International Journal of Educational Research

E-ISSN: 3047-6038
P-ISSN: 3047-6046

Research Article

Development of Animated Learning Video Media Based on Problem Based Learning (PBL) Model on Human Skeleton Material to Improve the Learning Outcomes of Sixth Grade Students at SDN Liprak Kidul I

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Abstract: This study aims to improve the learning outcomes of sixth-grade students at SDN Liprak Kidul I through the development of Problem Based Learning (PBL)-based instructional video media on the human skeletal system. The research was motivated by several learning problems, including low student achievement, limited availability of attractive teaching materials, monotonous learning activities, and the lack of interactive media that could encourage active student participation. This study employed a Research and Development (R&D) method using the ADDIE model, which consists of Analysis, Design, Development, Implementation, and Evaluation stages. The research procedures included needs analysis, product design, media development, expert validation, product revision, product trials, and evaluation. The subjects of this study were sixth-grade students at SDN Liprak Kidul I. The instruments used included media and material expert validation sheets, teacher and student response questionnaires, and student learning outcome tests. The results showed that the developed instructional video media had a high level of validity, practicality, and effectiveness. Media expert validation obtained a score of 94%, while material expert validation reached 95%, indicating that the media was highly feasible for use in learning. Teacher and student responses also showed very positive results, with scores of 93.75% and 95.45%, respectively. The use of PBL-based instructional video media increased students' attention, engagement, and motivation during the learning process. In addition, the media effectively improved students' understanding and learning outcomes related to the human skeletal system. Therefore, this media is considered feasible, practical, and effective for IPAS learning in elementary schools.

Keywords: Human Skeletal System; Instructional Video Media; Learning Outcomes; Problem Based Learning; Science Learning.

1. Introduction

According to Darmiah (2022), education is a deliberate and organised endeavour to establish a learning environment that allows pupils to reach their full potential and develop into dependable, honourable, knowledgeable, skilful, and responsible adults. In practice, education is centred not only on knowledge acquisition but also on character development and the growth of students' capacity to deal with a variety of life's obstacles. Therefore, in compliance with Law Number 20 of 2003 concerning the National Education System, educators must create engaging, innovative, and pertinent learning activities.

The introduction of the Merdeka Curriculum is one of the many changes that Indonesia's educational system has experienced as the times have changed. This curriculum gives teachers more freedom to create learning activities that are tailored to the requirements, characteristics, and learning settings of their pupils (Alfaeni & Asbari, 2023). Nevertheless, there are still a number of obstacles to the Merdeka Curriculum's implementation, even if it offers more autonomy in instructional preparation. Teachers' poor comprehension of the curriculum concept, challenges in creating instructional materials, and subpar use of technology and learning media to enhance the teaching and learning process are common barriers (Jannah et al., 2022). In order to promote critical thinking, creativity, teamwork, and communication skills, the Merdeka Curriculum also highlights the significance of contextual and student-centered learning. According to research, implementing the Merdeka Curriculum can enhance learning quality by giving instructors the freedom to choose instructional material, tactics, and procedures that best suit the needs of their students (Pinem, Darma, & Fahrurrowzi, 2025).

Received: April 30, 2026;
Revised: May 30, 2026;
Accepted: June 20, 2026;
Published : June 24, 2026;
Curr. Ver.: June 24, 2026.

The utilisation of instructional material is a crucial part of the learning process. The delivery of educational messages through learning media improves students' focus, motivation, and comprehension of the course materials (Hapsari & Zulherman, 2021). Additionally, in order to develop a more dynamic, student-centered, and engaging learning process that can boost students' involvement in educational activities, novel learning media must be developed (Kasdriyanto & Wardana, 2021). Students can have more fulfilling and pleasurable learning experiences when instructional media are used appropriately (Azmussya'ni & MZ, 2022). Information and communication technology (ICT)-based media integration has emerged as a successful alternative for raising educational standards in the digital age (Febrialismanto, 2020).

