

DEVELOPMENT OF INTERACTIVE ANIMATED VIDEO LEARNING MEDIA ON ENERGY TRANSFORMATION MATERIAL FOR CLASS IV PRIMARY SCHOOL

Nazzila Hasya Afina¹, Dede Margo Irianto², Syifa Nailul Aljamaliah³
^{1,2,3} Primary School Teacher Education, Indonesian Education University, Indonesia

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ABSTRACT

This research is based on the use of animated video learning media which has often been one-way between the media and students without actively involving students. This research was conducted to describe the initial design, results of design development, as well as user responses to interactive animated video learning media on energy transformation material. Interactive animated video learning media was developed using *the Design and Development (D&D)* research method and using the ADDIE research model which includes five stages, namely *analysis, design, development, implementation, and evaluation*. The results of the assessment of the interactive animated video learning media that have been developed are obtained from validation questionnaire scores by material experts of 88.89% in the "very feasible" category, media experts of 91.1% in the "very feasible" category, language experts of 79.17 % in the "feasible" category, and the overall expert validation percentage was 86.39% in the "very feasible" category. The media that had been developed was then tested on users and obtained a percentage of 85.42% in the "very appropriate" category from responses from teachers, 87.96% in the "very appropriate" category from fourth grade elementary school students, and user response assessment overall 86.69% in the "very feasible" category. Based on the recapitulation of the expert validator assessment results and user responses, it shows that the interactive animated video learning media that has been developed is very suitable for use in the learning process on energy transformation material for class IV elementary schools.

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Corresponding Author:

Nazzila Hasya Afina,

Primary School Teacher Education, Cibiru Campus

Indonesian education university,

Jl. Education No.15, Cibiru Wetan, Cileunyi, Bandung, West Java, Indonesia.

Email: nazzilahasya198@gmail.com

1. INTRODUCTION

The increasingly rapid development of technology means that everything in aspects of human life can be done based on technology, including the educational aspect. Maritsa, Salsabila, Wafiq, et al (2021), stated that education and technology in human life are inseparable parts. This is in line with the definition of technology which is a product of science, so it is appropriate to use technology in education to help implement learning (Lestari, 2018). Technology can be implemented into the learning process, starting from

the use of learning resources, administration, to learning media. In line with what Darimi stated (in Aisyah, Maulana, Rahmelina, et al, 2020) , that in the use of technology, the use of lecture methods in the learning process should be reduced and can be enriched by the use of learning media.

Technological developments as time goes by require humans to be able to balance and follow technological advances (Maritsa, Salsabila, Wafiq, et al, 2021) . The educational aspect is no exception. Teachers are required to be able to adapt and utilize technology in learning as the demands of the times change. One form of utilizing technology in learning is by using digital learning media. Sudhyatmika, Agustiana & Nugraha (2022) argue that the lack of teacher creativity hinders efforts to create student-centered media that can be practically adopted in elementary schools. Teachers are increasingly being asked to demonstrate originality and creativity in the creation of educational materials that meet students' individual needs. In line with this, Rusman (2018) stated that students' drive to learn and their natural curiosity can be stimulated through the use of teaching materials that are adapted to their individual characteristics. As a result, today's classrooms require digital and interactive learning media.

Not a few studies have discussed digital-based interactive learning media for use in schools. One of these studies was conducted by Wardani and Syofyan (2018), who found that the interactive video learning materials they created were very successful. Apart from that, Anggraeni, Alpian, Prihamdani, et al. (2018) found that students' interest in learning increased after using interactive multimedia learning media compared to their interest in learning before using this media.

The existence of multimedia including text, illustrated images and sound is integrated and can be controlled according to the user's wishes, so it can make interactive learning media more interesting so that students can enjoy the learning process and digest the material (Arindiono & Ramadhani, 2013) . Students can actively participate in the learning process by using interactive learning media, which allows them to explore, engage, create and communicate. (Shalikhah, Primadewi & Iman, 2017) . Supported by the statement of Syofyan and Ismail (2018) , that interactive learning can increase students' independence, criticality and creative thinking. Of course, this is really needed in every lesson in elementary school, especially in Natural Sciences (IPA) subjects or in the Independent Curriculum currently known as Natural and Social Sciences (IPAS).

