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PENGEMBANGAN MEDIA PEMBELAJARAN IPA MATERI METAMORFOSIS HEWAN BERBASIS APLIKASI SCRATCH

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Abstrak

Penelitian ini bertujuan untuk mendesain media pembelajaran berbasis aplikasi Scratch pada materi metamorfosis hewan. Metode penelitian ini menggunakan model pengembangan Multimedia Development Life Cycle (MLDC) dengan enam tahapan, yaitu concept, design, collecting, assembly, testing, dan distribution. Dilakukan dua tahap pengujian, yakni pengujian fungsionalitas untuk memeriksa kesesuaian fungsi program dan pengujuan user acceptance untuk mengetahui respon pengguna terhadap uji coba program yang telah didesain dengan menyebarkan pertanyaan terbuka melalui Google Form serta melakukan wawancara. Partisipan penelitian adalah 18 orang mahasiswa program studi Pendidikan Guru Sekolah Dasar pada salah satu universitas di Yogyakarta. Berdasarkan hasil penelitian didapatkan hasil bahwa media pembelajaran ini dapat diselesaikan dengan baik melalui tahapan MDLC. Selain itu, respon pengguna terhadap media yang dikembangkan adalah positif dengan kategori sangat baik. Untuk pengembangan media pembelajaran, media ini dapat didaftarkan hak cipta serta dapat dilakukan penelitian lanjutan dengan materi yang berbeda beserta penelitian untuk mengetahui efektivitas penggunaan media yang sudah dikembangkan..

Kata Kunci: IPA, MDLC, media pembelajaran, metamorfosis hewan, scratch

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PENDAHULUAN

Natural Science (IPA) learning content is included in the learning content that has the aim of developing the level of thinking of students to become more logical, critical, creative, and able to find and understand various scientific concepts and then apply them in everyday life (Mursalin & Muhsam, 2021). This statement is reinforced by Uslan et al. (2021) that the content of science learning is a learning content that is very close to the lives of students. Natural Sciences according to Permendiknas No. 22 of 2006 is a learning content that examines various systematic and comprehensive sciences. As a result, the learning process in science not only contains a series of facts, concepts, or concepts but also presents a discovery. Therefore, science can be categorized as fun learning content because it can support students' interest in developing their potential and increasing their love for the surrounding environment.

To overcome this, teachers should have competencies, creativeness, and teaching styles that are able to entice students to always concentrate on learning. One of the materials in the IPA is the metamorphosis of animals. In this material, students are often found who are less enthusiastic because the delivery of the material is limited to using the images described.

The solution to this problem is the use of learning media. Learning media is very useful because it can display material creatively so that students can more easily understand the learning material (Aulia et al., 2021). In addition, the use of learning media makes the learning process more interesting and increases students' interest in learning (Supriyono, 2018). No less important, learning media also makes the learning process efficient and effective because learning can be done anywhere and anytime, not necessarily depending on the place, time, and whereabouts of the teacher (Wahid, 2018; Wahyuningtyas & Sulasmono, 2020).

The current globalization has a positive impact on technological advances that educators widely use to create learning media. This is very useful for answering students' learning difficulties (Ardiansyah & Nugraha, 2022; Muthy & Pujiastuti, 2020). Among other learning media, Scratch is still rarely used by educators at the elementary school level. Scratch itself is an educational game designed through a programming language that can display animations and sounds (Iskandar & Raditya, 2017). In addition, Scratch can also be accessed easily via the internet for both children and adults (Isnaini et al., 2021). Another interesting thing, the use of Scratch in science learning can increase students' interest in learning (Sholeh et al., 2022)

Based on literature studies from various sources, also proves that learning media from scratch is the right medium if used as a learning medium. If you look at it, students still very difficult to understand the material of animal metamorphosis. This is because the learning media used by teachers is still in the category of less effective and innovative to be used in learning in this century and this animal metamorphosis material itself requires abstract thinking and needs to understand concepts. One of the interactive learning media used by most teachers is PowerPoint. However, the use of PowerPoint is still considered ineffective because teachers use the media only filled with material writing and images, which students have also often encountered in their printed books (Irfan et al., 2019).

There are several studies that prove that the use of scratch-based learning media has a good impact on the course of learning. Scratch learning media is very good and worth

developing because this learning media is integrated with the website so that it can be accessed anytime and anywhere and is the most interesting learning media today (Arfiansyah et al., 2019). Scratch is also a learning medium that is considered effective for teaching creativity to students because this media is included in block-based programming media (Solihah et al., 2022). Scratch-based learning media can be used offline and is easy to operate. Scratch is also able to increase students' enthusiasm in participating in science learning and can help teachers to create an interesting and fun atmosphere in learning (Wardani et al., 2022).

