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Development of Ibis Paint X-Based Learning Video Media on Metamorphosis Content to Improve Students' Understanding of Third Grade Elementary School

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Abstract

Background: *Science learning in elementary schools often faces challenges, particularly in students' difficulty understanding the material. These difficulties stem from a lack of interest in learning due to the unappealing learning media used in class. This problem certainly requires a relevant solution. The use of engaging learning media, such as instructional videos, can be utilised in learning. These instructional videos can be developed using various platforms, one of which is Ibis Paint X. The purpose of this study is to develop educational videos as learning media for science instruction in third-grade.* **Methodology:** *The research method employed is Research and Development (R&D), utilising the ADDIE Model, which comprises five stages: analysis, design, development, implementation, and evaluation.* **Findings:** *Based on the results of the validity test, the assessment of media experts obtained (79%) with the criteria of "feasible", (80%) from material experts with the criteria of "feasible", (90%) from education experts with the criteria of "very feasible", (92%) from small trials with the criteria of "very feasible", and (92%) from large trials with the criteria of "very feasible". The pre-test score is (57%) and the post-test score is (71%); the assessment shows an increase in student understanding by (14%). Based on the research results, it is evident that there was an increase in students' understanding of the material. Furthermore, during the learning process, it was also observed that students were interested in the media presented, which made them more focused on the learning activities.* **Contribution:** *The results of this study contribute to the development of effective video-based learning media that improve third-grade students' understanding of animal metamorphosis material.*

Keywords: *Elementary School; Learning Media; Learning Videos; Science Learning*

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INTRODUCTION

Science is one of the subjects studied in elementary schools. According to Dewi & Putra (2022), science is a crucial component of the Indonesian school curriculum, particularly at the elementary level, where most elementary school students find it challenging. In the Merdeka's Curriculum, Natural Science (IPA) and Social Science (IPS) are integrated. These two subjects are integrated into a single theme called Natural and Social Sciences (IPAS). One of the key learning outcomes of science is that students can observe phenomena and events using their five senses and record their observations.

According to Dewi & Putra (2022), the implementation of science learning in schools is crucial because it provides students with a foundation for entering society, enhances critical thinking, creativity, and problem-solving skills, thus preparing them to face the challenges of the 21st century. According to Nadhif & Utama (2023), science can be defined as knowledge obtained from the results of observation. Recognizing the importance of science learning, steps are needed to address the challenges students face in understanding the material. One topic in science that students find challenging is animal metamorphosis. Many students struggle to differentiate between pupae and larvae, as well as the sequence of metamorphosis that occurs in animals.

Based on interviews conducted with homeroom teachers of third-grade at elementary school, it was found that there were misconceptions in the material on animal metamorphosis. Some misconceptions that arose from the material on animal metamorphosis, among others, were that students were unable to distinguish between animals that undergo metamorphosis and those that do not. Students also struggled to differentiate between animals that undergo perfect metamorphosis and those that undergo imperfect metamorphosis, and had difficulty remembering other names for animals that undergo metamorphosis, such as larvae (caterpillars) and pupae (cocoons). These misconceptions arose due to students' limited access to information on animal metamorphosis materials. Several other reasons were that students did not have enough time to study science material because, in the second semester, students had to study social studies. In addition, students also accessed more information only through textbooks during class learning, compared to using audio-visual media. The development of learning media is also considered to be able to improve student learning outcomes. This is in line with opinion Hartini et al., (2017) that to improve student learning outcomes, teachers must be able to develop learning media with the latest technology. Therefore, it is necessary to develop learning media to address students' misconceptions about metamorphosis.

This learning media exists as part of the development of science and technology. As stated by Supraba & Winanto (2024), the development of science and technology has a significant impact on various aspects of life, including education. According to Anam et al., (2023), learning media serve as a means for educators to convey learning messages or information linked to direct learning models. Wardani et al., (2024) state that learning media, both digital and conventional, can enrich the learning experience, thereby helping students better understand concepts. This means that learning media is crucial for use in learning activities to help students understand the material well.