Learning videos are becoming one of the most popular forms of instructional material in classrooms. Videos can help students grasp abstract ideas in a more tangible way by presenting information through both visual and audible channels (Aulia et al., 2024). Learning videos can increase students' motivation, engagement, and possibilities for independent learning based on their unique learning speed in addition to boosting conceptual knowledge (Rahmawati & Hidayat, 2021). Because they incorporate moving pictures, sound, and graphics that are appropriate for primary school pupils, animated videos are very appealing (Husni, 2021).

By using the Problem Based Learning (PBL) methodology, video-based learning materials can become even more successful. According to Sari and Nugroho (2020), PBL is a student-centered learning strategy that emphasises problem-solving techniques connected to real-life scenarios. Students can notice issues more realistically, examine their causes, and find answers through debate and group projects when PBL-based videos are used. Prior research has shown that incorporating video content into the PBL paradigm can greatly enhance students' critical thinking abilities, learning activities, learning outcomes, and learning interest (Ardiansyah, Panigoro, & Alwi, 2024; Oktariani, Gading, & Wibawa, 2024).

Preliminary observations and interviews at SDN Liprak Kidul 1 on December 12, 2025, revealed a number of learning issues. These included low student learning outcomes, as evidenced by the fact that only 55% of students met the Minimum Mastery Criteria (KKM), a lack of interesting and interactive instructional media, and teachers' inadequate creation of creative learning media. These circumstances point to the necessity of creating educational materials that can boost students' enthusiasm and involvement in the learning process. According to Kasdriyanto and Wardana (2021), learning media that are tailored to the characteristics of students can be a useful way to create more significant and productive learning experiences.

Numerous prior studies that have demonstrated the efficacy of PBL-based learning videos in enhancing elementary school students' learning outcomes and critical thinking abilities underscore the significance of instructional media development. Nonetheless, there are still few research that particularly concentrate on creating PBL-based animated educational movies about the human skeleton. In order to enhance the learning outcomes of sixth-grade students at SDN Liprak Kidul 1, this project intends to create an animated learning video on the subject of the human skeletal system using Problem Based Learning (PBL). It is anticipated that this research will result in a legitimate, useful, and successful learning tool for science and social studies (IPAS) instruction in elementary schools.

2. Literature Riview

Learning Media

Learning media are crucial elements of the educational process that serve as instruments for teachers to communicate lessons to pupils. Learning media make it easier for students to communicate during class and improve their comprehension of the subject matter. While Febrita and Ulfah (2019) stress that media play a critical role in raising the calibre of learning activities, Rohani (2019) claims that media work as middlemen in the delivery of knowledge.

Students' focus, motivation, and involvement during the learning process can all be improved by using educational media. Additionally, media facilitate the conversion of abstract ideas into tangible experiences, which facilitates the comprehension of educational materials (Junaidi et al., 2019). Because they facilitate interactive, adaptable, and student-centered learning settings, technology-based learning materials have grown in significance in the digital age.

Thus, instructional materials that support learning activities and enhance students' comprehension, motivation, and learning outcomes can be referred to as learning media.

Animated Learning Video Media

Animated learning videos are audiovisual materials that provide educational content by combining text, sound effects, narration, moving images, and animations. Learning films, according to Cheppy Riyana (2007), are instructional materials created to convey ideas, methods, and principles in an auditory and visual manner that aids in students' comprehension.

Because they convey educational content in an appealing and entertaining way, animated videos are especially appropriate for elementary school pupils. Abstract ideas can be made more tangible through narration and visual aids, which enhances students' understanding and memory of the material. Learning films can boost students' motivation, engagement, and academic performance, according to earlier research.

Animated instructional videos are therefore regarded as useful teaching tools for facilitating significant and engaging learning experiences.

Problem Based Learning (PBL)

A student-centered learning approach called problem-based learning (PBL) bases learning activities on real-world issues. Howard S. Barrows claims that PBL empowers students to actively create knowledge through research, debate, and problem-solving exercises.

