Stop Motion Animation Video: A Learning Media on Global Warming for Middle School Students

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ABSTRACT

In the learning process, if the material presented is not innovative, it will result in a loss of student motivation and interest in learning. The use of engaging educational media, such as stop motion animation videos, can complement related technologies. This study aimed to describe production steps, examine product validation, assess readability, and evaluate student responses to stop motion animated videos used as resources for learning about global warming. The research involved 35 seventh-grade students at one of the MTs in Bandung Regency, utilizing an R&D (Research and Development) approach alongside a 3D model. The findings detailed the developmental stages, encompassing the defining, designing, and developing phases essential in creating stop motion animated video products. The stop motion animated videos underwent expert validation, attaining scores of 83% from material experts, 78% from media experts, and 94% from subject teacher experts, indicating high validity. Regarding readability, the stop motion animation videos, as teaching tools, scored 90% in the easy-to-understand category, while the quality of student responses received a score of 93% in the highly positive category. These results indicate that stop motion animation videos are suitable for use as educational resources for teaching global warming material, based on the outcomes of this research.

Keywords: instructional media, animation videos; stop motions; global warming

INTRODUCTION

The rapid evolution of technology and communication in the 21st century aligns education with the globalized landscape (Effendi & Wahidy, 2019). Educational updates become imperative to adapt to shifting conditions, especially in the aftermath of sudden changes like the COVID-19 pandemic. The education system must swiftly respond by offering adaptable programs that emphasize skill development and digital literacy as fundamental pillars of learning (Sa'adah et al., 2020).

The post-pandemic aftermath of COVID-19 has noticeably affected students' engagement in the classroom, leading to diminished enthusiasm and reduced interest in learning. Students exhibit shorter attention spans and increased distractions, potentially impacting their optimal comprehension of study materials. Putri (2019) emphasizes the use of learning media by teachers to rekindle student motivation, enhance comprehension, provide engaging and reliable information, and facilitate better material interpretation. Developing and employing effective learning media becomes crucial in augmenting motivation and stimulating students' enthusiasm (Sari, 2019).

The abstract nature of science subject challenges educators to employ diverse methods in knowledge transfer. Developing learning media emerges as a pivotal approach in clarifying the conveyed knowledge during the learning process to achieve educational objectives. Sari (2019) highlights that learning media can reduce reliance on verbalism (spoken or written words) by establishing tangible foundations for thinking. This transformation of abstract concepts into concrete forms through learning media enhances understanding and reduces the likelihood of information being forgotten (Supriyono, 2018).

Addressing the challenges identified in preliminary studies, the development of stop motion animation videos emerges as a potential solution for enhancing learning experiences related to global warming. Stop motion animation, pioneered by Albert E. Smith and J. Stuart Blackton in 1898, involves manipulating physical objects and combining sequential images to create the illusion of movement, forming a cohesive video (While crafting stop motion animation demands patience, it yields unique movements that evoke an intriguing sensory experience(Puspita & Raida, 2021).

The focus of creating stop motion animation videos for science learning centers on the critical topic of global warming. Understanding the significance of global warming in daily life is vital for students to comprehend natural issues and contemporary environmental conditions. This knowledge aims to inspire, nurture, and instill a love for our planet (Puspita & Raida, 2021). As highlighted by Mosrifa (2022), the complexities of global warming cannot be adequately conveyed through traditional textbook materials alone; students require more vivid visualizations for easier comprehension.

Puspita & Raida (2021) conducted research and development on STEAM-oriented stop motion graphic animation videos addressing global warming in junior high school. The study evaluated video feasibility as a learning medium, considering aspects like media presentation, material coverage, student responses, and product trials, indicating an overall

feasibility. However, identified shortcomings include the need for additional animation adaptations in the opening section and material explanation.

