Proceedings Series of Educational Studies

The 5th International Conference on Educational Management and Technology (ICEMT) 2026

Development Of Nano Learning Animation Video In Learning On Waste Recognition Material For Grade V Students

Putri Aulia Rahmani, Yerry Soepriyanto

State University of Malang, Jl. Semarang No. 5 Malang, East Java, Indonesia

Email: putri.x10x@gmail.com

Abstract

This research aims to develop and test the feasibility level of learning media in the form of nano learning-based animation videos on waste recognition materials for grade V elementary school students. The scope of research is focused on understanding the classification of waste types, such as organic, inorganic, and B3, as well as the principles of 3R management. This innovation is present as a solution to conventional methods that are considered less effective in maintaining students' focus. The method used is Research and Development (R&D) by adapting the Sadiman model which includes nine procedural stages. The production process leveraged artificial intelligence technology to produce seven short-form video clips. Data collection was carried out through validation of subject matter experts, media experts, and questionnaires of class V student responses as a user trial using the Likert scale. In conclusion, nano learning videos have proven to be very valid, interesting, easy to use, and effective in maintaining students' concentration in learning. The implications of this research make a real contribution to the development of educational technology science, especially in formulating compact digital media designs that are adaptive to the cognitive characteristics of the modern generation.

Keywords: Learning Video, Nano Learning, Waste Introduction, Elementary School, Research and Development

1. Introduction

Education is the main foundation in the development of a nation because quality education is able to produce human resources who are knowledgeable and competent in solving various problems in life. In line with the mandate of Law Number 20 of 2003 concerning the National Education System, education aims to develop the potential of students to become believers, virtuous, capable, creative, and responsible. However, the quality of learning in Indonesia is still faced with various challenges, one of which is reflected in the results of the 2022 Programme for International Student Assessment (PISA) which shows that the literacy and numeracy skills of Indonesian students are still below the country average of the Organisation for Economic Co-operation and Development (OECD). The low interest in learning of students is also caused by dense materials, conventional methods, and less varied learning media so that students tend to be saturated and less motivated during the learning process.

The development of information and communication technology opens up opportunities for the education sector to present learning media that is more interactive, adaptive, and accessible at any time. The Independent Curriculum Policy also encourages the integration of digital technology into the learning process to improve the quality of learning. Various forms of digital media, such as interactive multimedia, animation, simulation, and learning videos, have been proven to be able to increase students' active participation during the learning process. Wardana et al. (2024) prove that the use of technology-based media has a significant impact on improving students' focus, abilities, and skills because teaching materials can be presented in a more attractive and easily digestible way.

This work is licensed under a Creative Commons Attribution-ShareAlike 4.0 International License.

Learning videos are one of the most commonly used technology-based media in the world of education today, because of its advantages in presenting information visually and audio simultaneously. Marliani (2021) proves that the application of learning videos is effective in boosting students' understanding of concepts while supporting information retention. However, as the characteristics of the digital generation change, which tend to prefer short visual content over long information presentation, there is a shift in the trend towards short video formats, as reflected in the popularity of TikTok, Instagram Reels, and YouTube Shorts, which according to Statista (2025) have gathered more than two billion active users every month globally. Wibowo et al. (2023) found that the use of short videos in learning can increase the retention rate of students' knowledge by up to 40% when juxtaposed with a purely text-based method.

This phenomenon gave birth to an innovative learning approach known as nano learning, which is a method that packages material into very small and short-duration units with a focus on one specific main concept (Wibowo, 2025). This approach is in line with the Cognitive Theory of Multimedia Learning (Mayer, 2021) which emphasizes that the presentation of information through the integration of images, videos, text, and audio elements has been proven to be able to optimize students' understanding as well as retention. A number of previous studies reinforce the urgency of this approach. Agustina and Kholidya (2024) show that a concise and focused material delivery strategy has proven to be crucial as a form of digital innovation that is able to trigger students' independent thinking skills, while Aritonang et al. (2023) prove that the implementation of nano learning-based short videos is effective in boosting the interest and interest in learning of elementary school students.

Although previous studies have confirmed the effectiveness of learning videos and nano learning approaches in general, studies that specifically develop nano learning animation videos on waste recognition materials for elementary school students are still limited. Dewi and Handayani (2021) developed an animated video on alternative energy source material, while Wardana et al. (2024) focused on developing an animated video for IPAS subjects in general. The two studies have not specifically targeted the topic of waste management or integrated the use of generative artificial intelligence technology in the production process. The novelty of this research lies in the development of nano learning videos that specifically discuss waste recognition and management materials, including the classification of organic, inorganic, and B3 waste as well as the 3R principle, by utilizing generative artificial intelligence technology to produce visual assets and audio narratives, and distributed through the TikTok social media platform to be in harmony with the habits of the digital generation in accessing information.