Problem orientation, setting up students for learning, directing investigations, presenting solutions, and assessing the learning process are all steps in the PBL implementation process (Arends, 2013). Students gain critical thinking, teamwork, communication, and problem-solving abilities during these phases.

Because PBL offers authentic and relevant learning experiences, numerous studies have shown that it positively affects students' academic achievement, critical thinking skills, and learning motivation (Wahyuni, 2019; Sudiana & Dari, 2022). Thus, it is anticipated that incorporating PBL into animated instructional videos will result in more successful and captivating learning opportunities.

Science and Social Studies (IPAS) Learning

In the Merdeka Curriculum, Science and Social Studies (IPAS) is an integrated topic that blends ideas from the social and natural sciences. Through contextual learning experiences, the course seeks to assist students in comprehending interactions between people, society, and the environment (Rasmani et al., 2023).

Students are encouraged to enhance their critical thinking, problem-solving, and curiosity skills through IPAS learning. Additionally, by incorporating character development, knowledge, and skills into the learning process, IPAS helps students meet the Pancasila Student Profile (Agustina et al., 2022).

The utilisation of cutting-edge learning resources, including PBL-based animated movies, is seen to be extremely relevant to facilitate effective learning because IPAS comprises numerous ideas that call for visualisation and contextual understanding.

Human Skeletal System Material

One of the subjects taught at Grade VI IPAS elementary schools is the human skeleton. The structure, kinds, and functions of the human body's bones are covered in this topic, along with the significance of preserving skeletal health.

However, because many of the structures are not visible, pupils frequently struggle to comprehend skeletal principles. Thus, in order to make the subject easier for pupils to understand, instructional tools that offer visual representations are required. Learning can be made more meaningful and efficient by using animated educational videos that provide the skeletal system's structure and function in a tangible and captivating manner.

Learning Outcomes

The competencies that students attain after engaging in learning activities are referred to as learning outcomes. The cognitive, emotional, and psychomotor components of these abilities show how well students have mastered the learning objectives.

Numerous elements, such as instructional methodologies, learning settings, learning media, and student motivation, have an impact on learning outcomes. It has been demonstrated that using cutting-edge media and student-centered learning approaches improves learning results. Thus, it is anticipated that the creation of PBL-based animated learning videos will improve students' comprehension and performance in studying the human skeletal system.

3. Research Methods

Type of Research

In order to enhance the learning outcomes of sixth-grade students at SDN Liprak Kidul I, this study used a Research and Development (R&D) approach to develop and assess the viability of an animated learning film on the subject of the human skeletal system. Research and development, according to Sugiyono (2023), is a research technique used to create a specific product and evaluate its efficacy prior to broader application. This study combined quantitative and qualitative data using a descriptive methodology.

Development Model

The five steps of the ADDIE development model—analysis, design, development, implementation, and evaluation were employed in this investigation.

a. Analysis Stage: This stage involved observations and interviews to identify learning needs, student characteristics, school conditions, and problems encountered in IPAS learning on the human skeletal system topic.
b. Design Stage: At this stage, the learning objectives, target users, and components of the animated learning video were designed. The video consisted of a cover page, learning objectives, learning materials, summary, and closing section.
c. Development Stage: The PBL-based animated learning video was developed according to the design specifications that had been prepared in the previous stage.
d. Implementation Stage: The developed product was implemented with sixth-grade students of SDN Liprak Kidul I to obtain user responses and evaluate the effectiveness of the learning media.
e. Evaluation Stage: Evaluation was conducted through expert validation, user assessments, and revisions to improve the quality of the product before wider application.

Research Subjects

Media experts, material experts, sixth-grade teachers as users, and sixth-grade students of SDN Liprak Kidul I were the study's subjects. Teachers and students evaluated the developed media's practicality and efficacy, while media experts and material experts evaluated the product's validity.