In grades 1 and 4 the Independent Curriculum is introduced at elementary school level (Rahmadayanti & Hartoyo, 2022). The Merdeka Curriculum required the rebranding of elementary school Science courses to "IPA," an abbreviation for "Integrated Pedagogy in the Arts and Social Sciences." As a result, students will have a deeper appreciation of their environment and be better prepared to maintain harmony between the natural and social worlds (Kemendikbud, 2022). Learning is easier and deeper, independent, relevant and participatory with an independent curriculum, as indicated by the Ministry of Education and Culture (2022).

Based on the results of observations and interviews with one of the teachers at SDN 128 Haurpancuh, the researcher knows that classes I and IV at SDN 128 Haurpancuh have implemented an independent curriculum. The name of the science subject was changed to IPAS, which is a combination of science and social studies. Apart from that, regarding the integration of technology in learning, SDN 128 Haurpancuh already has adequate technological infrastructure, such as *projectors* and *speakers* in the classroom. The school uses this facility to support learning as a tool when displaying learning media. Researchers learned through interviews that educational institutions never use technology-based interactive learning materials in classrooms. Presentation media and learning videos are two examples of one-way digital learning media. As a result, education seems boring and requires active participation from students.

In connection with this problem, researchers started a project to create interactive animated video learning media for fourth grade energy transformations using the Animaker, Edpuzzle, and Capcut programs. Students can learn about energy transitions around the video by following the characters through the video's interactive animation. For example, electrical energy can be converted into heat energy, into motion energy, into light energy, into sound energy, and so on. Built in features questions about Energy Transformation content in the middle to keep students engaged and prevent them from stopping mid-movie.

This interactive animated video learning media has the advantage that students feel as if they are experiencing the experience directly through the visualization of the media presented. Referring to the material discussed, namely energy transformation, this requires students to see examples of energy transformation, either by visiting energy transformation locations such as hydropower plants or displaying concrete objects resulting from energy transformation. However, because it is not possible to invite students into the actual situation, students are invited to enter the situation in the animated video version. This learning media is interactive and helps students listen and think in accordance with the quality of cognitive development of fourth grade elementary school students, as shown by the questions about Energy Transformation content included in the middle of the film. Because it is adapted to the needs and characteristics of fourth grade elementary school students, interactive animated video learning media is a very important tool for education and plays a very important role in teaching and learning Energy

Transformation content. The questions this research seeks to answer are as follows: (1) What is the process of developing interactive animated videos on energy transformation material in class IV elementary schools?; (2) What is the feasibility of interactive animated videos on energy transformation material in Class IV Elementary Schools?; (3) How do teachers and students respond to interactive animated videos on energy transformation material in Class IV Elementary School?

2. RESEARCH METHODS

According to Ellis and Levy (2010), the goal of *Design and Development (D&D)* research is to design and create new products, tools, or models that can solve current problems. The ADDIE paradigm is used for D&D research. Analysis, Design or Planning, Development, Implementation and Evaluation are the five steps that form the ADDIE paradigm (Cahyadi, 2019). Expert validators in the fields of materials, media and language, as well as class teachers and class IV students at SDN 128 Haurpancuh, participated in this survey.

Each phase of the ADDIE process produces the data needed in this research. User needs, curriculum, and materials are analyzed through interviews with educators during the analysis phase. The next step, design or planning, involves using the findings from the analysis to create a Media Development Outline (GBPM) and storyboard. During the development phase, the product design is refined, and feasibility validation tests are carried out by expert validators. The following is a matrix of validation tools used in this research, broken down by expert type (material, media, or language).

Table 1. *Material Expert Validation Instrument Grid*

Aspect	Indicator	Question Items
Content/Material	Accuracy	Accuracy of material with Learning Outcomes
		Suitability of material to the flow of learning objectives
		Suitability of video content with material
		Appropriateness of the questions in the video
		Language use
	Clarity of Material	Order of presentation of material
		Presentation of energy transformation material that is easy to understand
		The energy transformation material is explained clearly
	Appropriateness in Learning	Help students understand energy transformations
		Suitability of interactive animated video media for the learning process
Interactive animated videos increase students' interest in learning		
		Interactive animated videos create students' ability to answer questions

Modified from (Urip Purwono, 2008) and (Efryl Nurliani Purwitasari, 2021)

