

Development of Doratoon-Based Animation Audio Visual Media to Improve Cognitive Learning Outcomes in Science Teaching Materials

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Abstract: In the learning process, media is quite an important aspect. However, many teachers do not use educational media in teaching, causing low student cognitive learning outcomes. This research aims to: determine the feasibility of Doratoon-based animated audio-visual learning media; to determine the effectiveness of Doratoon-based animated audio-visual learning media in improving student learning outcomes. The ADDIE method (Analysis, Design, Development, Implementation and Evaluation) is a research method used by researchers. Media experts and material experts assess whether media development is suitable for use. The average pretest score for the large group test is 59.70 and the average posttest score is 85. After calculating the N-gain value, we get a value of 0.63, which is included in the medium standard. These figures show that the animated audio visual media developed based on Doratoon can be used and can improve students' cognitive learning outcomes IV

Keywords: Animated audio visuals; development; instructional Media; learning outcomes

Introduction

Technology develops rapidly along with scientific knowledge and technological habits. Technological developments such as the Internet of Things (IoT), artificial intelligence, and robots are evidence of innovation that occurs in life (Rahm, 2023). This development has given rise to various groups who innovate openly and gradually in various fields (Ramirez, 2021; Bertello et al., 2024). Education is one area that is experiencing the impact of technological developments. Education and technology cannot be separated because new technology will always be developed in response to advances in human knowledge.

This is in line with the view Maritsa et al. (2021), that humans can create innovations that make daily work easier with the help of technology. Technology and education will continue to develop along with the progress of humanity (McDiarmid & Zhao, 2023). Technology and education are two things that can create

a nation's progress. The existence of technology makes education easier to access. All forms of information can be accessed anywhere and at any time thanks to technology such as the internet. For example, children in remote areas can still get easy access to education through YouTube videos, research journals and so on. This will have an impact on educational equality in the country. On the one hand, technological developments are also influenced by education. Education serves as the basis for acquiring the knowledge and skills necessary to create new technologies in the future (Darling-Hammond et al., 2020; Barber et al., 2024).

Learning media can be an example of a device that utilizes technology in the world of education. Learning media is an important bridge in maintaining educational relationships between students and educators (Lee et al., 2023; Teidla-Kunitsõn et al., 2023; Coman et al., 2020). Media is a learning resource consisting of people, objects, or events that enable students to acquire knowledge or skills (Sivakumar et al., 2023).

In the process of creating learning media, the content and learning objectives must be prioritized. This

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aims to give students the opportunity to create their own learning methods and if necessary take on new and exciting roles in learning (Haleem et al., 2022). From the description of these opinions, it can be concluded that learning media is a learning resource where the teacher acts as a provider of knowledge and skills to be conveyed to students in order to stimulate learning motivation. The use of technological media provides learning opportunities for students to interact with friends and teachers (Hubers et al., 2022; Ansari & Khan, 2020). The use of technology in creating learning media can make learning more interesting because it displays various features such as animation, sound, video, text and images (Rachmavita, 2020; Alobaid, 2020).

Elementary school is an example of an educational level that has begun to take advantage of technological advances. The use of technology in elementary schools is very necessary, especially in creating learning media (Sa'odah et al., 2022). The use of technological learning media can increase students' interest and help them understand the material discussed. So that students can keep up with the times and compete globally, teachers play an important role in improving the quality of students at school (Irnidayanti & Fadhillah, 2023). Therefore, as educators, teachers must be able to innovate learning to encourage students to learn optimally (Gorozidis & Papaioannou, 2014). Learning using media is one example of teacher efforts to improve student learning outcomes.

However, many elementary school teachers still use traditional media to teach. This statement is strengthened by the results of interviews with class IV teachers and students at SDN 02 Pegundan on February 20 2023, where in the science and science lesson on energy transformation the teacher only used simple media such as pictures and objects around them. This causes learning activities to become uninteresting and students have difficulty understanding the material, which ultimately results in low student cognitive learning outcomes. Learning outcomes are the final process of learning activities where they are very important as a benchmark for how successful the learning process has been (Untari et al., 2017).

Referring to the problems above, researchers plan to develop a learning media to help improve student learning outcomes. The learning media that will be developed is audio-visual animation (Wahida et al., 2023). Researchers chose to develop this learning media because it has advantages such as the media can be used anywhere, produces interesting animations and can be easily used. Animated video is a medium that combines audio, images and video, scripts or diagrams to achieve learning objectives (Kanellopoulou et al., 2019). This media can be used in learning, especially learning in elementary schools because students really like the colorful appearance and attractive cartoon characters.