The urgency of this material is also based on data from the Ministry of Environment and Forestry which notes that the volume of national waste generation in Indonesia has exceeded 60 million tons every year, so the integration of waste management education is crucial to be instilled from an early age to build students' environmental awareness (Dewi & Handayani, 2021). The results of initial observations at SD Negeri Kedoya Selatan 04 Pagi Jakarta show that the learning of waste introduction material still focuses on the use of textbooks and teacher explanations on the board, so that students tend to lose focus after some time participating in learning. The results of interviews with teachers and students also indicated a strong preference for short video-based learning media that highlighted attractive visual aspects and concise and easy-to-understand material delivery.

Conceptually, nano learning is characterized by a number of characteristics that distinguish it from conventional learning media. Masyhuri (2024) identified that the main characteristic of nano learning lies in the very short duration of content, which ranges from one to a maximum of three minutes, with the nature of content that focuses on one topic or one specific concept completely (single-concept focus). This compact determination of duration has a strong psychological justification in maintaining the stability of concentration of elementary school students, especially in mitigating the limitations of the attention span that is possessed in that age range. Aburizaizah and Albaiz (2021) added that nano learning is also characterized by a diversity of visual-auditory delivery formats and a high level of accessibility, with the principle of mobile-first design so that it can be accessed flexibly using devices outside the boundaries of the classroom. These characteristics are used as a conceptual reference in designing nano learning videos in this study, especially in determining the duration of each clip, the modular structure of seven stand-alone videos, and the distribution format based on the short video platform.

As a variant of learning video media, animated videos are considered to have comparative advantages in presenting material dynamically and immersively. Wardana et al. (2024) emphasized that the integration of moving visual elements, audio narratives, sound effects, and background music that are harmoniously arranged is able to create an effective multimodal learning experience in stimulating students' cognitive engagement, especially for students of primary education age who are psychologically more sensitive to colored, moving, and visual stimuli accompanied by interesting audio elements. Farhan et al. (2024) also emphasized that the effective use of video media can stimulate students' attention, facilitate a deeper understanding of the material, and have a significant impact on increasing student motivation and learning outcomes. In line with that, animation plays a strategic role as a visualization instrument that is able to transform abstract concepts, such as the process of decomposing waste and the stages of 3R management, into concrete, dynamic, and interesting representations for elementary school students.

Based on this description, this study aims to develop and describe the feasibility level of nano learning animation videos on waste recognition materials for grade V elementary school students, based on assessments from material experts, media experts, and student responses.

2. Method

2.1 Research and Development Model

In this study, a Research and Development (R&D) approach was used to develop a product in the form of a nano learning video on the introduction to waste management. The development model applied is the Sadiman model. The selection of this model is based on the procedural suitability of the media production needs, especially in the storyboarding stage which is crucial for the preparation of video flows. The development procedure in the Sadiman model includes nine systematic stages, namely: (1) Identification of Needs, (2) Formulation of Objectives, (3) Formulation of Material Items, (4) Development of Success Measuring Tools, (5) Manuscript Writing, (6) Media Production, (7) Tests/Trials, (8) Revision, and (9) Ready for Production, as presented in Figure 3.1.

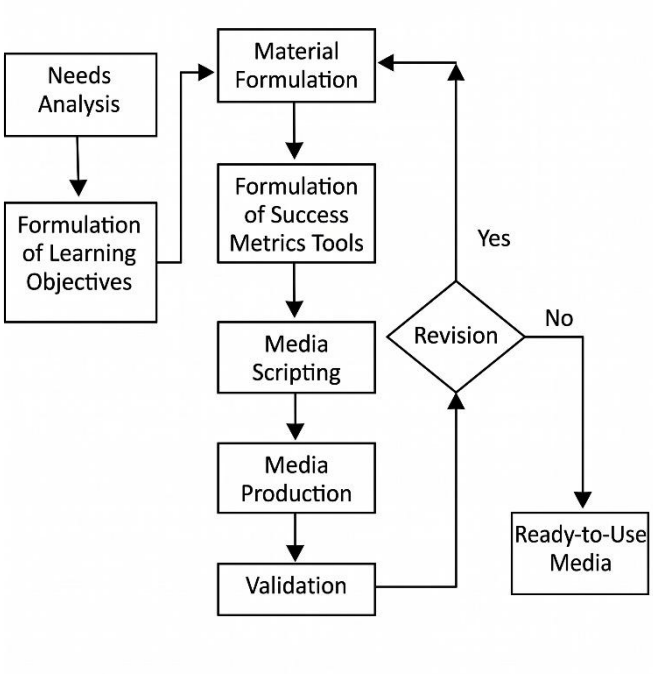


Figure 2. 1 Sadiman Development Model (2014)

