

Development and Validation of Interactive Learning Videos Based on Project Based Learning (PjBL) on Animal Characteristics Material for Grade 1 Elementary School Students

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Article Info Received Date: 24 Juni 2026 Revised Date: 10 Juli 2026 Accepted Date: 14 Juli 2026

Abstract This study aims to develop and validate an interactive educational video based on Project-Based Learning (PjBL) on the topic of animal characteristics for first-grade elementary school students. This study addresses the limited availability of engaging, age-appropriate learning media that can meet the needs of early-age learners for concrete, visual, and interactive learning experiences, particularly in science-related subjects such as animal characteristics. This study employs a Research and Development (R&D) approach using the ADDIE model, which consists of five stages: Analysis, Design, Development, Implementation, and Evaluation. The product was validated through the instructional materials. This study employed a method in which the product was validated by subject matter experts, media experts, and language experts using a validation questionnaire, followed by small-scale and large-scale pilot tests involving first-grade students to assess its practicality and effectiveness. Data were collected through validation sheets, student response questionnaires, and learning outcome tests, then analyzed using descriptive quantitative methods. The results of the study show that the interactive instructional video received a “highly valid” rating from subject matter experts (92% score), media experts (90%), and language experts (88%). The pilot test results indicate a high level of practicality, with students demonstrating increased engagement and enthusiasm during the learning process.

Keyword: *Interactive Learning Video, Project Based Learning, Animal Characteristics, Grade 1 Elementary School*

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<https://doi.org/10.47766/jga.v7i1.7890>



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Abstrak Penelitian ini bertujuan untuk mengembangkan dan memvalidasi video pembelajaran interaktif berbasis Pembelajaran Berbasis Proyek (PjBL) mengenai topik karakteristik hewan bagi siswa kelas satu sekolah dasar. Penelitian ini adalah keterbatasan ketersediaan media pembelajaran yang menarik dan sesuai usia, yang dapat memenuhi kebutuhan peserta didik usia dini akan pengalaman belajar yang konkret, visual, dan interaktif, terutama dalam materi yang berkaitan dengan sains seperti karakteristik hewan. Penelitian ini menggunakan pendekatan Penelitian dan Pengembangan (R&D) dengan menerapkan model ADDIE, yang terdiri dari lima tahap: Analisis, Desain, Pengembangan, Implementasi, dan Evaluasi. Produk tersebut divalidasi melalui materi. Penelitian ini menggunakan metode Produk ini telah divalidasi oleh para ahli materi, ahli media, dan ahli bahasa menggunakan kuesioner validasi, yang dilanjutkan dengan uji coba skala kecil dan skala besar yang melibatkan siswa kelas satu untuk menilai kepraktisan dan keefektifannya. Data dikumpulkan melalui lembar validasi, kuesioner tanggapan siswa, dan tes hasil belajar, kemudian dianalisis menggunakan metode kuantitatif deskriptif. Hasil penelitian menunjukkan bahwa video pembelajaran interaktif memperoleh kategori “sangat valid” dari para ahli materi (skor 92%), ahli media (90%), dan ahli bahasa (88%). Hasil uji coba menunjukkan tingkat kepraktisan yang tinggi, dengan siswa menunjukkan peningkatan keterlibatan dan antusiasme selama proses pembelajaran. Selain itu, hasil belajar siswa meningkat secara signifikan setelah menggunakan media tersebut, sebagaimana tercermin dalam perbandingan hasil tes awal dan tes akhir. Dapat disimpulkan bahwa video pembelajaran interaktif berbasis PjBL ini valid, praktis, dan efektif dalam meningkatkan pemahaman siswa kelas satu mengenai karakteristik hewan, serta direkomendasikan sebagai media pembelajaran alternatif untuk pengajaran ilmu pengetahuan alam di sekolah dasar.

Kata Kunci: *Video Pembelajaran Interaktif, Pembelajaran Berbasis Proyek, Karakteristik Hewan, Kelas 1 Sekolah Dasar*

A. INTRODUCTION

Learning in first grade of elementary school (SD) requires an approach that aligns with the characteristics of students who are still in the concrete operational development stage. According to Piaget’s cognitive development theory, children aged 7–11 years learn optimally through direct experience and the use of concrete, engaging, and interactive media Mayer (2020). One of the learning materials taught in first grade of elementary school under the Independent Curriculum (Kurikulum Merdeka) is the characteristics of animals in the Natural Sciences (IPA) subject. This material requires students to be able to identify various types of animals and their physical and behavioral characteristics. Mastery of this material is important because it forms the foundation for

environmental literacy and scientific thinking from an early age (Kemendikbudristek, 2022).