Table 2. *Media Expert Validation Instrument Grid*

Aspect	Indicator	Question Items
Technical Quality	Usefulness	Assist teachers in delivering learning material
		Make it easier for students to understand learning material
		Makes the learning process easier
		Media is easy to use anytime and anywhere
	Legibility	Letters can be read clearly
		Appropriate font size
Design Quality	Energy Transformation Interactive Animation Video Illustration Design (Opening)	Letter color composition
		Text layout and illustration images
		Accuracy in color selection
		Suitability of illustrative images
		Accurate selection of font size and type
		Color proportions are appropriate
	Energy Transformation Interactive Animation Video Illustration Design (Content)	Balance text and image layout
		Attractive color choices
		Appropriate color proportions
		Appropriateness of the illustration image to the event
		Appropriate font size
		Selection of typeface
		Character consistency
		Suitability of background to story
Interesting picture illustrations for students		

Modified from (Efryl Nurliani Purwitasari, 2021)

Table 3. *Linguist Validation Instrument Grid*

Aspect	Indicator	Question Items
Language	Straightforwardness	Accuracy of sentence structure
		Sentence effectiveness
		Standardity of terms
	Use of interactive dialogic language	The language used is two-way

	Suitability to student development	The language used stimulates student engagement
		Suitability to students' intellectual development
		Suitability to the level of emotional development of students
	Conformity to language rules	Grammatical correctness
		Spelling accuracy
	Use of terms, symbols, or icons	Consistency in use of terms
		Consistent use of symbols or icons

Modified from (BSNP, 2014) and (Efryl Nurliani Purwitasari, 2021)

Once the product is deemed feasible by an expert validator, the product can be implemented for users. At the implementation stage, data was obtained in the form of an assessment of the responses of teachers and students as users.

Table 4. *Teacher Response Questionnaire Instrument Grid*

Aspect	Indicator	Question Items
Content/Material	Accuracy	Accuracy of material with Learning Outcomes
		Conformity to the Flow of Learning Objectives
		The order of presentation of the material is appropriate
		Language according to student characteristics
	Completeness	There are image objects and materials
There is audio		
Media Quality	Interest/Concern	Attract students' interest and attention
		Create a learning atmosphere
	Usefulness	Learning media is easy to use
		Flexibility of use
		Makes learning easier
	Display Quality	Interesting media to use
		Image quality in media
		The text in learning media is easy to read
		Clarity of dubber's voice pronunciation

Modified from (Efryl Nurliani Purwitasari, 2021) and (Widi Nurjaman, 2022)

Table 5. *Student Response Questionnaire Instrument Grid*

Aspect	Question Items
Content/Material	The material is presented clearly
	The material is presented in an interesting way
	Material is easy to understand
	Very useful material
Media	Attractive display of images and animations
	Attractive color display
	The writing is easy to read
	The meaning of words and sentences is easy to understand
	Videos are easy to use
Animated videos can motivate students	

Modified from (Efryl Nurliani Purwitasari, 2021)

The average percentage of each section of the questionnaire was then calculated to examine the feasibility test findings and user responses. The number of points obtained on each questionnaire question will be divided by the maximum score to get a percentage result.

$$Ps = \frac{S}{N} \times 100\%$$

Ps = Percentage

S = Total Score Obtained

N = Number of Total Scores

The data that has been converted into percentage form is then interpreted. Data interpretation obtained from validation results refers to the following Likert scale criteria.

Table 6. *Likert Scale Product Validation Assessment Instrument Criteria*

Value Scale	Category
4	Very good
3	Good
2	Not good
1	Not good

Table 7. *Product Eligibility Criteria*

Value Scale	Category	Information
81% –100%	Very Worth It	The interactive animated video on energy transformation material that is made is very suitable to be used as a learning medium

61% –80%	Worthy	An interactive animated video on energy transformation material that is made suitable for use as a learning medium
41% –60%	Decent Enough	The interactive animated video on energy transformation material that is made is quite suitable to be used as a learning medium
21% –40%	Not Worth It	The interactive animated video on energy transformation material that was made is not suitable to be used as a learning medium
0% –20%	Not feasible	The interactive animated video on energy transformation material that was made is not suitable to be used as a learning medium

According to Riduwan (Nurhaliza, 2020)

The evaluation stage is the final stage in the ADDIE model. The purpose of this evaluation stage is to see feedback on the development of interactive animated videos which will then be revised according to unmet needs. Apart from that, at the evaluation stage, the effectiveness of learning media is tested through SWOT analysis.