Data Collection Techniques

Numerous methods, such as observation, interviews, questionnaires, documentation, and pretest-posttest evaluations, were used to gather data.

a. Observation was conducted to identify classroom conditions and learning problems.
b. Interviews were conducted with teachers to gather information regarding instructional needs and challenges.
c. Expert validation data and teacher and student response data were gathered using questionnaires.
d. Documentation was used to support research findings through photographs, lesson plans, and other relevant documents.
e. Students' learning outcomes were measured both before and after using the created media through the administration of a pretest and posttest.

Research Instruments

Validation sheets, response questionnaires, interview guides, observation sheets, and learning accomplishment exams were among the tools utilised in this investigation.

a. The animated learning video's viability was evaluated by media specialists using the Media Validation Sheet.
b. Material Validation Sheet was used to evaluate the suitability and accuracy of the learning content.
c. The usefulness of the created media was assessed using teacher and student response questionnaires.
d. To assess how well the media improved students' learning results, pretest and posttest instruments were utilised.

Data Analysis Techniques

The collected data were analyzed using both qualitative and quantitative descriptive techniques.

Validity Analysis

The validity of the learning media was determined using the following formula adapted from Sugiyono (2022):

$$P = (f/N) \times 100\%$$

Where:

a. P = Validity percentage
b. f = Total score obtained
c. N = Maximum expected score
d. 100% = Conversion into percentage form

The validity criteria were adapted from Sugiyono (2019) and Riduwan (2016), consisting of: Very Valid (81%–100%), Valid (61%–80%), Fairly Valid (41%–60%), Less Valid (21%–40%), and Invalid (0%–20%).

Practicality Analysis

The practicality of the learning media was calculated using the following formula (Riduwan, 2015; Sugiyono, 2019):

$$P = (X/Y) \times 100\%$$

Where:

a. P = Practicality percentage
b. X = Total score obtained from teacher or student response questionnaires
c. Y = Maximum score
d. 100% = Conversion into percentage form

The practicality criteria consisted of: Very Practical (81%–100%), Practical (61%–80%), Fairly Practical (41%–60%), Less Practical (21%–40%), and Not Practical (0%–20%).

Effectiveness Analysis

The effectiveness of the learning media was determined based on the percentage of students who achieved the Minimum Mastery Criterion (KKM) after using the developed media.

$$E = (f/N) \times 100\%$$

Where:

a. E = Effectiveness percentage
b. f = Number of students achieving the KKM
c. N = Total number of students
d. 100% = Conversion into percentage form

The effectiveness criteria were adapted from Sugiyono (2019) and Riduwan (2016), consisting of: Very Effective (81%–100%), Effective (61%–80%), Fairly Effective (41%–60%), Less Effective (21%–40%), and Ineffective (0%–20%).

By comparing data from observations, interviews, questionnaires, and documentation, source triangulation and procedure triangulation were used to increase data validity and guarantee the reliability of the results.

4. Results and Discussion

Results

Analysis Phase

In order to determine learning needs, student characteristics, and issues that arose throughout the learning process, the analysis phase was carried out at SDN Liprak Kidul I through observations and interviews. The results showed that students' learning engagement was subpar, their comprehension of the human skeletal system information remained low, and they tended to be passive during class activities. Additionally, teachers mostly used lecture techniques and textbooks as their primary learning materials, with little usage of instructional technology.

These results indicated that in order to make learning more engaging and meaningful, a novel learning medium was required. In order to enhance students' learning outcomes and participation in learning activities, an animated learning film based on Problem Based Learning (PBL) was created.

Design Phase

Learning objectives, instructional materials, learning activities, storyboards, and media layouts were the main focus of the design phase. The concept of the human skeletal system, the various types of bones, their functions, skeletal disorders, and strategies for preserving bone health were all covered.

At this point, contextual situations from the students' everyday life were used to incorporate the concepts of Problem Based instructional (PBL) into the instructional video. The design sought to foster students' critical thinking and problem-solving abilities as well as their active participation in the learning process.

Development Phase

The planned material was developed into a full animated educational film using the Problem Based Learning (PBL) methodology during the production stage. A cover page, learning objectives, instructional content, PBL activities, summary, and closing part made up the created product.