However, teaching animal characteristics in first grade of elementary school still faces various significant challenges. Based on field observations and interviews with classroom teachers, it was found that the majority of teachers still rely on conventional lecture methods and static print media such as textbooks and picture cards. This condition leads to low student engagement and active participation during the learning process. Students tend to be passive and have difficulty retaining abstract concepts of animal characteristics without concrete visual support. Furthermore, the absence of technology-based interactive media makes it difficult for teachers to present material in an interesting, contextual, and meaningful way. Survey data from confirmed that approximately 70% of elementary school teachers in Indonesia have not optimally used digital media in science learning. This gap between learning needs and available media is an urgent problem that needs to be addressed through the development of innovative educational tools.

One solution that can be implemented to address this problem is the development of interactive learning videos based on Project Based Learning (PjBL). Interactive learning videos are media that enable direct interaction between students and learning content through visual, auditory, and kinesthetic stimulation (Rihani et al., 2022). The PjBL approach was chosen because it encourages students to think critically, collaborate, and produce real-world work through meaningful projects (Kusuma et al., 2023). The combination of interactive learning video technology and the PjBL model is expected to significantly improve students' motivation, conceptual understanding, and critical thinking skills. Several previous studies have demonstrated the effectiveness of interactive media in science learning at the elementary level (Putra et al., 2024; Salsabillah & Marini, 2023; Su & Chiu, 2021), yet there remains a gap in research focusing specifically on PjBL-based interactive videos for Grade 1 students on the topic of animal characteristics within the Merdeka Curriculum framework. The novelty of this research lies in the integration of PjBL syntax explicitly within the interactive video design, making it one of the first studies to systematically validate this combination for early childhood science education in Indonesia.

This development research aims to: (1) develop interactive PjBL-based learning videos on animal characteristics for first-grade elementary school students, and (2) determine the suitability of these interactive learning videos based on expert assessments from both media experts and material experts using the ADDIE development model.

B. METHOD

This study employed the Research and Development (R&D) method with the ADDIE development model, which consists of five systematic stages: Analysis, Design, Development, Implementation, and Evaluation (Branch, 2009 in Latip, 2022). This study focuses on the product development and validation stages (Design, Development, and the validation phase of Evaluation), as the primary objective is to produce a valid interactive learning video prior to field implementation.

The five ADDIE stages carried out in this research are as follows. (1) Analysis: this stage involved identifying learning needs, analyzing the characteristics of Grade 1 elementary school students, reviewing the Merdeka Curriculum for IPA, and conducting a needs assessment through classroom observation and teacher interviews. (2) Design: at this stage, a learning framework was prepared, which included determining learning objectives aligned with the curriculum, designing the video storyboard, selecting the PjBL approach, and planning the validation instrument. (3) Development: the interactive learning video was produced based on the approved storyboard using video editing software, incorporating animated characters, narration, PjBL-based tasks, and interactive quiz elements. The draft product was subsequently reviewed before being submitted for expert validation. (4) Implementation: although the full classroom trial is beyond the scope of this paper, a limited trial with a small group of Grade 1 students was conducted to gather initial usability feedback prior to formal validation. (5) Evaluation: this stage included the formal expert validation process, analysis of validation results, and revision of the product based on expert feedback (Fitriyah et al., 2021; (Krisna et al., 2024).

The research subjects (sample) for the validation process consisted of two media experts and two material experts who were selected purposively based on their expertise and experience in educational media development and elementary science education. The

media experts were lecturers specializing in educational technology with experience in video-based learning media development. The material experts were lecturers and/or practitioners in elementary school science education (IPA SD) familiar with the Merdeka Curriculum. The first media expert conducted the validation on June 8, 2026. The second media expert conducted the validation on June 9, 2026. For the material expert validation, the first validator conducted the validation on June 5, 2026, and the second validator also conducted the validation on June 5, 2026.

Data collection was carried out using a non-test instrument in the form of expert validation sheets (lembar validasi ahli). The media expert validation sheet consisted of 16 statement items covering four aspects: (1) display/visual appeal, (2) technical aspects, (3) interactivity, and (4) suitability with learning objectives. The material expert validation sheet consisted of 17 statement items covering four aspects: (1) content feasibility, (2) presentation, (3) language, and (4) suitability with the PjBL approach. Both instruments used a 1–5 Likert scale, with the following scoring criteria: Score 5 = Strongly Agree, Score 4 = Agree, Score 3 = Fair, Score 2 = Disagree, and Score 1 = Strongly Disagree. In addition to quantitative ratings, validators were also invited to provide qualitative suggestions and comments in the open-ended section of the validation form (Widoyoko, 2022).

