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Creation of Physics Educational Media Utilizing Powtoon Integrated With Local Wisdom for the Execution of the Independent Curriculum

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Abstract

This project intends to assess the feasibility and efficacy of Powtoon-based educational videos on physics that include local expertise on sound waves. This study focuses on Research and development (R&D), utilizing the ADDIE framework, comprising investigation, planning, creation, execution, and assessment. This the study encompassed 30 students from class XI at Bhineka Tunggal Ika SMA Negeri 1 Tirawuta. The employed instruments include interviews, questionnaires for validating content and media specialists, effectiveness questionnaires for students and teachers, and documentation. The employed data analysis technique involves both quantitative and qualitative descriptive analysis. The findings indicated that the validation feasibility by material experts was 90%, while that of media specialists was 87.69%, both categorizing as highly practicable. The efficacy statistics for teachers were 94.28%, while for pupils, they were 83.6%, both categorized as highly effective. The creation of Powtoon-based physics educational material is concluded. coupled with local wisdom for class XI sound wave material, satisfies the criteria for practicality and efficacy within the execution of an independent curriculum at the SMA/SMK/MA level.

Keywords: *Learning Media, Powtoon, Local Wisdom, Sound Waves*

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1. INTRODUCTION

Indigenous knowledge-oriented the study of physics serves as a tangible expression of character education that educators can employ to uphold local culture. Local wisdom encompasses a philosophy of life and knowledge, along with diverse tactics employed by the local population to address diverse difficulties and meet their needs. Local wisdom encompasses any sort of knowledge rooted in esteemed values that are upheld, practiced, and preserved over extended periods, transmitted between generations within a specific context or location. Local wisdom is seen as immensely significant and offers distinct advantages in communal life (Njatrijani, 2018).

The incorporation of local expertise is crucial in the educational process, aligning with the execution of a Free Education, which emphasizes diversified, project-based, and contextual learning. Local wisdom constitutes a cultural asset that encapsulates the distinctive character and revered values of an area. In the educational context, integrating local wisdom into learning is a strategic effort to foster cultural awareness, strengthen students' character, and increase the relevance of learning materials to everyday life. In this study, the local wisdom integrated is bamboo baasi music and kentongan, two types of traditional musical instruments that have developed in the communities of Southeast Sulawesi.

Bamboo music is a local cultural tradition that utilizes bamboo stems as musical instruments that produce sound using the principles of physics, specifically sound waves. Bamboo instruments can demonstrate the concepts of resonance, frequency, amplitude, and vibration in a very realistic way. By

connecting physics material with real-life practices in bamboo music, students not only learn the concepts theoretically but also see their application in their own culture. By utilizing bamboo music in their learning, students can directly observe how sound waves are produced and influenced by the shapes and lengths of the instruments .

In the context of physics learning, the kentongan can be used as a real example to explain how sound travels through the air, how amplitude affects the loudness or softness of the sound. In the developed learning videos, the musical instruments are not only presented as visual illustrations, but are also used to connect physics concepts to local cultural practices familiar to the students. This can foster a sense of belonging to their culture and enhance the significance and enjoyment of learning.

Observations conducted by the author in various schools, as detailed in Appendix 1, revealed that some institutions have incorporated video media into their learning processes, while others have not utilized learning videos at all. The findings from the author's observations of educators at SMA Negeri 1 Tirawuta regarding the learning media used during the learning process indicate that interactive media, such as audio-visual media, have not been utilized; instead, they still rely on PowerPoint, which is said to be used very rarely. Currently, there are many media options capable of presenting various features, yet teachers continue to use lecture methods and outdated media, not keeping up with the changing times and technology. Considering that the current millennial generation is more interested in audio-visual-based applications and platforms such as TikTok, Instagram Reels, YouTube Shorts , and other media, Educational movies are highly appropriate for incorporation into learning activities. One pedagogical strategy is the utilization of media and instructional resources, wherein learning media significantly influence the classroom The method of learning. Technology can improve the learning process leading to enhanced student proficiency outcomes. Utilizing interactive video media can enhance students' engagement, motivation, and comprehension of the subject matter.