3. RESULTS AND DISCUSSION

3.1. Results

Analysis

To collect the information needed to continue creating interactive animated video learning media, an analysis step was carried out. Teachers were interviewed to obtain data. Needs analysis, curriculum analysis, and materials analysis are the three main types of analysis carried out. Analysis of student needs revealed that SDN 128 Haurpancuh has advanced technological resources and regularly uses them in the classroom; one of which is the use of video-based learning media. Unfortunately, the use of learning videos is mostly unidirectional (i.e. from teacher to student). Learning is deemed less effective if there is no interaction between students and the media. Therefore, to achieve learning goals effectively, relevant and interesting learning media is needed. From the curriculum analysis, it is known that class IV students at SDN 128 Haurpancuh apply the Independent Curriculum. Referring to the Merdeka Curriculum, the analysis of the material chosen is energy transformation material in phase B.

Design

At the design stage, researchers designed interactive animated video learning media on energy transformation material in accordance with the learning objectives. The design starts from designing the Media Development Outline (GBPM) and creating a *storyboard*.

Development

At the development stage, researchers developed the product design at the previous stage, namely in the form of learning media in the form of interactive animated videos using the help of several applications such as *Animaker*, *Edpuzzle*, and *Capcut*. Media development is carried out based on *the storyboard* that has been created. The assets used in interactive animated videos are adjusted to the material and *storyboard*. These assets include character selection, elements and icons, *backgrounds*, and *voice overs* in interactive animated video learning media.

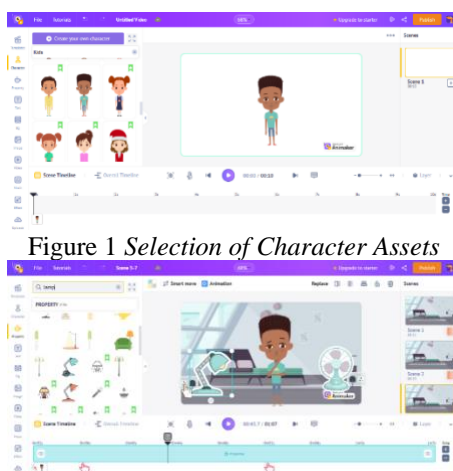


Figure 1 Selection of Character Assets

Figure 2 Element Asset Selection

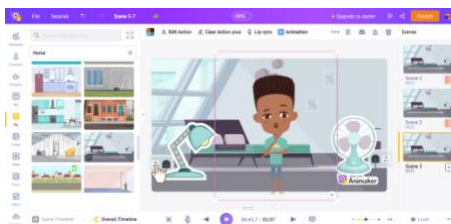


Figure 3 Background selection

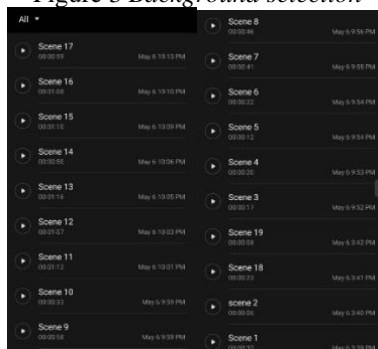


Figure 4 Voice Over (Dubbing) for Interactive Animation Videos

Once media is created, it must be checked for suitability by expert validators before it can be considered viable. Validation efforts include material expert validators, media experts, and language experts who evaluate the feasibility of interactive animated video learning media produced from various perspectives. Researchers can improve the quality of the media created and make it more useful for learning purposes by collecting notes and suggestions for improvements related to the media through validation activities.

1. Material Expert Validation

On May 16, 2023, one of the UPI Cibiru Campus Primary School Teacher Education (PGSD) lecturers carried out material expert validation on interactive animated video learning media. The aim of this validation effort is to ensure whether interactive animated video learning media is suitable for use based on the suitability of the material. Validators carry out assessments by responding to 12 questions designed to measure signs of material suitability, such as accuracy, clarity of material, and suitability for learning. The material expert validation results obtained a score of 88.89% based on the Riduwan Likert scale (in Nurhaliza, 2020) interpreted as "Very Appropriate" for the purposes of validating the suitability of the material in the media. This shows that interactive animated video learning media is very feasible to implement based on the feasibility aspect of the material.