Scratch is classified as an application that introduces programming languages more easily than other applications by using block code arrangements and other features such as adding sounds and images according to what the teacher wants to design and is suitable for all ages (Arfiansyah et al., 2019; Sudihartinih et al., 2021). This is in accordance with previous research which states that scratch-making used as a learning medium is relatively simpler when compared to other applications such as Adobe Flash, and similar applications (Arfiansyah et al., 2019; Jannah et al., 2021; Khalil & Wardana, 2022). Although it looks simple in its manufacture, scratch is very suitable and worthy of being used as a learning medium, especially to support the realization of the sustainable development goals of the SDGs 2030 which expects quality education. In addition, there has been no development of scratch with metamorphosis material. It is hoped that with this research, students as educational subjects will be able to understand metamorphosis material through Scratch and teachers as facilitators will be able to use Scratch as a learning medium. Therefore, based on these problems, researchers are interested in researching this with the title "Development of Animal Metamorphosis Material Based on Scratch Applications"..

METODE

The research method uses the Multimedia Development Life Cycle (MLDC) development model which is composed of six stages (Sugiarto, 2018). First, the concept is the stage of determining the goals and target users of the program. Second, design is the stage of designing the program architecture. Third, collecting is the stage of collecting the necessary materials. Fourth, assembly is the stage of making programs. Fifth, testing is the testing stage of the program that has been successfully created. Sixth, distribution is the stage of program storage in a storage medium.
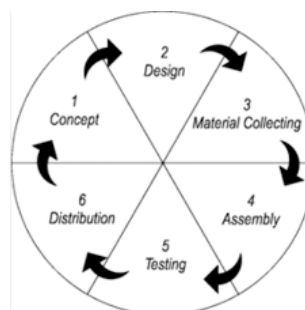

Figure 1. MDLC stages

Through the MDLC stage, it is hoped that science learning media can be obtained animal metamorphosis material that is interesting, motivating, and can make it easier for students and teachers in the learning process. This learning media contains animal metamorphosis material intended for grade 4 elementary school students. The creation of this Scratch application-based learning media was designed by three creators for approximately two months.

The participants of this study were 18 students of the Elementary School Teacher Education study program in Yogyakarta. The reason was chosen by students so that participants could provide suggestions and criticisms on the learning media made. The research was conducted by demonstrating the use of learning media that had been designed for participants. Furthermore, to get user response data, two approval processes are carried out, namely functionality testing and user acceptance testing. The test result data was obtained by distributing questionnaires containing open-ended questions through Google Forms and conducting interviews.

User acceptance testing consists of 4 indicators with a total of 8 questions, namely indicators of material content (Iskandar & Raditya, 2017; Setiawan et al., 2021), display (Setiawan et al., 2021) and interest and usefulness (Aulia et al., 2021). Indicators and open-ended questions regarding user acceptance testing are as follows,

Table 1. User Acceptance Test Indicators and Open-Ended Questions

Indicators	Questions
Material Content	1. What do you think after using this learning media? Is the material presented easy to understand?
	2. What do you think about the content of the material on this learning medium? Is it complete and in accordance with basic competencies?
Display	3. What do you think about the appearance of images, writing, and animation in this learning media?
	4. What do you think about the functions of the buttons and the available features? Does it work properly?
Interest	5. What is your interest in using this learning media?
	6. How do you feel after using this learning media?
Usefulness	7. What do you think about this learning media? Is it interactive?
	8. What do you think about the benefits of this learning media?

After filling out the questionnaire through Google Forms, researchers conducted interviews with three participants to obtain specific answers regarding the results of the questionnaire responses that had been given. The results of user acceptance testing through questionnaires are analyzed by being separated into two categories, namely positive responses,

and negative responses. The calculation of the value of the positive response uses the following formula,

$$\text{The Value of Positive Response} = \frac{Amount\ of\ Positive\ Response}{Amount\ of\ Respondent} \times 100\%$$

Furthermore, the positive response values are categorized based on the scale compiled by Nirfayanti and Nurbaeti (2019) as follows,

Table 2. Positive Response Value Category

The Value of Positive Response (%)	Category
75% ≤ VPR < 100%	Excellent
50% ≤ VPR < 75%	Good
25% ≤ VPR < 50%	Poor
0% ≤ VPR < 25%	Very Poor

HASIL DAN PEMBAHASAN

A. Learning Media Design Process

The design process of Scratch-based learning media on animal metamorphosis material is as follows,

1) Concept

At the concept stage, researchers and creators conceptualize science learning media consisting of material and practice questions. This learning media can be accessed online through the Scratch website. The material in this medium is the metamorphosis of animals for grade IV elementary school.