2.1.1. Identify Needs

The initial stage in Sadiman's development model is the identification of needs. This step is a crucial instrument for researchers to analyze the problems and obstacles that arise during the learning process in the field, so that product development can be ensured to be relevant to the real needs of students. As stated by (Sadiman, 2014), 'needs' in the instructional realm are defined as the discrepancy between the profile of abilities, skills, and attitudes of students in actual conditions and the expected ideal competency target. In line with this, the needs analysis procedure is carried out through interview techniques with teachers and students to map essential learning needs in the field. The results of the needs analysis obtained through interviews with teachers and students revealed that the range of learning materials currently used is still limited. This condition causes low effectiveness of the material in stimulating students' attention during the learning process. The majority of students said that short films with attractive images and concise and easy-to-understand content delivery were more interesting for them as learning materials. The findings underscore the urgency of innovation in designing educational content that is able to stimulate students' in-depth curiosity about waste management issues. Based on this analysis, the development of nano learning video-based learning media is a crucial strategy to stimulate and increase students' interest in learning. Elementary school students will find it easier to understand content when it is delivered concisely, clearly, and with attractive images thanks to nano learning media. Therefore, the development of nano learning videos is important to be realized.

2.1.2. Purpose Formulation

An important factor in learning is purpose. Goals are able to show where learners will go, how they will achieve them, and how they know that they have achieved their goals (Sadiman, 2014). The results of the needs analysis through interviews with teachers and students indicate that the learning media applied for waste recognition materials is still less varied, so it has not been able to stimulate students' attention and involvement optimally during the learning process. In addition, the characteristics of short videos that combine attractive visual elements with concise material delivery have proven to be effective in facilitating students' understanding. Based on this, the development of this nano learning media aims to optimize students' understanding of waste management materials, as well as stimulate their learning interests through the presentation of more adaptive and relevant content.

The use of nano learning videos that are packaged in a concise and attractive manner is expected to facilitate students in understanding the environmental consequences due to waste accumulation, as well as internalizing proper waste management practices in daily activities. It is hoped that they will be more interested in learning about the material on waste recognition.

The formulation of learning objectives is prepared by integrating aspects of the cognitive development of elementary school students, which requires the presentation of material in a simple, concrete, and attractive manner to facilitate the optimization of information absorption. In addition, this learning objective is adjusted to the principle of nano learning, which emphasizes the delivery of material in a concise, focused, and effective manner. Through the formulation of structured learning objectives, the media developed is projected to be able to optimize understanding and stimulate students' interest in learning related to waste management materials.

2.1.3. Formulation of Material Items

The formulation of learning materials must be aligned linearly with the instructional objectives that have been set previously, as emphasized by (Sadiman et al., 2014) that each component of the material must support the success of achieving learning objectives. In line with the learning objectives that have been formulated, the next stage is to conduct material analysis to ensure the relevance of the content. Based on this analysis, the following are the components of the material developed into the nano learning video:

1. Definition of waste
2. Types of garbage
3. Explanation of organic, inorganic, and B3 waste
4. Impact of waste on the environment
5. 3R Principle (Reduce, Reuse, Recycle)

All subject matter integrated into this media is adapted from the main textbook of Natural and Social Sciences for elementary school grade V, published by the Ministry of Education, Culture, Research, and Technology (Kemendikbudristek).

2.1.4. Development of Success Measurement Tools

The development of success evaluation instruments must be based on the alignment between the learning objectives set and the substance of the material presented to students, as emphasized by (Sadiman et al., 2014). The development of a success measuring tool was used in this study to determine the success rate of nano learning video learning media on waste recognition materials. The success measuring tools used are as follows:

1. Product Eligibility

Product feasibility assessments are carried out through validation by experts to ensure the quality of the content and technical aspects of the media. This process is divided into two evaluation focuses:

- Material Expert Validation: Carried out using a validation sheet instrument to test the suitability of the material content, the correctness of the concept, and the clarity of the presentation of the material in the nano learning video.
- Material Expert Validation: Carried out using a validation sheet instrument to test the suitability of the material content, the correctness of the concept, and the clarity of the presentation of the material in the nano learning video.

The product is declared valid and feasible to be tested if it has reached the minimum criteria of "valid" based on the results of assessments from material experts and media experts.

2. Product Appeal

The media attractiveness assessment was carried out to measure the extent to which nano learning videos were able to attract students' attention and interest during learning. The instrument used was a student response questionnaire that was distributed after the use of media. The product is declared to meet the "attractive" criteria if a positive response percentage score of at least 75% of the total respondents is obtained.

2.1.5. Scriptwriting

After the material/content and evaluation tools are ready, the development process continues to the manuscript writing stage. The script acts as a blueprint for media production, detailing the dialogue, visuals, and other elements that will be included. Systematic manuscript preparation is a crucial component to ensure the effectiveness of the production process, so that the output of the final product is in line with the instructional goals that have been set (Sadiman, 2014).

The pencil-sketch style illustrations presented at the storyboard stage serve as a guide for narrative and basic composition. In the final production stage, the visual guide is developed and customized using specific prompts on the Grok AI platform to produce a 3D animation-style output (claymation) with a bright color palette. This visual style adjustment is deliberately made so that the video becomes more lively, attention-grabbing, and in accordance with the visual needs of children aged 10-11 years.