The videos will be packaged in such a way that they are accessible for students to comprehend. The benefits and innovation of the learning media to be utilized encompass the incorporation of local expertise, particularly in physics, specifically sound waves, into the implementation of the independent curriculum. The learning videos to be created and developed by the researchers are based on Powtoon.

Powtoon is a web-based platform that offers animation capabilities for developing presentations on educational content. The animation capabilities include written illustrations, comic animated and dynamic movement animations, as well as intuitive timeline setups. (Astika, Anggoro, & Andriani, 2019). The user-friendliness of these elements offers advantages for both students and educators, enabling them to provide instructional materials in novel ways. Media including visual and auditory features will augment students' retention of the subject matter conveyed through video. This will enhance cognitive engagement with the topic matter under examination, thus resulting in active learning activities.

Powtoon-based applications feature characters that can help students understand material. In these applications, Students obtain visual and auditory knowledge that can be synthesized into captivating animated animations. (Wulandari et al., 2020).

A study by Lubis et al. (2024) on the creation of Powtoon-based physics learning videos focused on sound wave material to enhance the scientific literacy of Grade XI students revealed that the media's feasibility, as evaluated by material experts, was 90.67%, categorized as very feasible. The evaluation by media specialists was 90.56%, categorized as highly practicable; the evaluation of teacher response questionnaires was 90.67%, also deemed highly viable; and the evaluation of student answer questionnaires was 89.83%, classified as very engaging. The enhancement of student scientific literacy was assessed with N-Gain. The group conducting the experiment obtained an N-Gain metric of 0.70, classified as high, while the control class secured a score of 0.56, classified as medium. Powtoon-based physics educational movies on sound wave material improve pupils' scientific understanding skills.

According to prior study and the aforementioned explanation, the utilization of Powtoon-based animated video learning media has yielded numerous beneficial effects on education. However, no research has been conducted on the integration of local wisdom into Powtoon-based physics learning videos. Therefore, researchers will develop physics learning videos that integrate local wisdom into the topic of sound waves. Based on this background, researchers will conduct a study entitled

"Development of Powtoon-Based Physics Learning Videos Integrated with Local Wisdom In the execution of the Free Education."

2. METHODS

The current study utilizes a developmental approach methodology known as the Development and research (R&D) methodology. Development and research (R&D) constitutes a methodical procedure designed to creating a new product or enhancing an existing one. (Okpatrioka, 2023). This research is one that has an output, namely the existence of a product that can then be tested for its feasibility for use. The output is a product that can be tested for its feasibility, namely Powtoon -based physics learning media on sound waves for class XI. This study was done from December to May of the 2024/2025 term of study, taking place at SMAN 1 Tirawuta in class XI Bhineka Tunggal Ika.

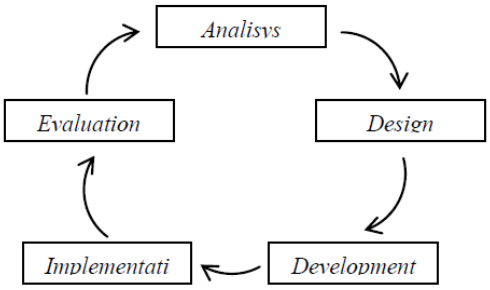


Figure 1. Research Design ADDIE Model Scheme (Sugiyono, 2015)

Sugiyono (2013) defines an instrument for study as a device employed to quantify reported events in nature or society. study instruments serve as data collection tools and are typically utilized in studies that involve a series of questions presented to each participant in the study sample, such as a questionnaire. A questionnaire is an instrument for research consisting of a series of inquiries or claims intended to gather data or information that respondents are required to answer voluntarily based on their perspectives (Ernawati & Setiawaty, 2021). The evaluation tools employed for data gathering in this developmental research are as follows:

a. Interviews

Interviews are a technique often used to gather information or data from an individual or group of people. Interviews can be conducted either in writing or verbally. To determine teacher and student responses to the learning material that will be developed into instructional videos, the researchers in this study interviewed teachers.