Apart from that, according to Fauziah & Ninawati (2022), Pertiwi et al. (2023) audio-visual media can be used as a tool to support ideas and clarify learning. Animation media is a promising medium for increasing understanding in the learning process about education, science and technology (Crayne et al., 2023).

Method

The research method used is research and development (R&D). The aim of this research is to develop certain products and test the effectiveness of these products (Andi Rustandi & Rismayanti, 2021). This research methodology uses five stages of the ADDIE development model: analysis, design, development, implementation and evaluation.

Results and Discussion

In this research, researchers will develop Doratoon-based animated video learning media for grade IV science subjects. The steps for developing media using the ADDIE model are as follows:

Analysis

What is done is analyzing needs by means of pre-research observations and interviews with teachers and class IV students at SDN 02 Pegundan. Based on the results of pre-research conducted by researchers, it is known that students easily get bored in following the learning process, causing them to not be able to fully understand the material taught by the teacher and resulting in low student learning outcomes in science and science subjects with only 4 students getting a score above KKM 75. At this time teaching, teachers also only use simple learning media such as pictures and worksheets. This is the cause of low cognitive learning outcomes in science subjects. Based on this, the researcher decided to develop animated video media for fourth grade students in the science and science subject on energy transformation around us to improve students' understanding and learning outcomes.

Design

At this stage the researcher decided to develop Doratoon-based animated video learning media regarding energy transformation around us. Activities begin by identifying learning outcomes, setting learning objectives to be achieved, finding appropriate learning content such as material content and activities that students will carry out, creating storyboards and storylines in animated videos.

Development

Researchers will use the Doratoon website to develop animated graphics in accordance with the

design and teaching materials on energy transformation around us.

Implementation

At this stage testing is carried out on animated video media to determine the level of feasibility and effectiveness of the media being developed. The following are the results of animated video media developed by researchers:

Title

The appearance of the title section can be seen in Figure 1. This title section is approximately 20 seconds long and displays the teacher's character introducing himself, a background image of an electrical energy generator, the Semarang State University logo, the video title "Energy Transformation Around Us", and the name developer. The voice actor is the narrator and the background sound used is the accompanying musical instruments.



Figure 1 . Title Display

Initial Part

The appearance at the beginning of the animated video can be seen in Figure 2. The first part of the



Figure 3. View of the Core Section

animated video has a duration of around 2 minutes and displays an explanation of learning outcomes, learning objectives, concept maps and learning material presented by the teacher character. The voice actor is the narrator and the background sound used is the accompanying musical instruments.



Figure 2. Initial display

Core Section

The main part is about 8 minutes long. This section contains an explanation of the material that students will study, such as the meaning of energy, various forms of energy, various types of energy transformations and simple experiments regarding energy transformations presented by the teacher character with a voice actor, namely the narrator. The background sound used is accompanying musical instruments. The core part can be seen in Figure 3.

Closing Part

Figure 4 is a view of the closing part of the animated video. This section is about 20 seconds long and contains the conclusions of the learning that has been carried out which is conveyed by the teacher character with a voice actor, namely a narrator and the background sound used is an accompanying musical instrument.



Figure 4. View of the Closing Section

Thank-you note

The appearance of the thank you section can be seen in Figure 5. The thank you is said by the teacher character with a voice actor, namely the narrator, addressed to students who have taken part in learning using animated video media. The backsound used is accompanying musical instruments.



Figure 5. Display of Acknowledgments

Developer Profile

The developer profile display contains information about who is involved in the process of making animated videos. The developer profile display is in Figure 6.



Figure 6. Developer Profile Display

The next stage is validation by media experts and material experts:

Media Expert Validation

Media expert validation was carried out by Mr. Dr. Deni Setiawan, S.Sn., M. Hum as a lecturer in Elementary School Teacher Education at Semarang State University. Table 1 shows the results of the media expert validation assessment.