2.1.6. Media Production

At this stage, all designs that have been prepared at the stage of material formulation and script/storyboard writing are realized into real video media products that are ready to be tested. The production stage is carried out independently by researchers by integrating Artificial Intelligence (AI) technology as the main instrument in the creation of visual and audio assets. Furthermore, all of these elements are brought together through professional video editing software to produce a complete final product.

Media production in this study includes three main stages, namely: (1) visual asset production using Grok AI; (2) narration audio production using Google AI Studio; and (3) post-production in the form of editing and integrating all elements using CapCut. The three stages are carried out sequentially and interconnected to produce a complete nano learning video unit.

a. Visual Asset Production with Grok AI

The first stage in the production process is the creation of visual assets that will be used as the main elements in each video clip. Visual assets are produced using the Grok AI platform, which is a text-to-video generative AI system developed by xAI. The platform is optimized to produce illustrations and animated characters that are specifically tailored to the cognitive development and aesthetic preferences of elementary school students in the age range of 10–11 years.

In the visual asset production process, prompts are carefully crafted and structured for each scene contained in the storyboard. Each prompt is designed to produce illustrations with a consistent visual style, using a 2D animation style with a vibrant color palette and friendly characters. This consistency of visual style is important to maintain the overall visual identity of the product so as not to confuse the audience, as suggested in the principle of Coherence in the Cognitive Theory of Multimedia Learning (Mayer, 2021).

The visual assets produced include various elements, including: illustrations of the characters of the message conveyors, visualizations of concrete objects that represent learning materials (such as drawings of types of garbage, landfills, and 3R waste management stages), the background of each scene, and supporting graphic elements such as icons, kinetic text, and visual markers. Each asset produced is then selected, evaluated for suitability with the storyboard, and adjusted its color and composition before being used in the next stage.

b. Voice Over Audio Production with Google AI Studio

The second stage is the production of narrative audio that functions as an auditory component of explaining the material in each video. Narration is produced using Google AI Studio, a natural language processing platform based on Text-to-Speech (TTS) technology developed by Google. This technology is used to produce digital vocal narratives with clear articulation and stable intonation. In addition, the use of standard but still communicative grammar is specifically designed to ensure that the content is easily digestible by elementary school-level students.

The audio production process begins with the preparation of a narrative script sourced from the script columns in the storyboard of each video. The script is then entered into the

Google AI Studio system using voice characters that have been adjusted to the characteristics of the target listener, namely elementary school grade V students. The selection of voice characters is prioritized in voices that sound friendly, clear, and have a tempo that is not too fast so that it is easy for students to follow and understand.

Each audio file produced is then evaluated for quality, including clarity of articulation, intonation suitability, and synchronization of duration with the intended visual content. If there is inappropriate audio, the researcher regenerates it with prompt adjustments to produce optimal audio quality. The selected audio files in MP3 format are then exported and saved for further integration in the next stage.

c. Editing and Rendering with Capcut

The third and final stage in the production process is the process of editing, integrating, and rendering all elements into a single video whole. This stage is carried out using CapCut software, a video editing application that has comprehensive features and an intuitive interface. CapCut was chosen for its ability to integrate animated video elements, narrative audio, sound effects, background music, visual transitions, and kinetic text simultaneously in one easy-to-operate timeline interface.

This process is done systematically for each video clip. The first step is to set up the video timeline, which is to arrange the sequence of visual assets according to the storyboard that has been designed. Each video asset generated from Grok AI is placed on a visual path (track) with a duration adjusted to the narrative script in each scene.

The second step is audio syncing. Narrative audio files that have been produced using Google AI Studio are placed on the audio path and synchronized with the relevant visual display so that the narrative and images can appear simultaneously and support each other. In addition to the narration, the researcher also added background music that is cheerful and does not disturb concentration, as well as sound effects at certain moments to strengthen the auditory appeal of the video.

The third step is the addition of kinetic text and supporting graphic elements. Each video comes with text that features keywords as a visual message reinforcement. The use of this text is based on the principle of Dual Coding in the Cognitive Theory of Multimedia Learning (Mayer, 2021), which states that the presentation of information through two channels simultaneously (text and audio) can facilitate information processing and increase student retention. This kinetic text is designed using easy-to-read typography with optimal visual proportions to the screen.

The fourth step is the implementation of inter-scene transitions. Each scene change in the video is given a smooth transition effect and is not overdone to keep the flow of the material delivered smooth and not confusing. Finally, once all the elements have been integrated, the video is rendered and exported in MP4 format with High Definition (HD) resolution of 1080p (1920 × 1080 pixels) and a screen aspect ratio of 9:16 (portrait), according to the technical specifications set during the product planning stage.

Overall, the media production stage produced seven nano learning videos, each focusing on one main concept of waste recognition material. The seven videos are attractively packaged

with a combination of 2D animated visual elements, clear audio narration, background music that supports the learning atmosphere, and kinetic text as a message reinforcement. All videos are produced with attention to the principles of nano learning, namely short duration (less than 2 minutes per clip), focus on one single concept per video, and audio-visual design that is adaptive to the learning characteristics of elementary school students.