According to Maghfiroh & Suryana (2021), media can be defined as a tool that educators can use to convey lesson content and stimulate students' thoughts, feelings, attention, and abilities in teaching and learning activities. According to Oktaviani & Arini (2021), learning media used in the educational process can also help students grasp and understand lesson material more effectively. Media is a device that can be heard, seen and read which is used in teaching and learning activities, and can influence the effectiveness of learning (Ismiyanti et al., 2023). The use of learning media in the teaching and learning process aims to stimulate students' interest in the learning process (Ediyani et al., 2020). Anastasya et al., (2022) also states that the use of learning media can make learning activities more enjoyable, interactive, and improve the learning experience. Therefore, as educators, we must be able to develop interactive learning media to achieve the desired learning objectives. This is in line with what was said Guggemos & Seufert (2021) that a teacher must be able to use technology in learning in a way that is conducive to achieving meaningful pedagogical goals. This learning media is necessary to convey information about subjects that require material that is difficult to explain verbally.

Learning media is used to provide information about animal metamorphosis, helping students understand the material and avoiding misconceptions that may arise during the learning process. Misconceptions about animal metamorphosis need to be corrected to prevent errors in understanding the information. This aligns with the opinion of Nadhif & Utama (2023), who stated that misconceptions in initial knowledge will also influence subsequent knowledge. Therefore, educators need to recognize misconceptions about animal metamorphosis that students encounter during teaching and learning activities. One of the learning media that can help correct students' misconceptions about animal metamorphosis is learning videos. Video is a technology that is capable of capturing, recording, processing, storing, transferring and sequencing a collection of images, so that they become moving images in the form of video (Cahyani et al., 2020).

According to Norma (2021), the use of learning videos can make it easier for students to understand the subject matter and overcome the limitations of educators in conveying information. By using learning videos, students can listen to information while seeing visualizations of the material presented, making the use of these learning videos considered effective. This finding aligns with research conducted by Rahmawati & Atmojo (2021) on several elementary school teachers in various cities in Indonesia, which suggests that the use of video-based learning media is effective, particularly in science subjects. In using learning media for metamorphosis material, this approach has also been employed by Murdiani et al., (2025), who used pop-up book media and received a positive response from students.

Various applications can be used to create educational videos, one of which is Ibis Paint X. According to Azizah (2024), Ibis Paint X is a digital drawing application for smartphones and tablets, offering features nearly equivalent to those found in desktop digital drawing applications. The advantage of the Ibis Paint X application is that it offers various features that are easy to use, both online and offline. Additionally, its small storage capacity means this application can be downloaded without occupying much storage space (Rahma et al., 2024). Ibis Paint X has also been used in Dihyah et al. (2024) research to create comic strips for learning about aqidah akhlak,

which is considered an alternative solution to create effective and efficient learning. Using Ibis Paint X, we can create illustrations that can be used to produce animated videos as the final result. The animated videos are expected to convey information to students who experience misconceptions in understanding and distinguishing between metamorphosis in animals, including both perfect and imperfect metamorphosis.

Based on the problems described, the researcher concluded that it is necessary to develop media in the form of learning videos, with the hope of correcting students' misconceptions about animal metamorphosis and improving students' understanding of the material. Therefore, the researcher will conduct a study entitled "Improving Students' Understanding of Metamorphosis Content in Third Grade using Instructional Video based on Ibis Paint X".

METHOD

The research approach is a method used by researchers to find answers to a problem to be studied. The method used in this study is Research and Development (R&D). According to Yuliani & Banjarnahor (2021), the Research and Development (R&D) method is a process used to design and produce a product, as well as test its effectiveness after development. According to Slamet (2022), the steps used in Research and Development (R&D) research are also known as the R&D cycle, which consists of studying research findings related to the product to be developed, as well as developing and revising product deficiencies identified during the testing stage. According to Slamet (2022) Nine research and development models can be used in Research and Development (R&D) research. The model used in this study is the ADDIE research model.