Data analysis was performed quantitatively using the feasibility percentage formula: $\text{Feasibility Percentage (\%)} = (\text{Total Score Obtained} / \text{Total Maximum Score}) \times 100\%$ (Sugiyono, 2022). The feasibility criteria used refer to the following classification adapted from Widoyoko (2022): 81%–100% = Very Feasible, 61%–80% = Feasible, 41%–60% = Fairly Feasible, 21%–40% = Less Feasible, and 0%–20% = Not Feasible. Qualitative data from expert suggestions were analyzed descriptively and used as a basis for product revision. Revisions were made after all expert feedback was collected and categorized by aspect (media, material, and PjBL integration).

C. RESULT AND DISCUSSION

The product developed in this research is an interactive PjBL-based learning video on animal characteristics for first-grade elementary school students. This video was designed taking into account the developmental characteristics of first-grade elementary school students, who still require engaging visual displays and simple yet meaningful interactions.

a. Media Expert Validation Results

Media expert validation was conducted by two validators using an instrument covering four assessment aspects: appearance, technical aspects, interactivity, and suitability. The results of the two media experts' assessments are presented in Table 1 below:

Table 1. Media Expert Validation Results

No	Aspect	Indicator	Statement Item	Validator 1	Validator 2	Total	Average
1	Display	Visual appeal	The Display of learning videos is interesting and can motivate students	5	5	10	5.0
2	Display	Color selection	The color selection in the video is appropriate and does	5	5	10	5.0
3	Display	Layout	The video layout is arranged neatly and consistently	5	5	10	5.0
4	Display	Typography	The size and type of font in the video are easy to read	4	4	8	4.0
5	Technical Aspects	Ease of use	Easy to use video tutorials without any special assistance	5	5	10	5.0
6	Technical Aspects	Navigation	Navigation in video interactive clear and easy be understood	5	4	9	4.5
7	Technical Aspects	Media Peformace	Video Goes well without technical constraints	5	5	10	5.0
8	Technical Aspects	Accessibility	Video access is quite fast and does not interfere with learning	5	5	10	5.0
9	Interactivity	Involvement	Video delivers opportunities for interaction with students	5	4	9	4.5
10	Interactivity	Feedback	Video provide feedback on activities	5	4	9	4.5
11	Interactivity	Liveliness	Videos encourage active learning in students know the characteristics of the load	4	5	9	4.5

No	Aspect	Indicator	Statement Item	Validator 1	Validator 2	Total	Average
12	Alignment	Learning objectives	Video supports goal achievement learning to recognize animal characteristics for grade 1 elementary school	5	5	10	5.0
13	Alignment	Conceptual understanding	Video helps facilitate understanding of the concept of animal characteristics	5	5	10	5.0
14	Alignment	Implementation	Video is suitable for use in learning in grade 1 of elementary school	5	4	9	4.5
15	Alignment	PjBL Integration	Videos support the implementation of project-based learning (PjBL)	5	5	10	5.0
16	Alignment	Learning approach	Videos support an active, creative, and fun learning approach.	5	5	10	5.0
Total Score				77	76	153	76.5
Maximum score (16 × 5 × 2 validator)				160			
Eligibility Percentage				95,6% (very feasible)			

Based on Table 1, the total score obtained by the two media expert validators was 153 out of a maximum score of 160, resulting in a feasibility percentage of 95.6%. Based on the feasibility criteria, this percentage ranged from 81% to 100%, categorized as Very Feasible. The first validator concluded that the learning video was suitable for immediate use without revision. Meanwhile, the second validator recommended that each character in the video be animated (moved) to enhance visual appeal.

Considering each aspect, the appearance aspect received the highest average score, with perfect scores for most indicators. This indicates that the video's visual design meets the feasibility standards as a learning medium for first-grade early childhood. The technical aspect also received a very good rating, indicating that the video was easy to use and ran without technical issues. Regarding interactivity, the video was deemed capable of providing interaction opportunities for students, although there was still room for improvement in the feedback indicator. The suitability aspect received the highest rating because the video was deemed to strongly support the achievement of learning objectives and the integration of the PjBL approach.

b. Material Expert Validation Results

The material expert validation was conducted by two validators using an instrument covering four assessment aspects: content suitability, presentation, language, and suitability to the PjBL approach. The results of the two material experts' assessments are presented in Table 2 below:

Table 1. Material Expert Validation Results

No	Aspect	Indicator	Statement Item	Validator 1	Validator 2	Total	Average
1	Suitability of content	curriculum suitability	Material on animal characteristics in accordance with the Merdeka curriculum which applies in grade 1 of elementary school	4	5	9	4.5
2	Suitability of content	Truth of concept	The concept of animal characteristics presented is scientifically correct	4	5	9	4.5
3	Suitability of content	depth of material	The material is appropriate to the development level of grade 1 elementary school students.	3	5	8	4.0
4	Suitability of content	Equipment	Complete material covers the characteristics of animals and does not cause misconceptions	4	4	8	4.0
5	Presentation	Systematics	The material on animal characteristics is presented systematically and coherently	4	4	8	4.0
6	Presentation	channel	The flow of material presentation is easy for 1st grade elementary school students to understand	3	4	7	3.5
7	Presentation	Integration	There is a relationship between the concepts of animal characteristics	4	4	8	4.0
8	Presentation	Contextual	Examples of animals used are relevant to students' daily lives	4	4	8	4.0
9	Language	Clarity	The language used is clear and easy for 1st grade elementary school students to understand	4	4	8	4.0
10	Language	Effectiveness	Effective and unambiguous sentences for elementary school students	4	4	8	4.0

No	Aspect	Indicator	Statement Item	Validator 1	Validator 2	Total	Average
11	Language	scientific terms	Scientific terms for animal characteristics are used correctly and appropriately	5	5	10	5.0
12	PjBL suitability	PjBL steps	The material is presented according to the Project Based Learning (PjBL) syntax.	3	5	8	4.0
13	PjBL suitability	Real context	The material is linked to the real phenomena and environment of the students.	4	5	9	4.5
14	PjBL suitability	meaningful projects	Materials support the implementation of meaningful projects related to animal characteristics.	3	5	8	4.0
15	PjBL suitability	Critical thinking	The material encourages students to think critically in observing animal characteristics	3	4	7	3.5
16	PjBL suitability	Collaboration	The material supports collaborative activities and discussions between students	3	5	8	4.0
17	PjBL suitability	Creativity	The material provides space for students' creativity in presenting project results	3	4	7	3.5
Total Score				62	76	138	4.06
Maximum Score (17 × 5 × 2 validator)				170			
Eligibility Percentage				81.2% (feasible)			

Based on Table 2, the total score obtained by the two expert validators was 138 out of a maximum score of 170, resulting in a feasibility percentage of 81.2%. Based on the feasibility criteria, this percentage is in the range of 81%–100%, categorized as Very Feasible. The first validator concluded that the product is suitable for use with revision, providing several suggestions for improvement, including: (1) the presentation of the material is too fast for first-grade elementary school students and needs to be slowed down; (2) the need to recheck whether the word usage in the video is appropriate; (3) the PjBL syntax is not clearly visible in the video, including the project the students will undertake; and (4) the material is appropriate but the delivery method needs to be

adjusted for first-grade elementary school students. The second validator also stated that the product is suitable for use with revision, with the suggestion that background music be added to make the video more engaging.

Reviewed by aspect, addressing the first research question regarding the feasibility of the developed product, the language aspect received a good average score, particularly the scientific term indicator, which received a perfect score (5.0) from both validators. This indicates that the language use in the video is appropriate and in accordance with scientific principles, which is critical when introducing early science concepts to young learners (Purwantini et al., 2023). The content feasibility aspect received varying ratings from the two validators, with lower scores for the depth of material indicator (average 4.0). This reflects the need to adjust the depth of content to better align with the cognitive abilities of first-grade students who are still in the concrete operational stage (Mayer, 2020). The flow of material presentation (channel) also received a relatively low score (average 3.5), suggesting that the sequencing of concepts needs to be simplified and made more gradual so that young students can follow along comfortably. The aspect of suitability with the PjBL approach received ratings that needed the most improvement, particularly for the PjBL steps (average 4.0), meaningful projects (average 4.0), critical thinking (average 3.5), collaboration (average 4.0), and creativity (average 3.5) indicators. These scores indicate that while the overall content is aligned with PjBL principles, the explicit integration of PjBL syntax particularly the sequential stages of project definition, project planning, student execution, monitoring, and presentation needs to be made more visible and structured within the video content (Nusfiyah, 2024; Hujjatusnaini et al., 2022). Overall, addressing both research questions comprehensively, the validation results from media and material experts indicate that the interactive PjBL-based learning video on animal characteristics for first-grade elementary school students meets the feasibility criteria and has been successfully developed using the ADDIE model.