The initial appearance of the developed learning video is presented in Figure 1.

Figure 1. Cover Page of the Animated Learning Video.

The presentation of the human skeletal system material is shown in Figure 2.

Figure 2. Human Skeletal System Learning Material.

The implementation of Conclusions presented in Figure 3.

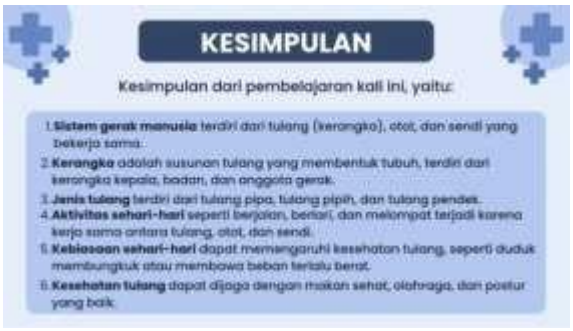

Figure 3. Conclusion Activity Display.

The developed media combines text, images, animations, narration, and contextual problems to enhance students' engagement and understanding during the learning process.

Implementation Phase

The animated learning movie was used with sixth-grade students at SDN Liprak Kidul I after being approved by media and subject matter experts. Twenty students—fifteen male and five female—participated in the product trial.

After using the created educational materials in class, students filled out response forms to assess the product's usefulness.

Evaluation Phase

The implementation step was followed by the evaluation phase. The final product was improved by gathering input and recommendations from teachers, students, media professionals, and material specialists. Before being widely used, the developed media was revised and improved based on the evaluation results.

a. Product Validity

1) Media Expert Validation

Media validation was conducted by Shofia Hattarina, S.Pd., M.Pd., a lecturer at the Faculty of Teacher Training and Education, Universitas Panca Marga.

Table 1. Media Expert Validation Results.

Validator	Percentage	Category
Media Expert	94%	Very Valid

The validity percentage was calculated as follows:

$P = (53/56) \times 100\%$

$P = 94\%$

The results indicate that the developed animated learning video falls into the very valid category and is appropriate for classroom implementation.

2) Material Expert Validation

Material validation was conducted by Ludfi Arya Wardana, S.Pd., M.Pd.

Table 2. Material Expert Validation Results.

Validator	Percentage	Category
Material Expert	95%	Very Valid

The validity percentage was calculated as follows:

$P = (38/40) \times 100\%$

$P = 95\%$

The results indicate that the learning content included in the media is highly appropriate and suitable for instructional use.

3) Practitioner Validation

The practicality assessment was conducted by the sixth-grade teacher of SDN Liprak Kidul I.

Table 3. Practitioner Validation Results.

Validator	Percentage	Category
Teacher	93.75%	Very Practical

The percentage was calculated as follows:

$P = (45/48) \times 100\%$

$P = 93.75\%$

The findings indicate that the developed learning media is highly practical and easy to implement in classroom instruction.

b. Product Practicality

The practicality of the learning media was assessed through student response questionnaires administered after the implementation of the animated learning video.

Table 4. Student Response Results.

Respondent	Percentage	Category
Students	95.45%	Very Practical

The practicality percentage was calculated as follows:

$P = (42/44) \times 100\%$

$P = 95.45\%$

These results indicate that students responded positively to the learning media. Students found the video attractive, easy to understand, and helpful in learning the human skeletal system material.

c. Product Effectiveness

1) Pretest Results

Before using the animated learning video, students completed a pretest to determine their prior knowledge of the human skeletal system material. The total score obtained by students was 1,430, with 20 participating students. The average pretest score was calculated as follows:

Average Score = $1430 \div 20$

Average Score = 71.5

2) Posttest Results

After using the developed learning media, students completed a posttest. The total score obtained by students was 1,840. The average posttest score was calculated as follows:

Average Score = $1840 \div 20$

Average Score = 92

Table 5. Comparison of Pretest and Posttest Results.