b. Expert Validation Sheet

Data regarding the accuracy of the eleventh-grade physics learning video created using Powtoon and combined with local wisdom about sound waves were collected using a validation sheet. The validation sheet was given to two qualified validators: a media expert and a material expert. The Likert scale ranking and assessment responses from the validators, students, and educators are displayed in Table 1. below:

Table 1. Likert Rating and Assessment Answers of Validator, Student, and Educator Items

Category	Score
Very good	5
Good	4
sufficient	3
less	2
very less	1

Source: modified (Janah, M. 2023)

3.4 Methods of Data Analysis

This study employs data analytic approaches to create a Powtoon-based physics learning film, incorporating local expertise on sound waves for grade 11 within the framework of the Independent Curriculum:

1. Qualitative Descriptive Analysis
This type of data processing, known as qualitative descriptive analysis, involves categorizing information from qualitative data into comments, criticisms, and recommendations to improve interview results. Validator reviews of the Powtoon-based learning video were processed using this qualitative descriptive analysis technique to obtain comments and suggestions.

2. Quantitative Descriptive Analysis
The quantitative descriptive analysis approach is a tool for data processing on a topic under study by methodically collecting information in the form of numbers and percentages to draw broad conclusions. The focus of this study is on respondents' opinions regarding the feasibility of the physics learning video developed using Powtoon, specifically by processing information obtained from teacher and student questionnaire responses and validation sheets.

3. RESULT AND DISCUSSION

This study focuses on the creation of Powtoon-based physics educational media, using local wisdom related to sound wave concepts for eleventh-grade students, within the framework of the autonomous curriculum, with the objective of producing a viable and successful video resource. The product was produced implementing the The ADDIE study paradigm consists of five stages: evaluation, planning, execution, and review, as outlined by Sugihartini & Yudiana (2018). This aligns with the research undertaken by Cahyadi, R. A. H. (2019) concerning the phases of the ADDIE model.

The initial phase regarding this advancement involves performing a three-part study: curriculum analysis, student needs assessment, and teacher needs evaluation, utilizing observation and interviews at SMA Negeri 1 Tirawuta. This analysis aims to find educational resources that align with the requirements and attributes of educators and learners. This agrees with the investigation done by Hidayati et al. (2024), it signifies that the activities at this stage involve assessing issues identified in schools, including needs analysis. The objective of the requirements analysis is to identify and classify the issues encountered, particularly concerning the educational medium utilized in schools.

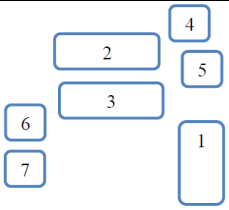
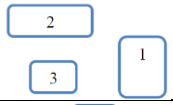
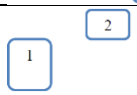
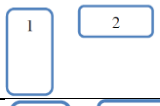
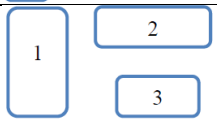
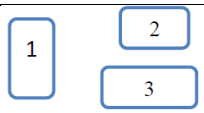
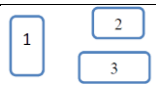
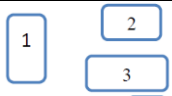
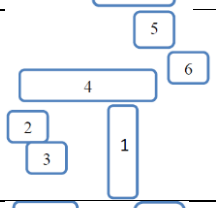
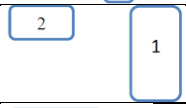
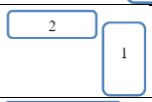
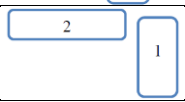
The curriculum analysis indicates that the independent curriculum in phase F is employed in schools, signifying that its implementation has commenced just in grade XI. The subsequent phase of analysis involves assessing student needs through the administration of a student needs questionnaire. The investigation was conducted to ascertain the features and requirements of students for physics instruction. The analysis revealed that 63% of students exhibited a lack of enthusiasm during the physics learning process, while 100% encountered challenges in comprehending the subject. Students concurred that enhancing their passion and comprehension of physics necessitates the utilization of engaging educational media. The conclusive analysis pertains to the assessment of teacher requirements; it is acknowledged that educators utilize learning media, including PowerPoint, which is reportedly infrequently employed. Consequently, this analysis led researchers to create physics learning media anticipated to enhance student engagement and comprehension of physics concepts, enabling educators to maximize the use of these resources in physics instruction. The developed media is a Powtoon-based educational movie on physics, using local wisdom related to sound waves.