Syahid et al., (2024) stated that the ADDIE model in research and development is more rational and comprehensive, and can be applied to various forms of product development, including models, learning strategies, learning methods, media, and teaching materials. The steps for product development using the ADDIE research model consist of five stages:

1. Analysis
   At this stage, researchers conduct a competency analysis, character analysis, and evaluate the abilities, skills, and attitudes of students, as well as analyze the material that will be developed into learning videos.
2. Design
   At this stage, the researcher creates a framework of reference that focuses on the selection of materials, strategies, assessment methods, and evaluations that will be used.
3. Development
   At this stage, researchers develop learning media that align with the predetermined framework of reference.
4. Implementation
   After the learning media were developed, researchers validated them with media experts, content experts, and education experts. Of course, researchers also implemented the media in the classroom to test its suitability for learning activities.

5. Evaluation
   In the final stage, researchers evaluated the students to determine the media's influence on their understanding. This evaluation consisted of a pretest and a post-test.

Sample or Participant

The sample used in this study consisted of students in third-grade of an elementary school at elementary school. A total of 3 classes were used to conduct the study. This sample selection used a cluster sampling technique. Meanwhile, the small and large test samples were selected using a simple random sampling technique. The activities in class A consisted of small tests with 5 students and large tests with 15 students, class B involved question validity with 31 students, and class C focused on research with 32 students.

Instrument

The instruments used in this study were questionnaires and assessments. These questionnaires were given to media experts, material experts, education experts, and students. Evaluations were given to students. This evaluation consisted of a pretest and a post-test. The media expert questionnaire consisted of seven assessment aspects: layout design, font, images, animation, audio, practicality, and portability. The material expert's assessment consisted of three aspects: material suitability, material accuracy, and evaluation. The education expert assessment consisted of three assessment aspects: content quality and objectives, learning quality, and technical quality. The pretest and posttest evaluations consisted of 20 multiple-choice questions.

Data collection

Data collection was conducted by administering questionnaires to media experts, material experts, education experts, and students. Students were also given pretest and post-test evaluations to assess their understanding of the material. The questionnaires were administered to the experts using a 1-5 Likert scale. Media experts assessed seven aspects, while material experts and education experts each assessed three aspects. There was one media and material expert each, and two education experts. Questionnaires were also administered to five students in the small test group and 15 students in the large test group. The questionnaire consisted of 10 statements, each of which was completed by ticking. The questionnaire consisted of 40 questions and involved 31 students. After validity and reliability testing, 20 questions were identified as suitable for use in the pretest and post-tests in the research class.

Procedure

This research procedure was conducted using the ADDIE development model, which comprises analysis, design, development, implementation, and evaluation. At this analysis stage, it is carried out by analyzing learning problems and student characteristics, assessing student needs, examining learning materials, which include Learning Outcomes (*Capaian Pembelajaran/CP*) and Learning Objectives (*Tujuan*

Pembelajaran/ TP), and evaluating media-making tools and materials. At the next stage, namely the design stage, researchers look for references, create illustrations, and summarize materials to be developed into learning videos. Furthermore, at the development stage, researchers begin to develop illustrations and materials into a learning video in the form of animation, and do voiceovers to explain the material that has been developed. After the learning video media is developed, the next step is to validate it with media expert validators and material experts before conducting research at the school. The media expert questionnaire consisted of seven assessment aspects: layout design, font, images, animation, audio, practicality, and portability. The material expert's assessment consisted of three aspects: material suitability, material accuracy, and evaluation. At the implementation stage, researchers distribute questionnaires to education experts and students and conduct question validity tests with students. The last stage, namely evaluation, at this stage researchers distribute pretest and post-test questions to students to test students' understanding of the animal metamorphosis material.