2.1.7. Evaluation/Trial

This evaluation stage is carried out through two main mechanisms: expert validation and field trials. Validation is carried out by material experts and media experts to measure the feasibility of the product in terms of substance and technicality. Furthermore, a response test was conducted on students to determine the effectiveness and level of acceptance of nano learning video media in the context of real learning.

The expert test stage aims to test the validity of the product, including an assessment of the substance of the material as well as the technical quality of the media. Meanwhile, a user test was carried out to evaluate the attractiveness aspects and students' responses to the developed nano learning videos.

The instrument's answer is made based on the Likert scale on each variable measured in the form of words as in the following Table 2.1:

Table 2.1 Skala Likert (Sugiyono,2022)

Criteria	Score
Strongly agree	5
Agree	4
Neutral	3
Disagree	2
Strongly Disagree	1

2.1.8. Revision

Based on the validation, it can be known whether there is an improvement or not to the learning video media. If there is an improvement, then improvements should be carried out first by repeating the steps of the development of the Sadiman (2014) model. If there is no improvement, then nano learning video media can be used in learning activities.

2.1.9. Ready-to-Use Media

The ready-to-use media stage is the final stage of the entire media development process according to the Sadiman (2014) model. Based on a series of expert validation processes and field trials, the nano learning video learning media on waste recognition material is declared to have reached the final stage. This product has met the criteria of validity and feasibility, so it is officially ready to be implemented as a learning medium in elementary schools.

2.2 Data Analysis Techniques

The data obtained from expert validators and student response questionnaires were analyzed using a mixed-methods approach, namely quantitative and qualitative. Quantitative data was processed using percentage descriptive analysis techniques to determine the level of validity and attractiveness of the media. Meanwhile, qualitative data in the form of criticism and written suggestions were analyzed in a narrative descriptive manner as the basis for product improvement and improvement.

The developer processes the data as a whole applying the formula from Arikunto and West Java (2014) as follows:

$$P = \frac{\sum X}{\sum Xi} \times 100\%$$

Description:

P	= Percentage Numbers
$\sum X$	= The number of points of all respondents' answers
$\sum Xi$	= Maximum number of points for all questions
100%	= Constanta

The results of the analysis of questionnaire data that have been calculated using the percentage formula are then converted into media eligibility criteria. The determination of the product feasibility category is carried out by mapping the percentage value into a scale range that has been set as an assessment reference. (Arikunto & Jabar, 2014). The percentage of feasibility for using media is as follows:

Table 2. 2 Table of Criteria for Determining the Level of Validity of Sudjana (2006)

Category	Percentage	Eligibility Categories
A	81%-100%	Valid
B	61%-80%	Quite Valid
C	41%-60%	Less Valid
D	<40%	Invalid

Table category description:

1. If the results of data analysis are obtained with a value range of 81%-100%, then the media gets category A, then the media can be declared valid.
2. If the results of data analysis are obtained with a value range of 61%-80%, then the media gets category B, then the media is declared quite valid.
3. If the results of data analysis are obtained with a value range of 61%-80%, then the media gets category B, then the media is declared quite valid.

4. If the results of data analysis are obtained with a value range of <40%, then the media gets category D, then the media is declared not.

3. Results and Discussion

3.1 Result

This research and development produced a product in the form of a nano learning animation video on waste recognition material consisting of seven video clips, namely the definition of waste, types of waste, organic waste, inorganic waste, B3 waste, reduce, reuse, and recycle. Each clip is 1-3 minutes long with a vertical format (9:16) with HD 1080p resolution, equipped with artificial intelligence-based voice narration and brightly colored animations tailored to the cognitive characteristics of students aged 10-11 years. An example of the product display is presented in Figure 2.

Figure 3.1 Nano Learning Video Display



Table 3.1 Material Validation Test Data

No	Assessment Aspects	Mean	P(%)	Category
1	Aspects of Conformity with the Curriculum	5,00	100%	Valid
2	Aspects of Accuracy and Precision of the Concept	5,00	100%	Valid
3	Material Completeness Aspect	4,50	90%	Valid
4	Aspects of Material Understanding	4,75	95%	Valid
5	Aspects of Potential to Increase Learning Interest	5,00	100%	Valid
Overall Average		**4,85**	**97%**	**Valid**

Calculation of the average total percentage	$\boldsymbol{P = \frac{\sum x}{\sum x_i} \times 100\%}$ $\boldsymbol{P = \frac{97}{100} \times 100\% = 97\%}$

Based on the data in Table 4.2 and the calculation results, the percentage of material validity was obtained at 97%. If referring to the Criteria for Determining the Level of Validity according to Sudjana (2006), the qualification of waste recognition materials contained in the nano learning video is categorized as valid because it is in the percentage range of 81%–100%. This shows that the content of the material, the accuracy of the concept, completeness, language, and presentation in the nano learning video learning media are in accordance with the Phase C Learning Outcomes and the needs of grade V elementary school students in the Waste Introduction material.