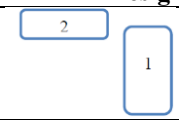
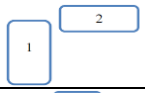
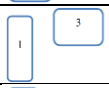
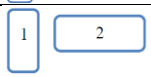
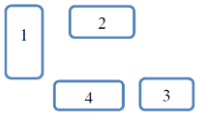
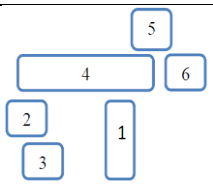
The local wisdom highlighted in this media development is bamboo musical instruments, specifically the baasi and kentongan. The baasi is a traditional bamboo instrument played in groups and produces specific tones. The kentongan is a traditional communication tool also based on sound. These two instruments were chosen because of their contextual relevance to the physics of sound waves and to reinforce local cultural values in learning. This integration The use of local wisdom is anticipated to enhance students' comprehension of the idea of sound waves more concretely but also foster a love for local culture.

In developing this learning video, the researchers not only show videos of baasi and kentongan musical instruments, but also explain how these instruments work scientifically. For example, the video shows that the longer the baasi bamboo, the lower the sound frequency, and this is in accordance with the equation ($f = \frac{v}{\lambda}$), where f is the frequency (Hz), v is the speed of sound (m/s), and λ is the wavelength (m). Thus, students can directly see the application of physics concepts in traditional musical instruments.

The second stage is designing the learning video product. The presentation of the material content is taken from book sources. The design is then presented as an outline in the form of a well-structured, sequential sketch, commonly called a storyboard. The storyboard can be seen in Tables 2.

Table 2 Video Design Creation (Storyboard)

No	Design	Information
1.		1. Contains teacher animation 2.Contains sound title 3.Composer's name 4.Picture of a clock 5.Picture of a bookshelf 6. Picture of a table and chair 7. Picture of a laptop
2.		1. Animation depicting a female educator 2. Learning objectives 3. Image
3.		1. Animation depicting a female educator 2. Animation of longitudinal waves
4.		1. Animation depicting a female educator 2. Contains an explanation of sound waves.
5.		1. Animation depicting a female educator 2. Quantities of sound waves 3. Frequency equation
6.		1. Animation depicting a female educator 2. Explanation of sound wave properties 3. Wavelength equation
7.		1. Animation depicting a female educator 2. Explanation of the quantities of sound waves. 3. Equation for wave speed
8.		1. Animation depicting a female educator 2. Explanation of the quantities of sound waves 3. Period equation
9.		1. Animation depicting a female educator 2. Image of a laptop 3. Image of a table and chair 4. Image of a blackboard 5. Image of a wall clock 6. Image of a bookshelf
10.		1. Animation depicting a female educator 2. Explanation of the sound source
11.		1. Animation depicting a female educator 2. Example of playing the Baasi musical instrument.
12.		1. Animation depicting a female educator . 2. Explanation of the sound source material.

No	Design	Information
13.		1. Animation depicting a female educator 2. Example of a sound source from a Kentongan
14.		1. Animation depicting a female educator 2. Example questions
15.		1. Animation of a girl 2. Answers to sample questions
16.		1. Female teacher animation 2. Baasi music game video
17.		1. Animation depicting a female educator 2. Student worksheet 3. Barcode 4. Barcode scanning instructions
18.		1. Animation depicting a female educator 2. Image of a laptop 3. Image of a table and chair 4. Image of a blackboard 5. Image of a wall clock 6. Image of a bookshelf

The creation of the storyboard is inline with studies carried out by Hidayati et al.. (2024), which states that at this stage, namely designing the form and concept of the audio-visual learning media product to be developed in the form of a storyboard and video script used as a guideline in developing audio-visual learning media. The storyboard contains slides, visual and audio displays, and captions.