Table 1. Assessment of Validation Results by Media Experts

Total Score	Maximum Score	Percentage(%)	Validity Level
80	92	86.90	Very Valid

Based on Table 1, it can be seen that the percentage of very valid criteria is 86.90%, which shows that animated video media can be used. Media experts assess animated videos as suitable for use based on visual, text, animation, audio, usage and media usage aspects (Boy et al., 2020). However, media experts also provide suggestions for improving animated videos as follows:

The type of text is adapted to teacher books and class IV student books

The voiceover narration uses standard Indonesian



Figure 7. View before revision



Figure 8. View after revision

In Figure 7 and Figure 8, the results of the revision of learning media are shown in accordance with media experts' suggestions, where several components have been changed, such as the use of font types that have been adapted to the teacher's and student's books, class text which is now placed under the video title and the addition of the developer's name to the display. below the animated video.

Material Expert Validation

Material expert validation was carried out by Mrs. Aldina Eka Andriani, S.Pd., M.Pd. as a lecturer in science courses at Semarang State University. Table 2 is the result of the assessment by material expert validation.

Table 2. Assessment of Validation Results by Material Experts

Total Score	Maximum Score	Percentage(%)	Validity Level
80	92	86.90	Very Valid

From the results of the assessment carried out by material experts, a percentage of 86.5% was found to be in the very valid and usable category. Material experts assess that animated videos based on aspects of material quality and learning design are included in the category suitable for use (Daryono et al., 2021; Abdulrahman et al., 2020). Material experts not only provide assessments but also provide suggestions, such as explanations regarding the meaning of energy as well as simple experiments regarding energy transformations, not just one experiment (Sambodo et al., 2024; Elo et al., 2014).



Figure 9. View before revision

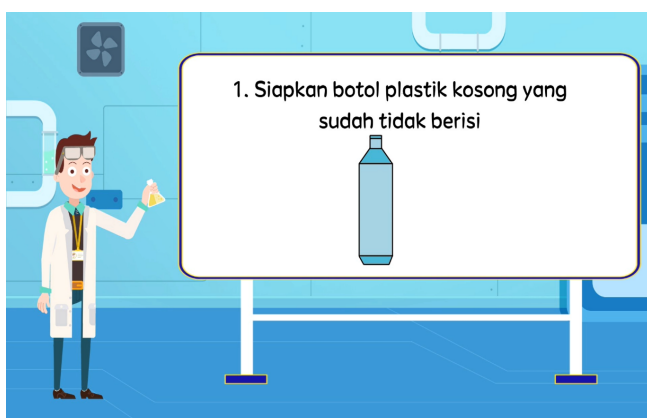
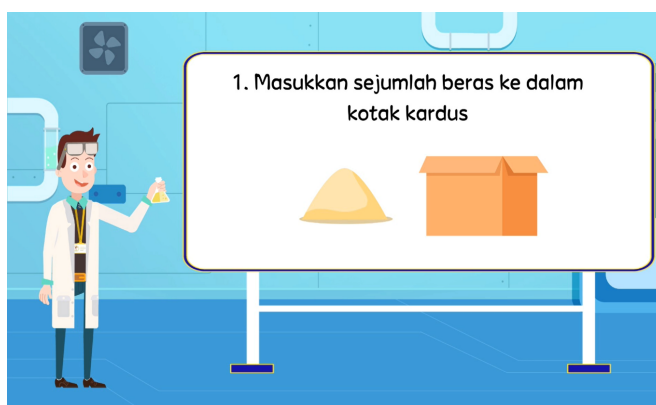


Figure 10. View after revision



To determine the suitability of learning media, researchers must carry out limited tests on the media developed, both small group and large group tests.

Small Group

Five heterogeneously selected fourth grade students were used for small group testing. At this stage the researcher conducted a pretest and posttest to

determine the suitability of the learning media and its effectiveness in improving students' cognitive learning outcomes. The pretest was carried out without using animated video media, while the posttest was carried out using animated video media (Rambe et al., 2023). The results of the small group pretest and posttest obtained the values in Figure 11.

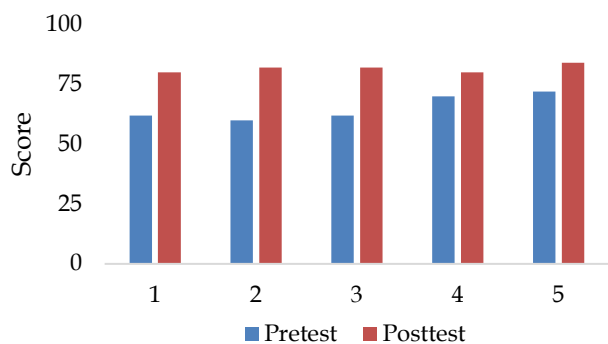


Figure 11. Small group test results

Based on this picture, the average pretest score was 65.2 and the average posttest score was 81.6. The N-Gain test result was 0.46 in the medium category. In this way, it can be concluded that there was an increase in the average pretest and posttest scores from 65.2 to 81.6, an increase of 16.4. This shows that animated video media is suitable for use because it can improve students' cognitive learning outcomes.