Table 3.2 Media Validation Test Data

No	Assessment Aspects	Mean	P(%)	Category
1	Visual Aspects	5,00	100%	Valid
2	Technical Aspects	5,00	100%	Valid
3	Aspects of User Interactivity & Engagement	5,00	100%	Valid
4	Attractiveness and Usability Aspects	4,80	96%	Valid
Overall Average		**4,95**	**99%**	**Valid**

Calculation of the average total percentage	$\boldsymbol{P = \frac{\sum x}{\sum x_i} \times 100\%}$ $\boldsymbol{P = \frac{99}{100} \times 100\% = 99\%}$

Based on the data in Table 4.3 and the calculation results, the percentage of media validity was obtained at 99%. If referring to the Criteria for Determining the Level of Validity according to Sudjana (2006), the qualification of the design and format of nano learning video products is categorized as Valid because it is in the percentage range of 81%–100%. This shows that the visual, technical, interactivity, and usefulness aspects of this learning media have been designed very well and are ready to be implemented to grade V elementary school students.

Table 3.3 Product Trial Results by Students

No	Indicator	Rating Scale					Scores obtained	Maximum score
		1	2	3	4	5		
Aspek Attractiveness Aspect								
1	The display of learning videos looks interesting and not boring.				16	34	234	250
2	This media is more interesting than the usual way of learning.			4	18	28	224	250
3	The video made me more interested in learning about waste.			7	15	28	221	250
4	The material in the video feels close to my life.			4	18	28	224	250
5	I feel satisfied learning this way.	1		3	11	35	230	250
6	This medium made me want to learn again in a similar way.	1		4	13	32	226	250
7	Learning with learning videos like this is fun.			3	14	33	230	250

8	I would recommend this learning video to a friend.		3	10	37	234	250
Ease of Use Aspect							
9	The text or text in the video is easy to read.	2	2	15	31	223	250
10	The material in the video is easy for me to understand.			11	39	239	250
11	The explanation in the video is conveyed clearly and concisely.		3	15	32	229	250
12	The example given helped me understand about waste.		4	18	28	224	250
13	This medium is easy to use without the help of others.			14	36	236	250
Learning Focus Aspect							
14	The video duration is just right, not too long and not too short.	2	12	14	22	204	250
15	The learning video made me focus on paying attention.		3	13	34	231	250
Total Score						**3409**	**3750**

Eligibility Percentage

$$\boldsymbol{P = \frac{\sum x}{\sum x_i} \times 100\%}$$

$$\boldsymbol{P = \frac{3409}{3750} \times 100\%}$$

$$\boldsymbol{P = 90,91\%}$$

Based on the data in Table 4.4 and the results of the calculation, the percentage of eligibility from the student trial was obtained at 90.91%. If referring to the Criteria for Determining the Level of Validity according to Sudjana (2006), the qualification of this nano learning video product is categorized as Valid because it is in the percentage range of 81%–100%. This shows that the nano learning video learning media in the Waste Introduction material is very interesting, easy to use, and able to maintain the learning focus of grade V elementary school students.

3.2 Discussion

The product developed in this study is in the form of a nano learning video on waste recognition material for grade V students of SDN Kedoya Selatan 04 Pagi Jakarta. This development is based on findings at the needs analysis stage, namely that students tend to receive a large amount of material at the same time, while the conventional media used by teachers does not fully guarantee comprehensive mastery of the material. Based on these problems, this study applies the model development procedure of Sadiman (2014) to produce digital learning media that facilitates the understanding of students' concepts more effectively, in order to answer the formulation of problems regarding the feasibility of nano learning videos based on the assessment of material experts, media experts, and student responses.

The first level of feasibility is evaluated through expert validation. The assessment in terms of material obtained a percentage of 97% with a very valid category, showing that the material in the video was considered to be on target, in line with the Phase C Science Learning Outcomes, relevant to the cognitive characteristics of grade V students, and presented without misconceptions. The assessment in terms of technical and aesthetics obtained a percentage of 99% with a very valid category, which indicates that the media has a clear visual and animated appearance, a selection of colors that are comfortable to see, a structured text layout, and the quality of audio narrative that supports the delivery of learning messages. These two validation

results strengthen the view that learning media functions as a strategic bridge in the delivery of instructional messages from educators to students. Despite obtaining very high scores, media experts noted that the appearance of the video thumbnail should ideally be further adapted to the material being presented, although such improvements could not be fully accommodated due to the limitations of the distribution platform's features that do not allow editing of the completeness of the video after seven days of publication.