Similarly, Maaruf et.al, (2022) explored stop motion animation's pedagogical potential in science education, creating the e-SMART video, enhancing focus, comprehension, and engagement. Nevertheless, the video's brevity, spanning only 30 seconds and explaining a single topic, emerged as a limitation. In response, this research introduces an innovative approach, developing stop motion animation videos that extensively cover 90% of the material using 2D image stop motion animation, each video spanning about ten minutes and explaining a singular learning concept.

Consequently, this study aims to introduce innovative learning media for science subjects, aligning with contemporary educational demands. It aims to depict the video creation process, assess expert validation, evaluate student comprehension, and gauge student responses to stop motion animation videos as learning tools for understanding global warming. This research strives to offer a viable solution for selecting learning media within or outside classroom settings, enriching the educational experience.

METHOD

This research employs the Research and Development (R&D) method aimed at either producing new products or enhancing existing ones while evaluating their feasibility and effectiveness (Sugiyono, 2019). The media development process follows a modified 3D model derived from Thiagarajan's original 4D model (1974) as quoted by Astini et al., (2020) involving three primary stages: define, design, and development. The product trials were conducted at a selected MTs in Bandung Regency, encompassing seventh and eighth-grade students from January to May 2023.

Data collection in this study involved multiple sources. Unstructured interviews were conducted with science subject teachers and two Class VII students. Expert validation was obtained through questionnaires administered to three validators—media experts, material experts, and teachers. Additionally, data was gathered from media trials involving a small group of 15 eighth-grade students and a larger group of 35 seventh-grade students. This process involved the assessment of readability and student response via questionnaires specifically designed based on the researchers' needs and insights from previous literature studies, including thesis research, national and international journals, and existing library resources.

The data analysis process involved the utilization of the Likert scale, designed to gauge opinions, attitudes, and perspectives on social phenomena (Riduwan & Sunarto, 2019). The Likert scale, incorporated into the research instrument, was assessed through score criteria outlined in Table 1, ultimately resulting in percentage values as shown in Table 2. Analysis of the research data comprised both descriptive depiction and presentation through visual representations such as images and tables

Table 1. Likert scale score criteria (Riduwan & Sunarto, 2019)

Alternative answer	Score
Very good	5
Good	4
Enough	3
Not good	2
Very not good	1

$$\text{Value} = \frac{\text{Total validation score obtained}}{\text{Total maximum score}} \times 100\%$$

Table 2. Score interpretation criteria (Riduwan & Sunarto, 2019).

No.	Interval	Score
1	0% ≤ x ≤ 20%	Very invalid
2	21% ≤ x ≤ 40%	Invalid
3	41% ≤ x ≤ 60%	Quite valid
4	61% ≤ x ≤ 80%	Valid
5	81% ≤ x ≤ 20%	Very valid

RESULT AND DISCUSSION

This research and development produced products in the form of stop motion animation videos as learning media on global warming material. The media development process has gone through several stages in the 3D model which are described as follows:

Define

The define stage serves as the initial phase aimed at establishing learning activities, involving three key steps: front-end analysis, student analysis, and task analysis. Each step is elaborated as follows:

    a. Front-end analysis

During this phase, data was gathered through interviews with science teachers at one of the MTs in Bandung Regency. The insights obtained encompassed:

-Teachers predominantly rely on printed learning materials, without utilizing additional media or supplementary tools, deeming it more practical.

-Students often exhibit diminished learning motivation and boredom due to the constrained and unengaging delivery of course material. Consequently, the exploration of stop motion animation videos as learning media emerges as a potential alternative to captivate student interest and augment learning motivation.

    b. Task analysis

The curriculum implemented at one of the MTs in Bandung Regency aligns with the revised 2013 edition. The task analysis phase involves defining Core Competencies (KI) and Basic Competencies (KD) based on this curriculum edition. These competencies are

meticulously reviewed and tailored to suit the material integrated into stop motion animation videos used as learning media.

Upon review, the developed material, focusing on global warming, corresponds to KD 3.9, which involves the analysis of climate change and its impact on ecosystems within the curriculum. Subsequently, the formulation of General Learning Outcomes (GPA) and specific learning objectives is conducted. This process serves as the foundation for fulfilling students' educational needs concerning the study of global warming.

