Jurnal Pendidikan Geografi:
Kajian, Teori, dan Praktik dalam Bidang Pendidikan dan Ilmu Geografi, 29(1), 2024, 95-105
ISSN: 0853-9251 (Print): 2527-628X (Online)
DOI: 10.17977/um017v29i12024p95-105

SAVI-based animated video for seismic material

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Paper received: 05-05-2023; revised: 01-08-2023; accepted: 19-01-2024

Abstract

Learning media supports effective and efficient learning. Meanwhile, seismic learning is deemed as a challenging geography course, thereby, requiring animated video as a medium to visualize abstract concepts into concrete ones. Thus, this study formulates animated learning videos using the SAVI approach for seismic material. It also assesses the effect of animated video media on student learning outcomes. The animation video was constructed using the ADDIE research model and tried out in a pre-experimental pretest-posttest type one group design. The trial was conducted involving 27 tenth grade students from Sunan Ampel Islamic Senior High School. The results of the validity test from the material expert indicate an 88 percent agreement rate, while the media expert shows an 87.3 percent agreement rate. The teacher's response questionnaire received a score of 97 percent, while the student responses received a score of 88 percent. After attending learning with animated video, the average student score increased from 51.31 to 83.77 in the pretest and posttest results. The data obtained from the normality test showed a normal distribution, while the t-test suggested significant results with sig. (2-tailed) 0.000 lees than 0.05. These results imply a significant difference in students' skills before and after the use of animated video media. In summary, the developed media is suitable for seismic learning, offering a positive impact on student learning outcomes.

Keywords: learning media; animated video; SAVI

1. Introduction

Learning media serves as a supporting tool for effective and efficient learning as it facilitates the proper delivery of information (Tri, Fitri, & Milu, 2016). It captivates students' attention, thoughts, and learning motivation (Daryanto, 2016; Maryanti & Kurniawan, 2018). However, learning media should be relevant and align with the learning purpose. Thereby, the selection of learning media must prioritize aspects of students' needs, students' characters, and findings from relevant research (Falahudin, 2014; Panjaitan, Yetti, & Nurani, 2020; Rahmawati, Roekhan, & Nuchasanah, 2016). Therefore, learning media is important for quick and precise delivery of learning material, enabling effective and efficient information delivery.

The use of animated videos provides teachers with an opportunity to enhance learning in both traditional and remote educational settings. Besides, they have been reported as an effective and engaging medium for learning (Gygli, Song, & Cao, 2016; Nurharini, Sumilah, & Yuyarti, 2019). Animated videos offer several advantages, including effective delivery of material, the ability to repeat certain discussions, visualization of abstract concepts, long usage periods due to low damage rates, easy application, and the potential to increase new abilities and experiences for students (Ahsan, Madhok, & Essa, 2019; Hapsari & Zulherman, 2021; Munir, 2020; Rifai, 2017). Therefore, animated videos are well-suited for presenting information or material that requires visualization to convey the intended message accurately.

In addition, the utilization of specific learning media should be supported by an appropriate learning approach to create a pleasant learning environment that encourages active student engagement. One of the available learning approaches is the Somatic, Auditory, Visual, and Intellectual (SAVI). This approach involves four elements, namely somatic (movement and action), auditory (listening and speaking), visual (observation and drawing), and intellectual (reflection, creation, problem-solving, and meaning-building) (Afriawan, Binadjab, & Artikel, 2012; Inayah & Rizqi, 2020; Lana, Karliani, & Dotrimensi, 2021; Minsih & Maya, 2014; Umam & Azhar, 2019). As modern education focuses primarily on the students, the learning experience should be customized to meet the unique needs and characteristics of each student.

The results of the interview and observation at Sunan Ampel Islamic Senior High School indicate that the seismic learning has been carried out with no learning media due to the limited facilities and infrastructures. Accordingly, teachers face challenges in effectively conveying seismic concepts to students due to limitations in verbal explanations and simulations (Wijayanto, Rizal, Subekti, & Novianti, 2018). As a result, students may struggle to comprehend seismic material without visual aids in their learning. Animated video media appears as an effective tool for visualizing abstract material and making seismic concepts more concrete and understandable.