To measure feasibility practically from the user's point of view, a field trial was conducted involving 50 students covering three main aspects, namely attractiveness, ease of use, and effectiveness in maintaining learning focus. In the aspect of attractiveness, the majority of students gave positive responses; This media has been proven to be able to stimulate students' motivation to learn and is considered more interesting than conventional learning methods, in line with the characteristics of nanolearning that are dense, concise, and relevant to the attention span of students in the digital era (Wibowo, 2025). In terms of ease of use, this media was designed from the beginning to be easily accessible independently, so that most students can use it without the help of others or understand the material presented.

In the aspect of maintaining learning focus, the duration suitability indicator obtained the lowest percentage of agreement among all indicators, although the feasibility of the media in maintaining the student's focus was still very good. These findings prove that video duration appropriateness is not the only instrument in maintaining learning focus, but rather needs to be compensated with other instructional elements such as dynamic animation and multimodal information presentation. This is relevant to the Cognitive Theory of Multimedia Learning (Mayer, 2021, 2024), which emphasizes that the combination of visual and audio information in small time units (segmentation) is able to reduce cognitive load so that students' focus is maintained. The ability of this media to maintain focus is also supported by a number of relevant research; Aritonang et al. (2023) confirmed that microlearning formats with visually appealing are crucial to help students stay focused, Wibowo et al. (2023) found that short video presentations significantly increase knowledge retention, and Sihombing (2022) proved that the use of audio-visual videos directly contributes to improving the focus and learning outcomes of science in elementary schools.

Cumulatively, the results of field trials that included attractiveness, convenience, and focus maintenance from 50 students recorded an average percentage of 90.91%, which puts this nano learning video on very feasible criteria to be implemented. As an instructional media product, this video has a number of advantages: the duration of the clip that only ranges from one to three minutes proportional to the attention capacity of class V students which tends to be short, the flexibility of access provides flexibility for students to learn anytime and anywhere, and the integration of audio, visual, and animation formats makes learning more attractive and easier to remember, in line with the findings of Aziz et al. (2022) and Mandasari (2021) which also prove the effectiveness of technology-based video and interactive media in learning.

On the other hand, this product has limitations that come from the short duration, namely the depth of the material cannot be described in detail, especially in the technical management of 3R, as well as its one-way nature so as to limit direct interaction with teachers. The study also has methodological limitations: the trial was conducted only in one school so the feasibility results could not be generalized; The feasibility of new products is measured

through expert validation and questionnaire responses, not to mention empirical measurements of improved learning outcomes through pretest-posttest design; distribution through short video platforms provides easy access but limits the space for post-upload content revision; and the scope of the material is still limited to the topic of waste recognition. These findings open up opportunities for further research to test the effectiveness of nano learning videos on learning outcomes empirically, extend the subject matter to various schools, and develop similar approaches to other learning content.

4. Conclusion

Based on the results of the research and development that has been carried out, it can be concluded that the nano learning animation video on waste recognition material for grade V elementary school students is on very feasible criteria to be implemented in learning. This level of feasibility is evidenced by the results of the validation of material experts who obtained a percentage of 97% due to the suitability of the material with learning outcomes, as well as the validation of media experts of 99% which indicates excellent technical, visual, and audio quality. This feasibility was also strengthened by the results of field trials on 50 students who produced an cumulative response of 90.91% with very feasible criteria, indicating that this media is interesting, easy to use independently, and effective in maintaining focus on learning. Overall, the nano learning videos developed have met the eligibility criteria as a practical and effective IPAS learning media innovation to be applied in elementary schools, while opening up opportunities for further development in the content of the material and a wider level of education.

References

Aburizaizah, Saeed Jameel, and Tahany Abdulaziz Albaiz. "Review of the use and impact of nano-learning in education." 4th International Conference on Research in education. Vol. 4. No. 1. 2021.

Agustina, H. F., & Kholidya, C. F. (2024). Pengembangan video pembelajaran berbasis microlearning materi model pengembangan kurikulum Program Studi S1 Teknologi Pendidikan Universitas Negeri Surabaya. Jurnal Mahasiswa Teknologi Pendidikan, 13(8).

Arikunto, S., & Jabar, C. S. A. (2014). Evaluasi program pendidikan: Pedoman teoritis praktisi pendidikan. Bumi Aksara.

Aritonang, R., Parmiti, D. P., & Sudarma, I. K. (2023). Video pembelajaran berbasis microlearning pada muatan IPAS. Jurnal Media dan Teknologi Pendidikan, 3(2), 75-83. https://doi.org/10.23887/jmt.v3i2.63538

Aziz, R. R., Degeng, I. N. S., & Soepriyanto, Y. (2022). Pengembangan media video podcast pada pembelajaran sejarah kelas XI materi pendudukan bangsa Jepang di Indonesia. JKTP: Jurnal Kajian Teknologi Pendidikan, 5(3), 265-273. https://doi.org/10.17977/um038v5i32022p265-273

Darojat, M. A., Ulfa, S., & Wedi, A. (2022). Pengembangan virtual reality sebagai media pembelajaran sistem tata surya. JKTP: Jurnal Kajian Teknologi Pendidikan, 5(1), 91-99. http://dx.doi.org/10.17977/um038v5i12022p091