Data analysis

Data analysis is necessary to determine the feasibility criteria for the developed learning video media and to assess its effectiveness in enhancing student understanding. Media feasibility is calculated using a Likert scale, while feasibility is tested using an N-Gain score. The percentages and product feasibility test criteria are on table 1. This questionnaire is completed by ticking the value column using a 1 – 5 Likert scale. The provisions are as table 3 follows,

Table 1. Media Eligibility Percentage, Source by Caprilia (2024)

No	Percentage (%)	Criteria
1	81 -100	Very Feasible
2	61 - 80	Feasible
3	41 - 60	Quite Feasible
4	21 - 40	Less Feasible
5	0 - 20	Very Less Feasible

Table 2 Classification of Gain Values Source by Harianja et al., (2024)

No	Normality Value of Gain	Criteria
1	$0.70 \leq n$	High
2	$0.30 \leq n \leq 0.70$	Medium
3	$n \leq 0.30$	Low

Table 3. Likert Scale Questionnaire Assessment Source by Caprilia (2024)

No	Description	Score
1	Very Good	5
2	Good	4
3	Quite Good	3
4	Less Good	2
5	Very Less Good	1

After collecting the assessment scores provided by experts and respondents, the percentage of eligibility for learning video media can be calculated using formula 1 which refers to Caprilia (2024), and N-Gain on formula 2 which refers to Oktavia et al., (2019).

$$P = \frac{f}{n} X\ 100\ \% \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ (1)$$

Description:
P = Percentage (%)
f = Total Score Obtained
n = Maximum Score
100% = Constant/Scale

$$N\ Gain = \frac{S\ post - S\ pre}{S\ max - S\ pre} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ (2)$$

Description:
N Gain = the normality test value
S pre = the pretest score
S post = the post-test score
S max = the maximum score

RESULT AND DISCUSSION

The development research conducted by the researcher was located at an an elementary school, implemented using the ADDIE development model, which consists of the following 5 stages,

Analysis Stage

Analysis of Learning Problems and Student Characters

In the analysis stage of learning problems and student character, the researcher interviewed the third-grade teacher in elementary school. The questions asked of the third-grade teacher at the elementary school were about the difficulties students face in understanding learning, how educators teach concepts that are challenging for students to grasp, and what media are used in learning activities. After conducting the interview, the researcher obtained results indicating a high interest among students in learning about animal metamorphosis. The students showed an increase in grades for the material, although the increase was not significant. Additionally, the researcher found that students were interested in learning about the media. However, students in third-grade of elementary school who were quite active made it possible for the class to be less conducive. Hence, the researcher needed to build a closer relationship with the students and create fun learning activities.

Analysis of Student Needs

Based on the results of interviews conducted with third-grade elementary school homeroom teachers, researchers also obtained information on the educational needs and learning activities of students, especially in science subjects. Researchers obtained the results of interviews in which third-grade elementary school teachers felt

that some students had difficulty distinguishing between larvae (caterpillars) and pupae (cocoons). One reason is that the terms "larva" and "pupa" sound foreign to them. In addition, they also find it difficult to distinguish between animals that undergo complete and incomplete metamorphosis, as well as what distinguishes animals that undergo metamorphosis from those that do not. Therefore, third-grade elementary school teachers provide suggestions for developing learning media that can be a solution to these problems. The learning media developed by researchers is an animated learning video.

Analysis of Learning Materials

In the learning material analysis stage, researchers look at the problems and needs of students in learning activities. Based on the analysis of student problems and needs, researchers identify learning materials that need to be developed, particularly those related to animal metamorphosis in third-grade elementary school. In determining the content of the material, researchers often use learning outcome in science materials, especially those related to animal metamorphosis, in third-grade of elementary school. After determining learning outcome CP, researchers then compile learning objective TP, which refers to learning outcome CP and the problems students face in understanding the material on animal metamorphosis. This learning objective TP is compiled based on the cognitive levels of Bloom's Taxonomy, which range from C1 to C6.