2. Media Expert Validation

On May 27, 2023, one of the UPI Cibiru Campus Primary School Teacher Education (PGSD) lecturers served as a media expert to validate the suitability of interactive animated video learning media. The purpose of this validation is to ensure whether the interactive animated video learning media is suitable for use based on the appropriateness of the media. The media expert validation questionnaire contains 21 questions used to evaluate media usability, readability, and design quality of the introduction and content. The media expert's validation results obtained a score of 91.1% based on the Riduwan Likert scale (in Nurhaliza, 2020) interpreted as "Very Appropriate" for the purposes of validating media suitability. This shows that interactive animated video learning media is very feasible to be implemented based on the feasibility aspect of the media.

3. Linguist Expert Validation

One of the UPI Cibiru Campus Primary School Teacher Education (PGSD) lecturers, in his capacity as a language expert, validated interactive animated video learning materials on May 16 2023. The aim of this validation effort was to find out whether interactive animated video learning media was suitable for use based on language suitability. Validators carry out evaluations by answering 11 questions from the linguist validation questionnaire which includes indicators of language appropriateness aspects such as straightforwardness, interactive dialogic use of language, suitability for students, conformity with language rules, and use of terms, symbols or icons. Based on language feasibility validation, a percentage of 79.17% was obtained with the interpretation "Decent" based on the Riduwan Likert scale (in Nurhaliza, 2020) because it is in the range of 61% -- 80%. This interpretation indicates that interactive animated video learning media is suitable for implementation based on the language feasibility aspect.

Validation by material experts, media experts and language experts has been carried out on interactive animated video learning media. Next, the percentage of validation obtained from these experts

will be summarized as a whole. The overall validation recapitulation by expert validators obtained a percentage of 86.39% with the interpretation of "Very Decent" based on the Riduwan Likert scale (in Nurhaliza, 2020) because it was in the range of 81% -- 100%. This interpretation indicates that interactive animated video learning media is very suitable for use in the learning process.

Implementation

The implementation stage includes testing the interactive animated video learning media that will be built. Users, including teachers and students, will test the learning media that has been developed. The teacher at SDN 128 Haurpancuh, Bandung City is the respondent for this implementation, because he is the one who will use interactive animated video learning materials. The following is a summary of teachers' assessments of the effectiveness of interactive animated videos as learning media. The teacher's opinion is needed to ensure whether interactive animated video learning media is suitable for media users in terms of content/material and media quality. As a user of interactive animated video learning media, the teacher carries out an evaluation by answering 15 questions specifically designed for that purpose. accuracy, completeness, interest/attention, usefulness, and display quality are some of the indications used to assess content and media. The teacher's response was evaluated and obtained a score of 85.42% interpreted as "Very Appropriate" based on the Riduwan Likert scale (in Nurhaliza, 2020). Based on considerations of content/material and media quality, this interpretation shows that interactive animated video learning media is very suitable for use in the learning process.

The implementation was carried out on students as users of this interactive animated video learning media, namely 25 class 4C students at SDN 128 Haurpancuh. Based on the assessment of student responses, a score of 88.75% was obtained in the content/material aspect and 87.17% in the media aspect. Thus, the recapitulation of the percentage of student responses reached 87.96% with the interpretation of "Very Decent" based on the Riduwan Likert scale (in Nurhaliza, 2020) . This understanding shows that the use of interactive animated video learning media is very suitable for use in the learning process.

Evaluation

The purpose of the evaluation stage is to determine the effectiveness of interactive animated video learning media by analyzing the results produced by the media. We know from analyzing teacher feedback that they provide various comments and suggestions for improvement to improve the quality of the interactive animated video learning media developed. Once completed, the interactive animated video learning material is evaluated using a SWOT analysis to determine its effectiveness.

Table 8. *SWOT Matrix for Interactive Animation Video Learning Media*

Strengths		Weaknesses	
1.	There is an animated visualization of the material.	1.	You must download the <i>Edpuzzle application</i> first if you access media via <i>cellphone</i> .
2.	Assist teachers in delivering material.	2.	Requires adequate facilities and infrastructure.
3.	Motivate students to understand the material.		
4.	Is interactive.		
Opportunities		Threats	
1.	Videos cannot be <i>skipped</i> in case students don't listen	1.	It takes quite a lot of time to create interactive animated videos.