The students' questionnaire results showed that 57% reported that the package book and students' worksheet were not helpful, and 62% had difficulty understanding seismic material. The students also expressed a need for audio-visual media that can be accessed at any time, with 85% showing interest in the use of animated video media. Animated video has been reported to enhance students' understanding of phenomena on the Earth's surface by providing audio-visual experiences during the learning of theories (Rifai, 2017).

A study from Yulianti, Herkulana, and Achmadi (2018) described that appropriate selection of learning media can significantly impact student learning outcomes. Learning outcomes are often indicative of student difficulties in comprehending material at school, which can be attributed to factors such as lack of motivation and ineffective learning strategies. The issues of learning outcomes can be resolved by the adoption of a learning media because it aids students in comprehending the learning material (Ambara, Adiarta, & Indrawan, 2018; Patricia & Susanti, 2018; Wahyuningtyas & Sulasmono, 2020).

Following the aforementioned studies, the research aims to produce a media product that can effectively visualize seismic material. It devises animated learning videos using the SAVI approach on seismic material and evaluates the impact of animated video media on students' learning outcomes. Therefore, this research is expected to contribute to creating more effective and enjoyable learning for students, as well as facilitating teachers to deliver seismic material.

2. Method

This animation video development research employed the Analysis, Design, Development, Implementation, and Evaluation (ADDIE) research model. In the analysis stage, research objectives based on curriculum analysis needs analysis and student characteristics were formulated, along with an analysis of the previous media. The design stage involved preparing a narrative or script, storyboard, and product assessment instrument. During the development stage, the product was validated by material and media validators. In the

implementation stage, product trials were conducted involving teachers and students, who were asked to complete response questionnaires. Then, a trial was performed in a class of 27 tenth-grade students from a social science major with a geography teacher at Sunan Ampel Islamic Senior High School in Buleleng, Bali, Indonesia. Finally, the evaluation stage includes both formative and summative evaluations.

The study uses both qualitative and quantitative data. The qualitative data was obtained from validation questionnaires completed by material experts, media experts, and teachers, as well as student responses in the form of scores. This garnered questionnaire score was assessed using a Likert scale due to its high reliability and flexibility (Table 1). Besides, its number of alternative answers could be adjusted, enabling measurement of the respondent's attitude towards the statement. The formula for calculating the score is shown in formula 1.

Table 1. Criteria of Questionnaire Score

Likert Scale	
Score	Description
5	Excellent
4	Good
3	Relatively good
2	Poor
1	Highly poor

Source: Sugiyono (2019)

$$P = \frac{\sum x}{\sum xi} \times 100 \quad (1)$$

Deskription:
P = Percentage of questionnaire score
∑x = Total score from the respondents
∑xi = A total of maximum score

The obtained questionnaire scores were used to classify the results. The resulting percentages were then interpreted through the category of learning media feasibility criteria to determine its level of feasibility (Table 2). Further, the product feasibility results were analyzed qualitatively using description and content analysis.

Table 2. Criteria for Media Feasibility

Classification	Percentage	Qualification
A	81-100	Highly Feasible
B	61-80	Feasible
C	41-60	Relatively Feasible
D	21-40	Not Feasible
E	0-20	Highly not Feasible

Source: Akbar (2013)

Once the product was acknowledged as feasible, then it underwent a product trial using a one-group pretest-posttest design to obtain quantitative data. The significance of the participants' skills differences before and after attending learning with the animated video media was determined by analyzing their pretest-posttest results using the paired sample t-test. A normality test was conducted as a prerequisite for the paired sample t-test. The

significance level used in this study was 0.05, with a confidence level of 95%. A sig value (2-tailed) < a suggested a significant effect of animated video media on improving student learning outcomes. The t-test analysis was carried out using the SPSS application.