Based on the results of the initial analysis, it is known that the lack of variety in the use of learning media makes students unenthusiastic and decreases their enthusiasm for learning which results in the learning process being less than optimal. With the development of technology today provides opportunities for the development of renewable learning media to be able to support problems in the learning process (Effendi & Wahidy, 2019). According to Pangestu et al., (2019) today students are more interested in using learning media than just listening to explanations from teachers during the learning process.

Basically, not a few science materials are conceptual and abstract science. Abstract concepts according to Maryanti & Kurniawan (2018) need to be clarified with visualization that supports students' understanding of a process mechanism that is not directly observed in everyday life. In science subjects, there is global warming material which is one of the materials that requires contextual examples in the learning process. It is not enough to rely on learning media in the form of textbooks and LKPD, real visualization is also needed by students so that global warming material is easier to understand (Mosrifa, 2022).

The solution that can be offered to help minimize problems in learning activities based on the results of the preliminary study is to develop stop motion animation videos as learning media on global warming material. Stop motion animation can help real visualization of the concept of global warming material that is abstract to be concrete and easier for students to understand (Sari, 2019).

Design

Following the define stage, the design stage involves the initial development of the product based on the earlier needs analysis. It comprises four essential steps: preparing media selection tests, determining the format, and creating preliminary designs for the media. Test preparation involves compiling a questionnaire grid for expert validators and students. Media selection entails choosing the learning medium, in this case, a stop motion animation video. Format selection involves shaping the media to incorporate elements such as animated imagery, text, color schemes, and music that align with the content. The initial design adheres to the predetermined format and design specifications. At this phase, the developed media exists in an initial draft format, ready for expert validation. The initial draft of the stop motion animation video encompasses various sections: identity, learning objectives, apperception, objective reinforcement, content on the greenhouse effect and global warming, and a conclusion. These components are detailed below:

Figure 1. Display of the results of the development of stop motion animation videos as learning media on global warming material

The results of this research and development are in the form of stop motion animation videos as learning media on global warming material which can be accessed at the link https://youtu.be/W7V3v1dP_5Y?si=XFm6kidNAS6gG7TE. The media products developed were declared valid, easy to understand with a very positive response. This is in line with the research of Maaruf et.al, (2022) showing that as many as 97% of respondents agreed that the use of stop motion animation videos called e-SMART can help the science learning process become more focused, easy to understand and enjoy lessons better. All respondents agreed that the use of e-SMART is necessary during science classes. Stop motion animation video media can also be an alternative for teachers and students to be used at unlimited times and places, for example as assignments or during the learning process outside the classroom/school.

Develop

The develop stage consists of two steps, namely expert validation and small-scale and large-scale product trials. The learning media produced comes from several criticisms and suggestions from validators which are very helpful in developing learning media for the better. The inputs given from material validators are related to the determination of learning objectives that must be in accordance with and master KD 3.9, namely with KKO analyzing, so that the learning objectives are changed and loaded so that students are able to understand the material up to the analysis stage. Then the animated images of fossils that both come from animal fossils are suggested to replace one of them into plant fossils, because fossils not only come from animals but can also come from plants. In order for students to be able to analyze

the problems in the media, it is recommended to provide information on solutions for students to be able to do small things that can be done by a student in action to help minimize the causes of global warming.

The comments from the media expert validator suggested that an alternative video of a real example could be done during clarification by the teacher in class, so that overall the media contains more pure stop motion animation content. Then it is recommended to improve learning objectives and replace video examples that look less clear due to broken resolution. With some input received, researchers revised the learning media so that the resulting stop motion animation video was better than before and could be used as learning media on global warming material.

Data analysis of the results of expert validation questionnaires from the three validators stated that stop motion animation videos as learning media on global warming material can be categorized as very valid with the acquisition of the overall average validation questionnaire is 85% which can be seen in Table 3.