Analysis of Tools and Materials for Making Media

The next stage involves analyzing media production tools and materials. Researchers develop learning media in the form of learning videos, utilizing digital tools and materials. The tools and materials used to create learning video media are cellphones, stylus pens, and the Ibis Paint X application.

Design Stage

After conducting the analysis stage, the researcher proceeded to the product planning stage. Before developing the learning video, the researcher compiled a storyboard, planning the video duration to be no more than 15 minutes. The content of the material was presented in simple language to facilitate easy understanding for students. The initial design of this learning video featured a colorful and attractive background. Each image was adjusted to a different background. These different-colored backgrounds were adjusted to match the color of each image, allowing the image to be seen clearly. The content of this learning video explains the stages of metamorphosis that occur in butterflies, powderpost beetles, cockroaches, and grasshoppers.

Development Stage

Learning about animal metamorphosis through video is an idea developed by researchers and based on relevant references. This video learning medium was developed to enhance students' understanding of animal metamorphosis. The video

learning duration is 13 minutes. The following is a summary of the results of this learning media development.

Figure 1. Learning Video Cover

Figure 2. The Beginning of the Material

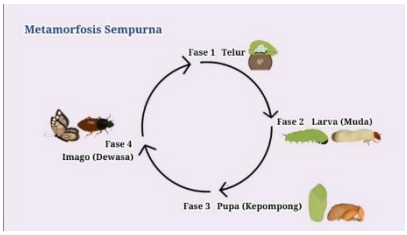

Figure 3. Material Discussion

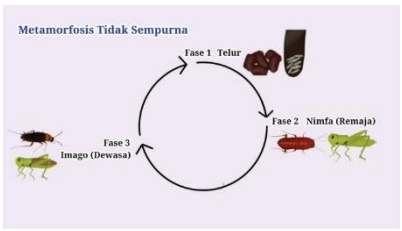

Figure 4. Material Discussion

Figure 5. Butterfly Metamorphosis Stages

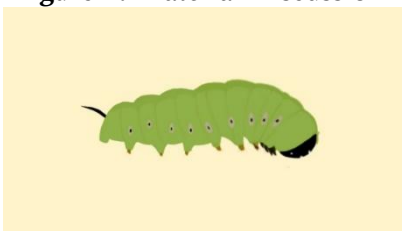

Figure 6. Butterfly Metamorphosis Stages

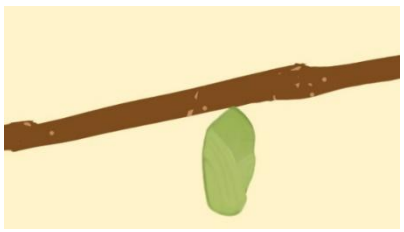

Figure 7. Butterfly Metamorphosis Stages

Figure 8. Butterfly Metamorphosis Stages

Figure 9. Powderpost Beetle Metamorphosis Stages

Figure 10. Powderpost Beetle Metamorphosis Stages

Figure 11. Powderpost Beetle Metamorphosis Stages

Figure 12. Powderpost Beetle Metamorphosis Stages

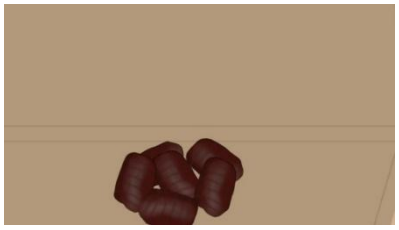

Figure 13. Cockroach Metamorphosis Stages

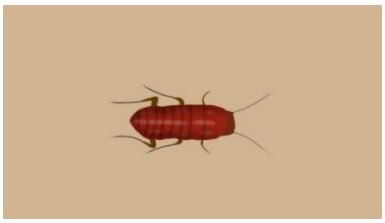

Figure 14. Cockroach Metamorphosis Stages

Figure 15. Cockroach Metamorphosis Stages

Figure 16. Grasshopper Metamorphosis Stages

Figure 17. Grasshopper Metamorphosis Stages

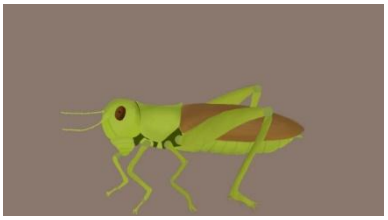

Figure 18. Grasshopper Metamorphosis Stages

After the development of learning media is carried out, media validation is required by validators, consisting of media experts and material experts. This validation is conducted to assess a product that has been developed, thereby determining its feasibility for use in learning activities. According to Ramadan et al., (2024), validity is checked by validators who are competent in their fields. In the development of this learning media, validation is needed from media experts and material experts. The following are the results of the assessment carried out by validators, media experts, and material experts.

Table 4. Media Expert Validation Test Results

No	Aspect	Percentage (%)	Criteria
1	Layout Design	80	Feasible
2	Font	73	Feasible
3	Illustration	80	Feasible
4	Animation	80	Feasible
5	Audio	80	Feasible
6	Practical	80	Feasible
7	Portable	80	Feasible
	Average	**79**	**Feasible**