After creating the storyboard, the next step is preparing the instruments. Validation sheets and teacher and student effectiveness questionnaires are tools used to assess the effectiveness of the video before and after it is shown to students.

The subsequent phase is the development stage, which entails the realization of the product derived from the previously established design stage. Validation is conducted to assess the viability of the generated product based on evaluations from material and media specialists. This parallels the study by Amanda and Darwis (2023), which indicates that two validators will evaluate the product created by researchers: a media validation specialist and a material validation expert. The validation outcomes and suggestions from the experts will serve as a reference for updating the generated product.

Two stages were conducted in the validation of materials and media. Material validation has three aspects : the feasibility of content/material, language feasibility, and presentation aspects. Based on the assessment of material experts in validation stage one , a score of 56.6% was obtained, categorizing it as fairly feasible. The suggestions provided were to improve the animation/image/video used to suit the material being discussed, and the time to display the equation was set so that it was not too short. After making improvements according to the suggestions given by the material experts, the researcher then provided a questionnaire to the material experts to conduct stage two validation for the improved product. Following the stage two validation questionnaire, a score of 90% was obtained, categorizing it as very feasible. Meanwhile, media expert validation consists of two aspects : the feasibility of video display and use. Based on the assessment of media experts in validation stage one , a score of 54.28% was obtained, categorizing it as fairly feasible, with suggestions to adjust the displayed narrative and reduce background sound to avoid interference with the narrative. After making improvements according to the suggestions given by the media experts, the researcher then provided a questionnaire to the media experts to conduct stage two validation for the improved product. The score obtained from the stage two validation questionnaire was 87.69%, categorized as very suitable. Therefore, this learning video is deemed suitable for use.

The fourth stage was implementing the video through a product trial. The trial was conducted with physics teachers and students. The aim of this trial was to evaluate the efficacy of the product. The trial conducted in this development research consisted of 30 11th-grade Bhineka Tunggal Ika students.

The results of the teacher response effectiveness sheet for the learning video presented by physics teacher I Wayan Pariana, S.Pd., showed a score of 94.28%, categorized as very effective. The outcomes

of the student trial prior to the video presentation yielded a score of 50.1%, classified as moderately effective. The outcomes of the student trial subsequent to the video presentation yielded an average score of 83.6%, classified as highly effective. Numerous student answers indicated that the film was engaging, comprehensible, and received favorable remarks regarding the utilization of educational media.

The concluding phase of this study is evaluation, which appraises the video according to the feedback and recommendations from the preceding stage to enhance the video. According to research by Hidayati et al. (2024), the gathered input and recommendations were utilized for the evaluation phase of this study. The findings and discussion indicate the creation of Powtoon-based physics educational media, incorporating local wisdom on sound wave material for Grade 11, aligns with the feasibility and effectiveness standards for application in Senior High Schools under the Independent Curriculum (SMA/SMK/MA).

4. CONCLUSION

Conclusions can be derived from the research and creation of Powtoon-based Physics Learning Media, coupled with local wisdom for sound waves, for Grade XI within the framework of the Independent Curriculum:

1. According to confirmation by specialists in materials and media, this physics learning video was deemed suitable for use in learning, with a feasibility percentage of 90% by the material experts and 87.69% by the media experts. Adjustments to the design and content of the video were made according to the validators' suggestions to achieve a better learning experience.
2. The outcomes of the teacher and student efficacy assessments about the video demonstrated a teacher effectiveness score of 94.28%, categorized as very effectiveThe outcomes of the student performance assessment prior to the video evaluation were 50.1%, categorized as moderately effective, and after the video was tested, the results were 83.6%, categorized as very effective. The physics instructional movie is appropriate and efficacious for utilization. Furthermore, students also expressed positive attitudes toward learning that incorporates local cultural elements, as they found it more engaging, contextual, and relevant to their lives.

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