3. Results and Discussion

3.1. SAVI-based Animation Video Product Development Formulation

The ADDIE model was utilized for this research and development project. During the analysis stage, curriculum analysis, needs analysis, student characteristics, and previous media analysis were conducted. These analysis results served as a strong foundation for the development of animated videos. The media was formulated following the basic competencies expounded on by the Minister of Education and Culture Regulation No. 37 of 2018, specifically the basic competency no 3.5, focusing on lithospheric dynamics material presented in the geography course for tenth grade. This basic competency aims to enable students to analyze lithospheric dynamics events (Kurniawati, Sari, & Efendi, 2019). To achieve this learning objective, students must learn about seismic material. Seismic material discusses a physical geography topic related to natural phenomena and facts whose processes cannot be directly observed by humans, thus requiring visual representation (Wijayanto et al., 2018). The animated video was chosen as it serves as a visual aid for seismic learning.

During the Design stage, seismic material is distributed, while scripts and storyboards are prepared. Scriptwriting and storyboarding are crucial in the development of audio-visual media (Hasan et al., 2021). The Design stage is divided into appearance and content design. The creation of animation video has been carried out using two applications, Adobe Illustrator (Ai) and Adobe After Effects (Ae). Ai is used to create design assets, while Ae is used to create movements from the design assets. The resulting animated video is in MP4 format, a widely compatible format with various devices. The creation of animated videos involves design elements such as color and typography. For coloring, a Tetradic (double complementary) color combination is commonly used. This combination is preferred because it carries a positive impression of cheerfulness and activity while also conveying negative emotions such as coldness, melancholy, anxiety, and restlessness (Yogananti, 2015). For the font, this video mainly uses sans serif since its typeface presents a clear and easy-to-read impression (Arifrahara, 2021).

The content design was performed using the SAVI approach. The somatic element appears in the discussion of earthquake mitigation, where students are asked to protect themselves during the earthquake. This approach increases students' basic knowledge of dealing with earthquake disasters and activates all of their senses in learning to prevent boredom (Lana et al., 2021). The animation video presents auditory and visual elements to stimulate students' senses of hearing and vision, aiming to increase their interest and motivation in learning. Animated videos present a special attraction for students to participate in learning (Ponza, Jampel, & Sudarma, 2018). The media presents the intelligence element in the form of questions to stimulate students to reflect and build their understanding. Following the questions, material explanations are provided to ensure that all students have an equal understanding of the concept (Muanifah & Sa'diyah, 2018).

The development stage involves recording the previously made script as guided audio for the animation video. In addition to this, sound effects and background sound are also added

to the video. After collecting the audio, then animated videos were made using the Ae application by distributing the asset design and audio into the application. Then, they are arranged according to the previously designed storyboard. Once the animation video is complete, material and media experts validate it to ensure its suitability for use in the implementation stage.

Material validation is carried out by involving the Geography Lecturers from the State University of Malang. These experts assess the material feasibility of animated video. The results of the material expert validation showed an average score of 87.3%, as shown in Table 3. According to the experts, the developed learning media provides clear material delivery and meets the demands of basic competencies(Muna & Wardhana, 2021).

In the media validation, Geography lecturers from Universitas Negeri Malang were also involved in assessing the learning media's feasibility. This validation resulted in a score of 87%, as shown in Table 4, indicating that the media is highly feasible. The experts also emphasized that the media have an attractive appearance and content that facilitates students' understanding of the material (Apriansyah, Sambowo, & Maulana, 2020). Comments and suggestions from media experts are generally positive. However, there is room for improvement in the dubbing sound during video transitions, as it tends to fluctuate. Therefore, audio adjustments should be made to ensure clear sound quality (Sidarta & Yunianta, 2022). This audio improvement aims to aid users in listening to clearer material with no distraction.