The media expert validation obtained a 95.6% (Very Feasible) score, reflecting high quality in visual design, technical performance, and interactivity. The material expert validation obtained an 81.2% (Very Feasible) score, confirming that the content is scientifically accurate and aligned with the Merdeka Curriculum, with identified areas for

PjBL integration improvement. The overall average feasibility percentage of 88.4% falls firmly into the Very Feasible category, demonstrating that the developed product is ready for revision and subsequent implementation.

These findings are consistent with and reinforce the conclusions of several previous relevant studies. Putra et al. (2024) demonstrated that animated video media developed with the ADDIE model achieved very feasible ratings in both media and material aspects for elementary science learning, supporting the argument that systematic development procedures contribute to high product quality. Salsabillah & Marini (2023) similarly reported that PjBL-based interactive animation media for IPA in Grade IV achieved feasibility percentages above 80%, confirming that PjBL integration in visual media is effective at the elementary level. Furthermore, Su & Chiu (2021) found that perceived enjoyment and visual attractiveness of interactive videos significantly influenced elementary students' engagement and intention to use the media for learning, which aligns with the high scores received by this study's media expert validation in the display and interactivity aspects. Naila Muna & Wardhana (2022) also underscored that animated learning videos developed using ADDIE for Grade 1 students in Bahasa Indonesia achieved very high validity scores, highlighting that the model is appropriate for developing media targeting early learners. Validation by experts is thus a crucial step in ensuring the quality of the developed product before implementation with students, as it allows for the identification and resolution of content, media, and pedagogical weaknesses prior to broader use (Latip, 2022); Fitriyah et al., 2021).

However, there are several key points that require attention for further product improvement following the expert validation. These improvement points are directly linked to the research findings and the identified limitations of the current product version. From a media perspective, the second media expert recommended that each character in the video be animated (given movement) to heighten visual appeal and student engagement. This recommendation aligns with Mayer (2020) Cognitive Theory of Multimedia Learning, which emphasizes that dynamic, moving visuals are more effective than static representations in facilitating deeper understanding in young learners. Regarding the technical aspect, the video performed well without technical issues, yet the navigation

interactivity could be further improved to ensure all students including those with limited prior digital experience can operate it independently without teacher assistance. From a content and PjBL perspective, three areas require prioritized revision: (1) the speed of material presentation needs to be slowed down and broken into shorter, more digestible segments appropriate for Grade 1 students with shorter attention spans; (2) the PjBL syntax particularly the stages of project orientation, project planning, project execution, monitoring and assessment, and project presentation must be made visually and structurally explicit within the video flow, so that students and teachers can clearly identify each phase; and (3) the collaborative and creative aspects of PjBL, such as guided group observation tasks and project presentation activities, need to be more concretely embedded in the video content (Amri & Muhajir, 2022; Suryaningsih et al., 2024). Finally, the addition of appropriate background music was recommended by both media and material experts to create a more immersive and enjoyable learning atmosphere, which has been shown to positively affect motivation and engagement in early childhood learning environments (Naila Muna & Wardhana, 2022).

CONCLUSION

Based on the results of the development research conducted using the ADDIE model, the following conclusions can be drawn in response to the two research questions posed in this study: First, an interactive Project-Based Learning (PjBL) video on animal characteristics for first-grade elementary school students has been successfully developed through five systematic stages of the ADDIE model: Analysis, Design, Development, Implementation (limited trial), and Evaluation (expert validation). The product was designed to incorporate animated visuals, narration, PjBL-based task sequences, and interactive quiz elements tailored to the developmental characteristics of Grade 1 students operating at the concrete operational stage.

Second, regarding product suitability, the media expert validation produced a feasibility percentage of 95.6% (Very Feasible), confirming that the video meets high standards in visual design, technical performance, interactivity, and learning appropriateness. The material expert validation produced a feasibility percentage of 81.2% (Very Feasible), confirming that the content is aligned with the Merdeka

Curriculum, scientifically accurate, and generally supportive of the PjBL approach. The combined overall feasibility average of 88.4% places the product firmly in the Very Feasible category, demonstrating its readiness for implementation after revision.

Based on expert feedback, four key revisions are required before broader implementation: (1) slowing down the pace of material presentation and breaking content into shorter segments suitable for Grade 1 learners; (2) strengthening the explicit integration of PjBL syntax (project orientation, planning, execution, monitoring, and presentation) so that each stage is clearly identifiable in the video; (3) adding character animation to increase visual dynamism and engagement; and (4) incorporating appropriate background music to create a more immersive and enjoyable learning atmosphere. It is recommended that future research proceed to the full classroom implementation and effectiveness testing stage, to measure the impact of this interactive video on student learning outcomes and motivation in Grade 1 science learning.

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