Large Group

Researchers conducted a large group test on 18 class IV students at SDN 02 Pegundan. Researchers conducted a pretest and posttest to find out whether student learning outcomes improved before and after using the media developed. Figure 12 is the results of the large group pretest and posttest as follows.

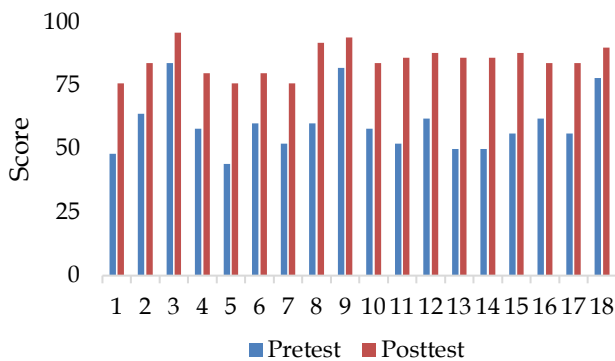


Figure 12. Large group test results

Based on Figure 12, the average pretest score was 59.7 and the average posttest score was 85 from a total of 18 students. The average N-gain test score was 0.63 with medium criteria. This shows that students' cognitive learning outcomes increased after using the science animation video on energy transformation around us, which initially obtained an average score of 59.70 to 85, an increase of 25.30. This proves that animated video media is proven to be able to improve students' cognitive learning outcomes.

Evaluation

This stage is an evaluation of implementation activities. Evaluation is obtained from the results of teacher response questionnaires and student responses.

Teacher Response Questionnaire

The teacher response questionnaire was given to class IV teachers after seeing the animated video display during the large group trial. The results of the teacher response questionnaire to animated video media were 92.50% with very interesting criteria.

Student Response Questionnaire

The results of the response questionnaire given to 18 students after using animated video media in learning obtained results of 83.75% with very interesting criteria.

Discussion

Learning media really helps students to understand the content of the material presented by the teacher. Learning media helps teachers deliver lessons to students in different and interesting ways, thereby increasing learning motivation and improving their learning outcomes (Lestari, 2023; Noviska & Anastasia, 2023). Technological developments that continue to develop now also require teachers to be able to adapt their learning media to current developments (Ong & Quek, 2023; Uzorka et al., 2023; Hennessy et al., 2022). Learning media can be in various forms, such as audio media, visual media and audio-visual media (Marpanaji et al., 2018). The media developed in this research is included in audio-visual media, namely animated videos. Researchers developed animated video media assisted by the Doratoon web. Doratoon is a platform that allows users to create animated videos quickly and easily with many features and elements, from free to paid.

Users can create interesting videos by adding animations such as handwriting movements, object animations and other animated transition. The results of this research are Doratoon-based animated video learning media which is proven to be feasible and effective as a learning tool. This statement is supported by the validation results of media experts who provide very feasible criteria by giving a final percentage of 86.9%. Meanwhile, the material expert validation results obtained a final score of 86.50% with very adequate criteria. Research conducted at SDN 02 Pegundan shows how the use of Doratoon-based animated video media can improve students' cognitive learning outcomes. The data obtained shows that before using animated video media the average cognitive learning outcome score was only 59.70, and after using animated video media the average score increased to 85.

Animated video media has advantages such as being able to display message elements with sound together and can display objects, places and events in the form of moving images (Isti et al., 2022; Shahbaznezhad et al., 2021). These results prove that the use of animated video media is appropriate and can improve students' cognitive learning outcomes in class IV science subjects.

Conclusion

The aim of this research is to find out whether animated audio-visual learning media is feasible and effective in improving students' cognitive learning outcomes. After testing by media experts, material experts, and large groups, Doratoon-based animated audio-visual learning media is suitable for use in the learning process and can improve students' cognitive learning outcomes.

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Author Contributions

M. A. R played a role in determining research ideas, methodology design, media design, data collection, data analysis and writing the original draft of the article. D. N. T is tasked with guiding, supervising and validating the instruments used in the research.

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Conflict of interest

The authors declare no conflict of interest.

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