Table 3. Results of Expert Validation Questionnaire Analysis

No.	Validator	Percentage	Category
1.	Material expert	83%	Very valid
2.	Media expert	78%	Valid
3.	Teacher expert	94%	Very valid
	Average	85%	Very valid

Based on more specific components of each aspect of the assessment, it can be seen that the material validation test scores have a fairly diverse range of values ranging from 72% to 93% with valid to very valid categories (Figure 2a). For the results of the validator test of the media components developed, the scores varied from 67% to 90% with a range of valid and very valid categories (Figure 2b). The results of the validation test by science subject teachers have the highest value with results ranging from 90% to 100% with all components obtaining a very valid category (Figure 2c).

The material feasibility assessment consists of four aspects consisting of content, presentation, science literacy content, and language. Learning media can be said to be valid if the analysis results are in accordance with each previously determined component (Suhailah et al., 2021). The results of this material expert validation test provide reinforcement for stop motion animation videos that have appropriate science learning characteristics because they received a score of 83%. In line with this, the material in a learning media must also meet valid criteria such as accurate content and in accordance with learning objectives (Pratiwi & Silalahi, 2021), as well as material that is easy to understand and presented in an effective way (Pratiwi & Silalahi, 2021).
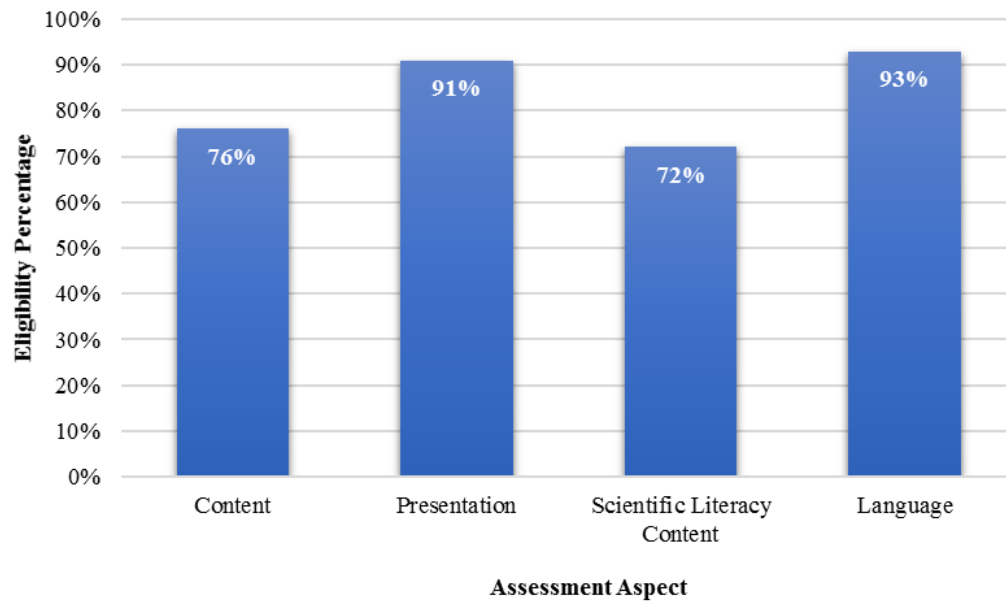
(a)
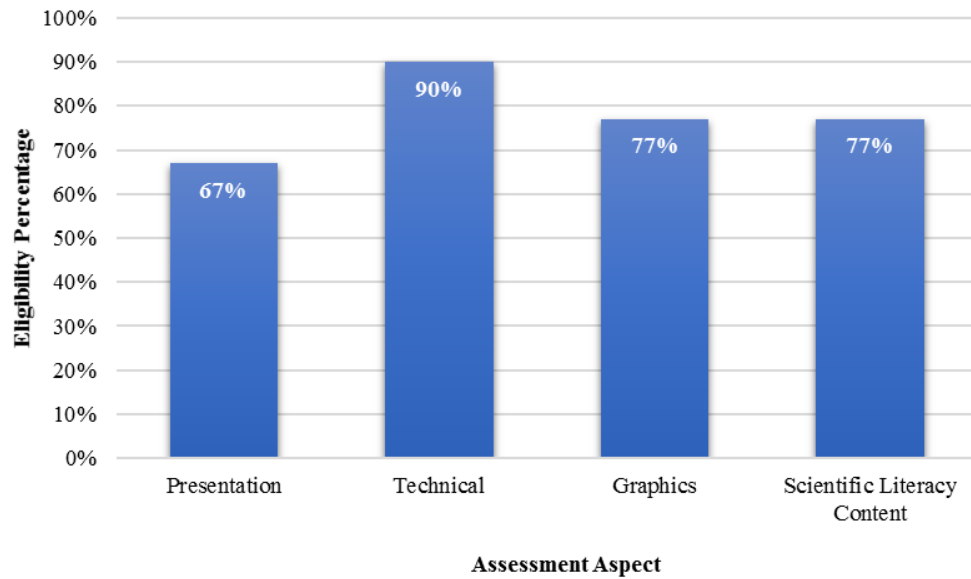
(b)
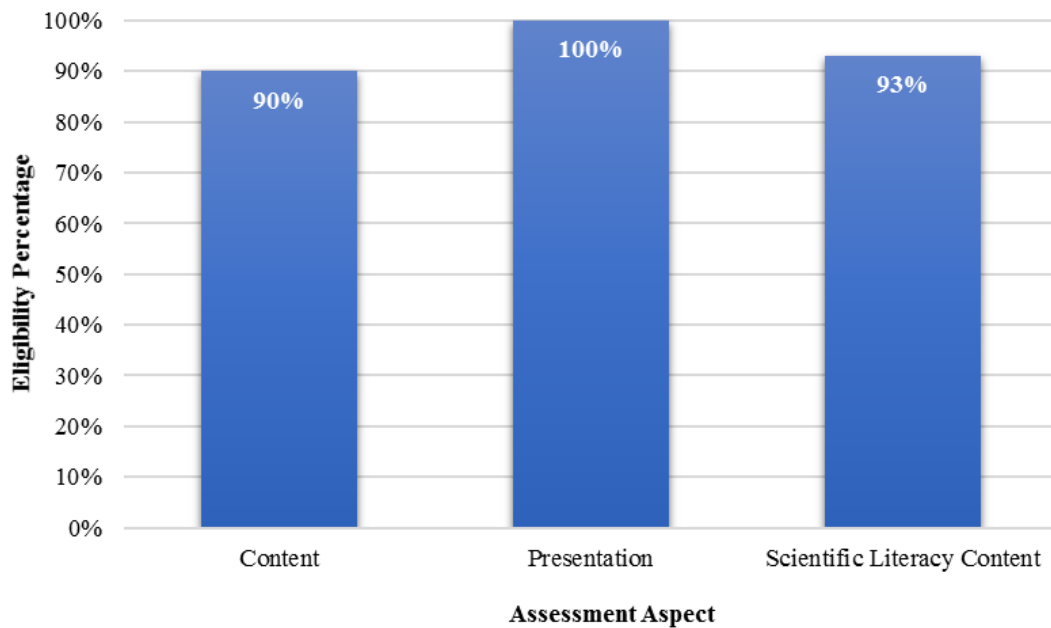
(c)