Table 3. Validation Results from the Material Experts

Scoring Indicator	Percentage (%)	Description
Material	91.4	Highly feasible
Usage	84.4	Highly feasible
Media Suitability	80	Feasible
Benefits	93.3	Highly feasible
Average 87.3% (Highly feasible)		

Table 4. Results of Validation from Media Expert

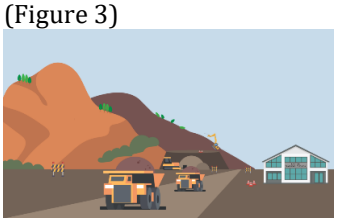
Scoring Indicator	Percentage (%)	Description
Purpose	92	Highly Feasible
Visual	87.5	Highly Feasible
Audio	76	Feasible
Usage	88	Highly Feasible
Benefit	91.4	Highly Feasible
Average percentage 87% (Highly Feasible)		

Tables 3 and 4 demonstrate the feasibility of animated video media usage for learning. According to expert validation, the content, purpose, and usefulness of the animated video media address existing problems in seismic learning. This is evidenced by the high scores obtained in the aspects of content, purpose, and benefits (Amali, Zees, & Suhada, 2020; Revlinasari, Degeng, & Wedi, 2021). The visualization of animated video learning media follows the objectives of geography learning on seismic material, giving users a clear picture of seismic events. The animated video provides not only an overview of seismic occurrences but also explains their impacts and the ways to minimize accidents during such events. The delivery of

material in this video is equipped with appropriate visuals to help users understand the material easily. The animated media provides complete content that also incorporates the SAVI approach in each part of the content to cater to students' learning styles. This approach encourages students to engage in hands-on activities, such as practicing earthquake disaster mitigation activities in a simulation guided by the video.

Although animated video media has become a feasible option, improvements were still made based on suggestions and comments from media experts, as shown in Table 5. These improvements aim to enhance the learning experience by providing clear and concise content with visually appealing graphics.

Table 5. Revision of Product

No.	Display Prior to revision	After revision	Description
1	The audio guide or dubbing voice does not maintain a consistent volume as the animated video transitions.	The revision was made by re-recording the problematic audio.	This revision on the audio was made following the suggestions and comments from the media experts.
2	 (Figure 1)	 (Figure 2)  (Figure 3)	Revision of the display on the discussion of the earthquake number per year in Indonesia. The separation of the table aims to enhance its visibility (Figure 1, 2, and 3).
3	 (Figure 4)	 (Figure 5)	Revision on the discussion of the earthquake causes due to landslides. This modification aims to enhance the resulting visualization by providing a more realistic and contextual representation (Figure 4 and 5).
4	Not available	 (Figure 6)	Addition of a mid-ocean ridge illustration to increase students' knowledge of seismic material (Figure 6).

During the implementation stage, product testing on animated videos was conducted, followed by questionnaires aimed to assess the responses of both teachers and students. The questionnaire responses from teachers indicated a score of 94% (indicating high feasibility), while the responses from students scored 88% (also indicating high feasibility). Both students and teachers describe the developed animated videos as excellent media facilitating them to attain learning purposes (Dewi & Handayani, 2021). Students show great enthusiasm for learning when presented with animated videos, leading to increased curiosity in the learning material. Additionally, the use of media aids students to better understand the content of the material (Apriansyah et al., 2020). Additionally, the student's responses to the questionnaire also suggest that the use of animated video learning media for seismic material, equipped with the SAVI approach, has met student needs. This media results in more interesting and differentiated learning, providing a non-monotonous impression for students.

In the evaluation stage, validation results conducted by material and media experts show that animated video media is highly feasible for use in learning, with a score of 87.3% and 87%, respectively. The evaluation stage revealed both the advantages and disadvantages of developing animated video learning media (Table 6).

Table 6. Advantages and Disadvantages of Product

Advantages	Disadvantages
Enhance students' learning motivation because the developed media is interesting for students.	Requires speakers, laptop and/or projector for classroom learning
Enable students to understand the material easily.	The preparation of animated videos requires specialized skills and mastery of specialized software.
Particular material can be replayed or repeated.	
Has high flexibility, thereby, it can be carried anytime and anywhere, as well as can be used for independent learning (only requires a smartphone)	
Provide a diverse learning experience.	

Animated video media offers several advantages, including its ability to attract and motivate students, increase their understanding of the learning material, and provide new experiences (Audie, 2019; Budiarta, 2014; Mashuri & Budiyono, 2020). However, it does require speakers, laptops, and/or projectors. According to feedback from teachers and students, there is a demand for animated videos covering additional materials. Overall, students find learning through animated videos to be more engaging and enjoyable. These existing advantages, disadvantages, suggestions, and comments can serve as valuable points for improving animated video media products and for future research.