Based on the results of the media expert validation calculations (See table 4), there are seven aspects in the assessment of learning video media. The assessment aspects are the Layout Design aspect with a percentage of (80 %), the Font aspect with a percentage of (73 %), the Illustration aspect with a percentage of (80 %), the Animation aspect with a percentage of (80 %), the Audio aspect with a percentage of (80 %), the Practical aspect with a percentage of (80 %), and the Portable aspect with a percentage of (80 %). These seven aspects have criteria for being feasible for use as learning media, so that the average percentage obtained through media expert validation is (79 %), with a feasible criterion.

Table 5. Material Expert Validation Test Results

No	Aspect	Percentage (%)	Criteria
1	Material Suitability	87	Very Feasible
2	Material Accuracy	80	Feasible
3	Evaluation	70	Feasible
	Average	**80**	**Feasible**

Based on the results of the material expert validation calculations (See table 5), there are three aspects in the assessment of learning video media. The assessment aspects, namely the aspect of Material Suitability obtained a percentage of (87 %) with very feasible criteria, the aspect of Material Accuracy obtained a percentage of (80 %) with feasible criteria, and the Evaluation aspect obtained a percentage of (70 %) with feasible criteria. So that the average percentage obtained through material expert validation is (80 %) with feasible criteria.

Implementation Stage

The implementation stage is carried out after the product has undergone a validation stage by validators, including media experts, material experts, and education experts. The assessment results from the validator are calculated. If the product has been validated, the next step is to make revisions or improvements based on the suggestions and input provided by the validator. This implementation stage was carried out at elementary school by conducting a small test with 5 students and a larger test with 15 students. This trial was conducted by administering a questionnaire to students regarding a product that had been developed and tested. After being declared

feasible, the next step is to validate the evaluation questions in various classes using both small tests and large tests. The number of evaluation questions is 40, with 31 students. This question validation stage is carried out by showing a learning video, then students are given time to answer the questions. The following are the results of the validation carried out by education experts, along with student responses.

Table 6. Education Expert Validation Test Results

No	Aspect	Percentage (%)	Criteria
1	Content and Purpose Quality	90	Very Feasible
2	Learning Quality	85	Very Feasible
3	Technical Quality	95	Very Feasible
	Average	**90**	**Very Feasible**

Based on the validation calculations conducted by the education experts above (See table 6), there are three key aspects in the assessment of learning video media. The assessment aspects, namely the aspect of Content and Purpose Quality obtained a percentage of (90 %) with very feasible criteria, the aspect of Learning Quality obtained a percentage of (85 %) with very feasible criteria, and the aspect of Technical Quality obtained a percentage of (95 %) with very feasible criteria so that the average percentage obtained through the validation of education experts is (90 %) with very feasible criteria.