Dewi, F. F., & Handayani, S. L. (2021). Pengembangan media pembelajaran video animasi en-alter sources berbasis aplikasi powtoon materi sumber energi alternatif sekolah dasar. Jurnal Basicedu, 5(4), 2530-2540. https://doi.org/10.31004/basicedu.v5i4.1229

Fadilah, A., Nurzakiyah, K. R., Kanya, N. A., Hidayat, S. P., & Setiawan, U. (2023). Pengertian media, tujuan, fungsi, manfaat dan urgensi media pembelajaran. Journal of Student Research, 1(2), 1-17. https://doi.org/10.55606/jsr.v1i2.938

Farhan, M., Utama, A. H., & Mastur, M. (2024). Pengembangan media pembelajaran interaktif: Integrasi short video learning untuk meningkatkan hasil belajar. Jurnal Riset dan Inovasi Pembelajaran, 4(2), 907-917. https://doi.org/10.51574/jrip.v4i2.1841

Fitri, A., dkk. (2021). Ilmu Pengetahuan Alam dan Sosial untuk SD kelas V. Pusat Kurikulum dan Perbukuan, Badan Penelitian dan Pengembangan dan Perbukuan, Kementerian Pendidikan, Kebudayaan, Riset, dan Teknologi.

Hasan, M., Milawati, M., Darodjat, D., Harahap, T. K., Tahrim, T., Anwari, A. M., & Indra, I. (2021). Media pembelajaran. Tahta Media Group.

Indah, B. P., & Uddin, S. (2022). Pengembangan dan pemanfaatan media pembelajaran. Jurnal Ilmu Terapan, 3(1).

Lailia, H. (2021). Pengembangan media pembelajaran berbasis video animasi untuk meningkatkan pemahaman konsep siswa kelas VIII pokok bahasan teorema phytagoras di MTs Negeri 6 Mandailing Natal (Disertasi doktoral, IAIN Padangsidimpuan).

Mandasari, Y. D. (2021). Pengembangan media pembelajaran interaktif konfigurasi elektron elektronik otomatis mata pelajaran IPA di masa pandemi Covid-19. JKTP: Jurnal Kajian Teknologi Pendidikan, 4(3), 309-317. http://dx.doi.org/10.17977/um038v4i32021p309

Marliani, L. P. (2021). Pengembangan video pembelajaran untuk meningkatkan motivasi belajar siswa sekolah dasar. PAEDAGOGY: Jurnal Ilmu Pendidikan dan Psikologi, 1(2), 125-133.

Masyhuri, A. (2024). Pengaruh nano learning berbasis STEM terhadap miskonsepsi siswa pada mata pelajaran IPA materi getaran, bunyi dan gelombang (Disertasi doktoral, Universitas Islam Negeri Sultan Syarif Kasim Riau). http://repository.uin-suska.ac.id/id/eprint/82249

Mayer, R. E. (2021). Multimedia learning (3rd ed.). Cambridge University Press.

Mayer, R. E. (2024). The past, present, and future of the cognitive theory of multimedia learning. Educational Psychology Review, 36(1), 8.

Pamungkas, W. A. D., & Koeswanti, H. D. (2021). Penggunaan media pembelajaran video terhadap hasil belajar siswa sekolah dasar. Jurnal Ilmiah Pendidikan Profesi Guru, 4(3), 346-354. https://doi.org/10.23887/jippg.v4i3.41223

Sadiman, A. S., Rahardjo, R., Haryono, A., & Rahardjito. (2014). Media pendidikan: Pengertian, pengembangan, dan pemanfaatannya. Rajawali Pers.

Sihombing, C. (2022). Pengaruh penggunaan media video pembelajaran terhadap hasil belajar IPA siswa kelas V. Edu Cendikia: Jurnal Ilmiah Kependidikan, 2(2), 289-294. https://doi.org/10.47709/educendikia.v2i02.1644

Smaldino, S. E., Zidon, M., & Lowther, D. L. (2022). Instructional technology and media for learning (13th ed.). Pearson Education.

Sudjana, N. (2006). Penilaian hasil proses belajar mengajar. Remaja Rosdakarya.

Wardana, R. A., Juniarso, T., & Hanindita, A. W. (2024). Pengembangan media video animasi pada mata pelajaran IPAS untuk siswa kelas V sekolah dasar. Jurnal Basicedu, 8(5), 3669-3681.

Wibowo, A., dkk. (2023). Pengaruh nano learning berbasis STEM terhadap miskonsepsi siswa pada mata pelajaran IPA materi getaran, bunyi dan gelombang (Skripsi sarjana, Universitas Islam Negeri Sultan Syarif Kasim Riau). Repository UIN Suska. https://repository.uin-suska.ac.id/82249/

Wibowo, F. C. (2025). Model pembelajaran project based learning modifikasi nano learning (ProNaLe). Penerbit K-Media.