3.2. Effects of SAVI-based Animated Video on Students' Learning Outcomes

This study conducted a hypothesis test to determine the impact of animated videos on student learning outcomes. The temporary hypothesis is as follows:

H_0 = SAVI-based animated video learning media has no effect on student learning outcomes.

H1 = SAVI-based animated video learning media affects student learning outcomes.

The evaluation of the media's effects on students was conducted by administering the pretest and posttest questions to 27 tenth-grade students in Sunan Ampel Islamic High School. The pretest questions were given before the learning activities, while the posttest questions were administered after the learning activities. The pretest and posttest scores were then tested for normality as a prerequisite for conducting the t-test. The results of the Normality and T-test are presented in Table 7.

Table 7. Results of Normality and T-test

	Mean	Normality Test	Description
Pretest	51.31	0.187	Normal
Posttest	83.77	0.178	Normal
Uji Paired Sample t-test	0.000		Significance

The results of the normality tests conducted on the pretest and posttest data showed a significance level greater than 0.005, with the pretest at 0.187 and the posttest at 0.178. This indicates that the data is normally distributed. The subsequent step involves analyzing the pretest and posttest data using a t-test.

According to Table 7, the average pretest score was 51.31, and the average posttest score of 83.77. This indicates that the posttest score is higher than the pretest score. Additionally, Table 7 also shows a significant value. The statistical analysis showed a p-value (2-tailed) of 0.000, which is smaller than 0.05. Therefore, the SAVI-based animated video media has a significant effect on student learning outcomes, as evidenced by the increase in posttest scores compared to pretest scores.

The use of suitable methods and media enhances student learning outcomes. Student-centered learning, such as discussion methods supported by SAVI-based animated video media, is suitable for visual learning. It enhances student enthusiasm and engagement, as seen through their active questioning during lessons and exploration of new knowledge during group discussions. The SAVI elements in animated video media have been observed to improve student learning outcomes (Andrianti, Susanti, & Hudaidah, 2016; Lukitawati, 2014; Ponza et al., 2018; Rosanaya & Fitrayati, 2021). High student enthusiasm may also contribute to their better understanding of the material.

Improved learning outcomes occur through the auditory and visual process as students view and listen to animated videos, stimulating their senses of hearing and vision (Sarnoko, Ruminiati, & Setyosari, 2016). Animated video media provides a visual embodiment of abstract material, transforming it into more concrete ones, thereby, leading to students' better understanding of seismic concepts (Apriansyah et al., 2020; Dwiyaniza, 2018; Surahmi, Lihawa, & Yusuf, 2021). Concrete visualization improves student learning motivation and interest in seismic material. Meanwhile, the use of question sentences in the animation video also encourages independent knowledge construction and stimulates curiosity. During discussion activities, students become curious and actively solve problems given by the teacher (Juliawan, Agung, & Arini, 2013). For example, students can be invited to perform earthquake disaster mitigation movements in accordance with the directions contained in an animated video. This activity stimulates the mind-body relationship in seism learning. Meanwhile for the teacher, their role is to guide students through the steps presented in the animated video. This activity

offers a unique learning experience for students, as they learn by actively participating in the task. It is important to note that blocking psychomotor learning can have a negative impact on cognitive function (Muanifah & Sa'diyah, 2018).

4. Conclusion

The data analysis results indicated that the animated video learning media developed using the SAVI approach for seismic material has completed all stages of development. Overall, the developed animated video media is highly feasible to be used in learning. Further, it presents a significant impact on improving student learning outcomes. The t-test results also show the significance value of the SAVI-based animated video of 0.000 <0.05, indicating a significant difference between pretest and posttest scores after the students attended learning using the SAVI-based animated video. The pretest average score was 51.31, while the posttest scores averaged 83.77. Therefore, the posttest scores were higher than the pretest scores. Following those results, future research on the development of animated video media is suggested to record scripts in a consistent environment with proper tools to ensure consistent sound frequency. This will prevent the dubber's voice from fluctuating during the editing process.

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