Table 7. Student Response Questionnaire Results

No	Group	Percentage (%)	Criteria
1	Small Test	92	Very Feasible
2	Large Test	92	Very Feasible
	Average	**92**	**Very Feasible**

Based on the results of the calculation of student responses above (found on table 7), two assessments were conducted: trials with small groups and trials with large groups. The trial conducted on small groups of 5 students yielded a percentage of (92 %), and the trial conducted on large groups of 15 students also achieved a percentage of (92 %). Therefore, the average percentage obtained through student responses is (92 %), which meets very feasible criteria.

Evaluation Stage

After the implementation stage is carried out, the next stage is the evaluation stage. At this stage, researchers have received an assessment of the product being developed and obtained questions that have been tested for validity and feasibility. This evaluation stage involves administering pretest questions to students in various classes, including both small and large classes, as well as classes used for question validation. Furthermore, students will be asked to take a short break, then they will be shown a learning video and given post-test questions. The results of the pretest and post-test are used to measure the increase in students' understanding of animal metamorphosis material. The following are the results of the pretest and post-test evaluations conducted at elementary school with third-grade students, comprising a total of 32 students.

Table 8. Student Evaluation Assessment Results

No	Evaluation	Percentage (%)
1	Pretest	57
2	Post-Test	71
	Increase	**14**

According to the results in Table 7, the pretest results indicate a percentage of (57 %), while the post-test results show a percentage of (71 %), representing an increase of (14 %). This indicates that video learning media is effective in enhancing students' understanding of animal metamorphosis material.

Discussion

Based on the research findings, it can be concluded that video learning media is suitable for use in learning activities. This feasibility statement is based on expert validation results and student responses. Student feasibility assessments indicate the level of student interest in video learning. This aligns with the opinion of Kasturi et al., (2022), who stated that video learning media can improve the quality of learning resources, thus providing innovation in learning activities. Furthermore, video learning is also considered a learning medium that can attract students' attention, thereby increasing their knowledge and independence in learning activities.

The effectiveness of video learning was also evaluated by administering pretest and post-test questions to students. In the pretest assessment, many students answered questions incorrectly that discussed pupae and larvae, as well as questions regarding the sequence of complete and incomplete metamorphosis. However, after being shown the video learning and engaging in learning activities related to the material, students were able to answer questions correctly on the post-test. This suggests that video learning is an effective tool for use in learning activities.

This aligns with research conducted by Kasturi et al., (2022) on the development of instructional video media in the context of fifth-grade elementary school science lessons on the properties and changes in state of matter, which states that instructional video media is highly suitable for use as a learning resource. This statement is supported by Nailiah & Saputra (2022), who stated that instructional videos can effectively visualize material, enabling educators to convey it dynamically through engaging, colorful visual displays, thereby increasing student interest in learning. Naimah (2022) also stated that instructional videos can explain complex concepts and convey abstract ideas visually in science learning.

Instructional videos have several advantages, including being easily accessible, which enables teachers to convey material visually, and facilitating student understanding. However, instructional videos also have disadvantages, such as being difficult to create, expensive to produce, and requiring a considerable amount of time to develop. The advantages and disadvantages of instructional videos were also discussed by Dewayanti et al., (2021), who noted that the benefits of instructional video media include making it easier for teachers to deliver science content, facilitating student understanding, and motivating students to participate in learning activities. Meanwhile, the disadvantages of using video media for learning include the time-consuming process of developing it, the need for expertise in creating video content,

the requirement for sufficient storage space, and the limitation that not all learning materials can be effectively utilized with animated videos.

CONCLUSION

The conclusion that can be drawn from the previous description is that the developed learning video has been qualified as suitable for implementation in elementary schools. Likewise, the assessment results also show that the learning video is effective in improving students' understanding of animal metamorphosis which student evaluation assessment representing an increase (14 %). Students were very interested in the learning video, where they watched the video with enthusiasm and focus. Some students were even eager to ask questions about the material presented. This learning video increased students' interest in learning and understanding the learning material.

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