Figure 2. The results of the validation test of the stop motion animation video, (a) material experts; (b) media experts (c) science subject teacher experts

Media feasibility conducted by media experts is done to find out each component in the media content is appropriate, good, and suitable for use in the learning process. Media assessment consists of four aspects, namely presentation, technical, graphical, and science literacy content. Each component is assessed to determine the media validity of the stop motion animation video, because learning media must be valid in terms of design which means it must be visually appealing, easy to use, and in accordance with the intended audience (Arini et al., 2022). There is one suggestion from the media validator, namely regarding the function of stop motion animation videos as interactive media. Based on this, it was analyzed that interactive media is a learning media made with a display that fulfills the function of delivering information interactively to its users (Cahyani & Suniasih, 2022). However, video is not an interactive media because it does not have real interaction between the media and the user. This makes shortcomings and development gaps for further researchers.

In the motivation aspect, it is known that the use of stop motion animation videos as learning media can make it easier for students to understand the material, improve their ability to think and answer questions, improve their ability to learn independently, provide motivation and enthusiasm for learning in learning global warming material. In line with the research of Maaruf et.al, (2022) that stop motion animation videos can help the science learning process become more focused, easy to understand and enjoy lessons better. This is

because stop motion animation videos have a display that is very attractive to students with components of animated images, writing, audio quality, the addition of real examples and the presence of prominent art elements that make the process of delivering learning materials not monotonous or boring for students (Puspita & Raida, 2021).

The stop motion animation video that has been made is then tested on a small scale to obtain the results of a student readability questionnaire, as well as a large scale to obtain student response results. The student readability test conducted on 12 eighth grade students produced the data obtained in Table 4. The trial was also conducted to obtain student responses to the use of media to 35 seventh grade students who produced the data obtained in Table 5.

Table 4. Readability questionnaire analysis results

No.	Validator	Percentage	Category
1.	Content	92%	Easy to understand
2.	Language	92%	Easy to understand
3.	Graphics	88%	Easy to understand
4.	Presentation	89%	Easy to understand
	Average	90%	Easy to understand

Table 5. Results of Student Response Questionnaire Analysis

No.	Validator	Percentage	Category
1.	Content	93%	Very good
2.	Language	94%	Very good
3.	Graphics	92%	Very good
4.	Presentation	92%	Very good
5.	Motivation	95%	Very good
	Average	93%	Very good

Based on the results of the product trial on a small scale, the results of the student readability questionnaire were obtained with an average assessment of 90% which was included in the very easy to understand category. The purpose of the readability questionnaire is to determine the level of readability of a learning resource, such as an electronic module, textbook, or enrichment material, so that it can assess whether the learning resource is suitable for use as learning material (Rahima et al., 2022). The results of the student readability test prove that stop motion animation videos can be easily understood so that the process of receiving information or learning materials can be better received by students. In line with Febriana et al., (2022) that the readability questionnaire can provide information on how easily or difficult a learning resource is understood by students or readers. This can affect the success of students in understanding the material conveyed visually through aspects of content, language, graphics and presentation presented in stop motion animation videos

can be easily accepted by students. In line with Suseno et al., (2020) through the readability test, students can assess writing, video content, illustrations, animation, and audio or sound effects based on their respective understanding abilities.

The results of student responses to the use of stop motion animation videos as learning media on global warming material were obtained through a large-scale product trial process. Of the five aspects assessed, the average percentage value is 93% which is included in the very positive category. The very positive response given by students means that the learning media has a good influence on the learning process in the classroom. The highest response data is shown in the language aspect and motivation aspect. Most agreed that the language used in the stop motion animation video is quite simple and easy to understand, and the selection of words and sentences used is appropriate for the school level. Simple and general language so that the delivery of material information in the video can be well received by students (Taib & Mahmud, 2021). The learning media developed proved to be a solution to the problem in the initial study, namely the lack of student motivation to learn and tend to feel bored during the learning process. With stop motion animation videos can increase learning motivation and make students more interested in understanding the material to be learned. The use of appropriate learning media and effective learning methods, it is hoped that students can be more interested and motivated in learning so that they can improve their learning achievement.

CONCLUSION

Stop motion animation videos have been deemed suitable as learning media for global warming material. Validators' assessment of the learning media yielded an average score of 85%, categorizing it as 'very valid.' Small-scale trials indicated a 90% average score for readability, falling within the 'easy to understand' category, while large-scale trials showed a 93% average score for student responses, categorized as 'very positive.' Looking ahead, future iterations of this research could consider incorporating additional variables, such as assessing the impact on students' cognitive abilities (knowledge). This expansion would enrich the understanding and information on the development of this learning media

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