Data	Pretest	Posttest
Number of Students	20	20
Average Score	71.5	92
Learning Mastery	40%	100%

The results demonstrate a significant improvement in students' learning outcomes. The average score increased from 71.5 in the pretest to 92 in the posttest. Furthermore, learning mastery improved from 40% to 100%.

Based on the effectiveness criteria, the developed PBL-based animated learning video is categorized as very effective in improving students' learning outcomes.

Discussion

The results of this study show that the animated learning video created using the ADDIE model, which is based on problem-based learning (PBL), satisfies the requirements of validity, usefulness, and efficacy. Both the media expert and the material expert scored 94% and 95%, respectively, on the validity assessment, classifying them as very valid. These results show that the created material satisfies the criteria for instructional suitability, design, language use, and content quality.

The teacher and pupils scored 93.75% and 95.45%, respectively, on the practicality evaluation. These findings show that the educational materials are user-friendly, appealing, and conducive to learning. Students' focus and engagement during learning exercises were effectively raised by the incorporation of animations, pictures, audio narration, and contextual challenges.

Student achievement significantly improved, according to the efficacy analysis. Learning mastery improved from 40% to 100%, and the average score rose from 71.5 on the pretest to 92 on the posttest. These results show that students' comprehension of the human skeletal system is successfully enhanced by the animated learning video.

The findings are in line with earlier research by Ardiansyah, Panigoro, and Alwi (2024), which found that PBL-based video learning materials greatly enhance learning activities, learning outcomes, and critical thinking abilities. Oktariani, Gading, and Wibawa (2024) also discovered that incorporating PBL into instructional films has a good impact on student engagement and academic accomplishment.

Therefore, it can be concluded that the created Problem Based Learning (PBL)-based animated learning video on the human skeletal system is valid, useful, and effective for use in sixth-grade elementary school IPAS learning based on the validation results, user responses, and improvement in learning outcomes.

5. Conclusions and Suggestions

Conclusion

Based on the findings of the research and development process, it can be concluded that the Problem Based Learning (PBL)-based animated learning video on the human skeletal system for Grade VI students at SDN Liprak Kidul I was successfully developed using the ADDIE model, which consists of the Analysis, Design, Development, Implementation, and Evaluation stages. The developed instructional media was categorized as highly valid, as indicated by the validation results from media experts (94%), material experts (95%), and practitioners (93.75%), demonstrating its suitability in terms of content, presentation, design, and instructional quality. Furthermore, the media was found to be highly practical, with student response questionnaires yielding a score of 95.45%, indicating that the video was attractive, easy to use, and well accepted during the learning process. The effectiveness results also showed that the media significantly improved students' learning outcomes, as evidenced by the increase in the average score from 71.5 on the pretest to 92 on the posttest, with 100% of students achieving the Minimum Mastery Criterion (KKM). In addition, the PBL-based animated learning video successfully enhanced students' understanding of the human skeletal system, stimulated their curiosity, and encouraged active participation throughout the learning activities. Therefore, the developed media can be recommended as an innovative, engaging, and effective instructional tool for science and social studies (IPAS) learning in elementary schools.

Suggestions

Based on the findings of this study, several recommendations can be proposed. Teachers are encouraged to utilize Problem Based Learning (PBL)-based animated learning videos as alternative instructional media to create more engaging, interactive, and student-centered learning experiences, thereby enhancing students' understanding, motivation, and participation in classroom activities. Schools are expected to provide adequate technological facilities and infrastructure to support the development and implementation of innovative learning media, which can improve the quality of teaching and learning processes while encouraging teachers to develop creative instructional materials. Future researchers are recommended to develop PBL-based learning media for different subjects, topics, and educational levels, as well as to conduct studies with larger sample sizes and broader implementation settings to obtain more comprehensive evidence regarding the effectiveness of the developed media. Furthermore, students are encouraged to actively use animated learning videos both inside

and outside the classroom as supplementary learning resources, as interactive media can foster independent learning and strengthen their conceptual understanding of the subject matter.

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