3.2. Discussion

Based on the findings of the analysis carried out at the ADDIE stage, interactive animated video learning media was developed. Based on interviews with class IV teachers at SDN 128 Haurpancuh conducted at the analysis stage, it is known that users or teachers and students need to create interactive animated video learning media to make learning more effective by helping students in understanding, especially in learning. Natural and Social Sciences (IPAS). According to the opinion that learning videos should make it easier for students to understand information Yudianto (2017). After analysis, the product is developed into an interactive animated video learning medium, and its feasibility is tested by expert validators.

The material expert validator's assessment of the suitability of the content/material received a percentage of 88.89% with the interpretation "Very Feasible". The media expert validator's assessment of the suitability of the media obtained a percentage of 91.1% which was interpreted as "Very Feasible". A percentage of 79.17% with the interpretation of "Feasible" was achieved for the language expert validator assessment based on elements of linguistic appropriateness. Thus, it can be concluded that the feasibility of interactive animated video learning media on energy transformation material based on expert assessments obtained a percentage of 86.39% with the interpretation "Very Feasible" according to the Likert scale according to Riduwan (in Nurhaliza, 2020) .

Before testing interactive animated video learning materials with students, the teacher evaluates and approves them. The percentage of 85.42% with the interpretation "Very Appropriate" was obtained from assessing the teacher's reaction to interactive animated video learning media on energy transformation material. It is easier for teachers to convey information to students when using interactive animated video learning media. Learning media was developed with the aim of helping teachers communicate with students, foster their creativity, and focus their attention on the learning process (Tafonao, 2018). By choosing the right learning media, teachers can communicate content better to their students (Sari, Helsy, Riri & Irwansyah, 2019).

The interactive animated video learning materials that have been developed are then tested with students. The researcher acted as a teacher during this procedure and led the learning exercises in the media testing activities. After students try the media, the response is then assessed. Obtained a percentage of 87.96% with an interpretation of "Very Appropriate" for the interactive animation video learning material on energy transformation. In interactive animated video learning media, the presence of attractive visual displays combined with explanations of the subject matter makes learning look more interesting and is able to encourage and make it easier for students to understand the subject matter (Sari, Helsy, Riri & Irwansyah, 2019). In addition, effective use of media can help students overcome their tendency to be passive (Tafonao, 2018). Students must be able to actively participate in the learning process when using interactive animated video learning materials. This can be seen from the enthusiasm of students when using interactive animated video learning materials during the learning process.

When students watch the interactive animated videos provided, they can participate by answering questions in the videos. This is in line with the statement of Sari, Helsy, Riri, and Irwansyah (2019) which states that the use of interactive learning media requires students' attention and interaction with the media. It can be concluded that the interactive animated video learning media developed by researchers is very suitable for use in learning as a learning support based on feasibility validation findings and user reactions.

4. CONCLUSION

The stages of Analysis, Design, Development, Implementation, and Evaluation are all included in the ADDIE research model, which is used in this research to conduct research using the D&D (design and development) method. The final product is interactive animated video learning media for class IV elementary schools about energy transformation. After development, user response testing and feasibility testing of the final product are carried out. Material experts, media experts and language experts assess the media suitability validation results. Validation of material experts who provided validation findings of the feasibility of a "Very Appropriate" interpretation was 88.89%, media experts provided 91.1% with an interpretation of "Very Appropriate" and linguists provided an interpretation of "Excellent" of 79.17%. Overall, interactive animation video learning material for class IV elementary school on energy transformation material obtained a percentage of 86.39% with the interpretation of "Very Appropriate" based on expert validation tests. Teachers at SDN 128 Haurpancuh assessed user responses and 25 class IV students. Based on the teacher's response assessment, the percentage obtained was 85.42% with the interpretation "Very Appropriate" and the student response assessment obtained a percentage of 87.96% with the interpretation "Very Appropriate". Interactive animated video learning media on energy transformation material obtained an overall score of 86.69% which was interpreted as "Very Appropriate" based on the assessment of teachers and students as users. Based on this, it can be said that the interactive animated video learning material that has been developed is very suitable for use in learning energy transformation in class IV elementary schools.

