts have not been able to overcome the problems that occur. Another problem found was that the material that was considered difficult by students was Momentum and Impulse material with a percentage of 54.5%. The difficulties felt by students are due to the inadequate availability of learning media in the teaching and learning process. The lack of use of learning media makes the learning process boring and students are not enthusiastic in receiving learning materials in class. In addition, another problem experienced by students is the lack of ability to develop the material provided by educators (Kalinda et al, 2015).

Table 1. Results of Completing the Observation Sheet

No.	Question Item	Persentase Jawaban Mahasiswa
1.	What do you think about Physics learning?	• Very Difficult (35.6%) • Difficult (41.6%) • Not Too Difficult (24%) • Not Difficult (3%)
2.	What model/method does your teacher apply in the learning process?	• Lecture (72.7%) • Group Discussion (9.1%) • Demonstration (24.2%)
3.	Is the model/method that your teacher uses effective?	• Already (27.3%) • Not Effective (72.7%)
4.	What learning method do you want?	• Lecture (57.6%) • Group Discussion (33.3%) • Demonstration (27.3%)
5.	What reference books do you have?	• Yudhistira (33.3%) • Erlangga (54.5%) • None (24.2%)
6.	Do you have other learning resources?	• Module (3%) • Power Point (27.3%) • None (69.7%) • Internet/Google (3%)
8.	Is the teacher's explanation enough for you to understand difficult material?	• Enough (48.5%) • Insufficient (51.5%)
9.	Has your teacher ever used multimedia in explaining the material?	• Ever (21.2%) • Never (78.8%)
10.	If so, how often?	• Every day (3%) • Sometimes (18.2%) • Never (78.8%)

11.	What media does the teacher use in the learning process?	• Power Point (12.1%) • Video (3%) • Flash Animation (6.1%) • Books/ E-Books (78.8%)
12.	What do you think about the availability of existing Physics learning media?	• Adequate (39.4%) • Inadequate (57.6%) • Quite Adequate (3%)
13.	What do you think, is it necessary to develop learning media for existing Physics lessons?	• Necessary (97%) • Not Necessary (3%)
14.	Do you want learning media in the form of videos?	• Yes (97%) • No (3%)
15.	What is the picture of the Physics learning media that you expect	• STEM-Based Videos (84.8%) • Using Animation (18.2%)

The results of the analysis of the student needs questionnaire sheet for the development of learning media showed that students stated that the learning media used in Physics learning activities were not sufficient to meet their needs in learning physics. Most of the research subject samples stated that students needed learning media that could help the learning process become more enjoyable. Students want learning media that can arouse enthusiasm for learning through more realistic visualizations. Students also stated that they agreed if the development of learning media in the form of learning videos based on the STEM approach was carried out, especially for Momentum and Impulse materials. The results of the study from the analysis of student needs for learning media showed that students needed innovative learning media that were useful for supporting learning activities. So, the researcher provided a solution to solving the problem by developing learning media. From the results of the study, 97% of students wanted learning media in the form of videos as an aid in learning activities. Learning videos are visual and auditory learning media (audio visual) that can be used to convey lesson material by displaying images and sound (Fitri, 2021;). Learning videos can provide more interesting explanations related to the knowledge provided by educators to students so as to produce innovative learning. The characteristics of innovative learning are student-centered and designed to provide developed learning media, with the hope that the learning videos that will be designed can help students understand and be more enthusiastic in physics subjects.

Previous research conducted research related to testing the law of conservation of momentum through experiments involving collisions and the use of experimental kits designed to provide high-quality data (Utari & Prima, 2019). This research makes a significant contribution to creating innovative and effective learning tools for physics teaching, especially at the junior high and high school levels, by showing how technology can be used to improve the accuracy and quality of science learning. The gap between the two studies lies in the different approaches and objectives. Previous research focused on the development and application of technology in physics experiments to improve students' scientific literacy, while current research focuses more on analyzing students' basic needs for learning media that have not been properly accommodated. Current research fills the gap by highlighting the importance of learning media that are more in line with students' needs, especially in conveying complex physics concepts in a way that is easier to understand and visualize.

The novelty of this study lies in its approach that directly focuses on analyzing students' needs for physics learning media, especially on Momentum and Impulse material. Unlike previous studies that emphasize more on the development of tools and technology for physics experiments, this study explores in depth students' needs for more interactive and visual learning media. The results of the study indicate that the majority of students want the development of learning media in the form of STEM-based videos, which are expected to facilitate understanding and increase their learning motivation. Thus, this study not only identifies gaps in existing teaching methods but also offers innovative solutions through the development of learning media specifically designed to meet the needs of students in this digital era. This makes this study a pioneer in connecting student needs analysis with the development of relevant and STEM-based video learning media, which has not been widely explored in previous studies. This study has important implications for the development of physics learning, especially in increasing the effectiveness and attractiveness of learning through the development of STEM-based

videos, which are expected to deepen students' understanding and increase their learning motivation. However, this study has several limitations, such as the sample coverage is limited to one school and the data collection method may not fully describe students' needs in depth. In addition, this study has not tested the effectiveness of the developed learning media, so further research is needed to overcome these limitations and test the direct impact of the proposed media.

CONCLUSION

Based on the data from the research on students' needs regarding learning media, it was found that students expect interesting learning media that can help students in the teaching and learning process and can increase enthusiasm in the learning process, especially in physics subjects. To meet these needs, researchers are interested in developing learning media in the form of physics learning videos using the Science, Technology, Engineering and Mathematics (STEM) approach, especially in the Momentum and Impuks material. The application of the Science, Technology, Engineering and Mathematics (STEM) approach in Physics learning is expected to provide and help students with various skills needed during the learning process. Likewise, the integration of the Science, Technology, Engineering and Mathematics (STEM) approach in this learning video can make learning more meaningful.

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Based on the research data on the analysis of student needs, it can be concluded that the learning media that needs to be developed in one of the physics subjects, namely Momentum and Impulse material at SMA Negeri 3 Muaro Jambi is a learning media in the form of learning videos based on the Science, Technology, Engineering and Mathematics (STEM) approach developed using the Kinemaster Pro application. This research is part of the research on the development of physics learning videos on Momentum and Impulse material aimed at meeting students' needs for learning media. With this research, it can be a reference in the development of learning media in the form of module learning videos on physics subjects, especially Momentum and Impulse material.

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