BIBLIOGRAPHY

- Aisyah, H., Maulana, II, Rahmelina, L., & Firdian, F. (2020). Implementation of Positive Technology in Improving the Quality of Education. *Journal of the Character Education Society*, 3(1), 86–94. <https://doi.org/10.31764/jces.v3i1.1309>
- Anggraeni, SW, Alpian, Y., Depi, P., & Winarsih, E. (2021). Development of Video-Based Interactive Learning Multimedia to Increase Elementary School Students' Interest in Learning. *Basicedu Journal*. 5(6), 5313–5327.
- Arindiono, R. Y & Ramadhani, N. (2013). Design of Interactive Mathematics Learning Media for 5th grade elementary school students. *Pomits Journal of Science and Arts*. 2(1), 28–32.
- National Education Standards Agency and Book Center. (2014). Stage I and Stage II Assessment Instruments for Primary and Secondary Education Textbooks.
- Cahyadi, RAH (2019). Development of Teaching Materials Based on the Addie Model. *Halaqa: Islamic Education Journal*, 3 (1), 35–42. <https://doi.org/10.21070/halaqa.v3i1.2124>
- Ellis, T. J & Levy, Y. (2010). A Guide for Novice Researchers: Design and Development Research Methods. Proceedings of Informing Science & IT Education Conference.
- Ministry of Education, Culture, Research and Technology. (2022). Pocket Book, Miscellaneous Edition of the Independent Curriculum, the Specifics of Primary Schools.
- Lestari, S. (2018). The Role of Technology in Education in the Era of Globalization. *EDURELIGIA: Journal of Islamic*

- Religious Education* , 2(2), 94–100. <https://doi.org/10.33650/edureligia.v2i2.459>
- Maritsa, A., Salsabila, UH, Wafiq, M., Anindya, PR, & Ma'shum, MA (2021). The Influence of Technology in the World of Education. *Al-Mutharahah: Journal of Social Religious Research and Studies* , 18(2), 91–100. <https://doi.org/10.46781/al-mutharahah.v18i2.303>
- Nurhaliza, N. (2020). *DEVELOPMENT OF BUSAMA LEARNING MEDIA (MATHEMATICS POCKET BULLETIN) FOR LEARNING MATHEMATICS IN CLASS III PRIMARY SCHOOL STUDENTS*. Bachelor thesis, Indonesian University of Education.
- Nurjaman, W. (2022) *DESIGN AND CONSTRUCTION OF INTERACTIVE VIDEO-BASED LEARNING MEDIA ON MIXED WHOLE NUMBER COUNTING OPERATIONS MATERIAL IN PRIMARY SCHOOL: Design & Development Research in Class VI Elementary School*. Bachelor thesis, Indonesian University of Education.
- Purwitasari, EN (2021). *DEVELOPMENT OF POWTOON-BASED LEARNING ANIMATION VIDEO MEDIA ON THE PROPERTIES OF LIGHT*. Bachelor thesis, Indonesian University of Education.
- Purwono, U. (2008). *Teaching Material Assessment Standards* . Jakarta: BSNP. Rahmadayanti, D., & Hartoyo, A. (2022). Portrait of the Independent Curriculum, the Form of Independent Learning in Elementary School. *Basicedu Journal* . 6(4), 7174–7187. <https://doi.org/10.31004/basicedu.v6i4.3431>
- Rusman. (2018). *Learning Models: Developing Teacher Professionalism Second Edition* . Jakarta: Rajawali Press.
- Sari., Helsy, I., Aisyah, R. Irwansyah, F, S. (2019). *Learning Media Module* . Bandung: Sunan Gunung Djati State Islamic University.
- Shalikhah, ND, Primadewi, A., & Iman, MS. (2017). Lectora Inspire Interactive Learning Media as a Learning Innovation. *LPM Newsletter* , 20(1), 9–16.
- Sudhyatmika, IKW, Agustiana, IGAT, & Nugraha, G. (2022). Fun Thinkers Media on Energy Changes Material for Elementary School Students. *Pulpit Science Journal* , 27 (2), 200-208.
- Tafonao, T. (2018). The Role of Learning Media in Increasing Student Interest in Learning. *Journal of Educational Communication* , 2(2), 103–114.
- Wardani, RK, & Syofyan, H. (2018). Development of Interactive Videos in Integrative Thematic Science Learning on Human Blood Circulation Material. *Primary School Scientific Journal* . 2(4), 371-381.
- Yudianto, A. (2017). *Application of Video as a Learning Media* . 2017 National Education Seminar .