2) Design

In the design stage, researchers design an initial picture of learning media using a storyboard for the display of media to be created. The storyboard is created through Microsoft Word with a total of four pages consisting of material constraints, initial views, menu views, material understanding displays, and question practice views. Some of the display designs in the storyboard are as follows,

8. Storyboard Display Examples of Metamorphosis

Visual	Sketch	Audio
There is a teacher animation, a frog metamorphosis image, a material explanation, a button next, and a button back.	Frog Metamorphosis A teacher animation (a material explanation) A frog metamorphosis image Back / Next	Backsound and audio explanation of the material

13. Storyboard Display of Evaluation

Visual	Sketch	Audio
There are questions, answer choices and answer column	Question Answer choices Answer Column	Backsound

Figure 2. Media Initial Design Results

3) Collecting

At the collecting stage, researchers collect various materials needed in learning media, such as learning materials, images, animated objects, to sounds. For example, in the display of perfect metamorphosis examples, materials such as perfect metamorphosis images, button animations, human object animations, and metamorphosis explanation sound records are needed.

4) Assembly

At the assembly stage, learning media began to be made according to the design that had been designed in the storyboard. The following are the results of making learning media for animal metamorphosis material through the Scratch application.
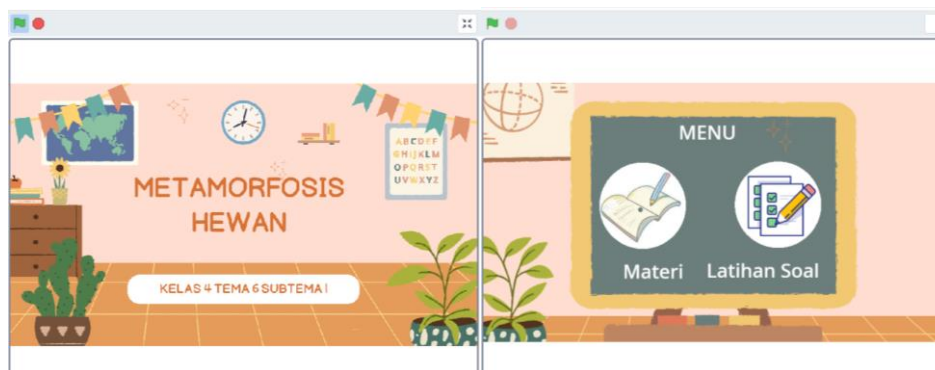

Figure 3. Start and Menu View

In figure 3 there is a start view and a menu. On the initial page, there is a title of the material in the learning media along with a description of the class, theme, and subtheme. Furthermore, on the menu page, there are two options, namely material or practice questions.
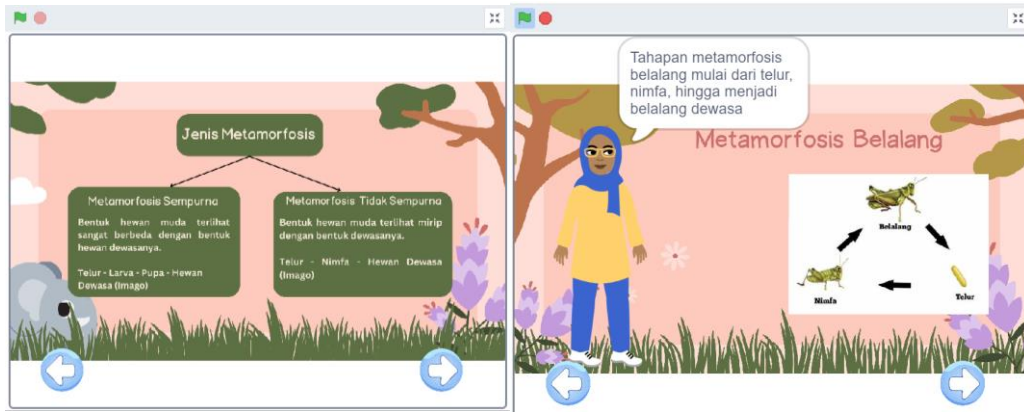
Figure 4. View of Metamorphosis Types and Examples of Locust Metamorphosis

Furthermore, in figure 4 there is a display of the type of metamorphosis and an example of metamorphosis. On the locust metamorphosis example page, there is a teacher's animation that will explain through sound and writing about the locust metamorphosis image on the right side. The writing in the chat column will change according to the explanatory sound.
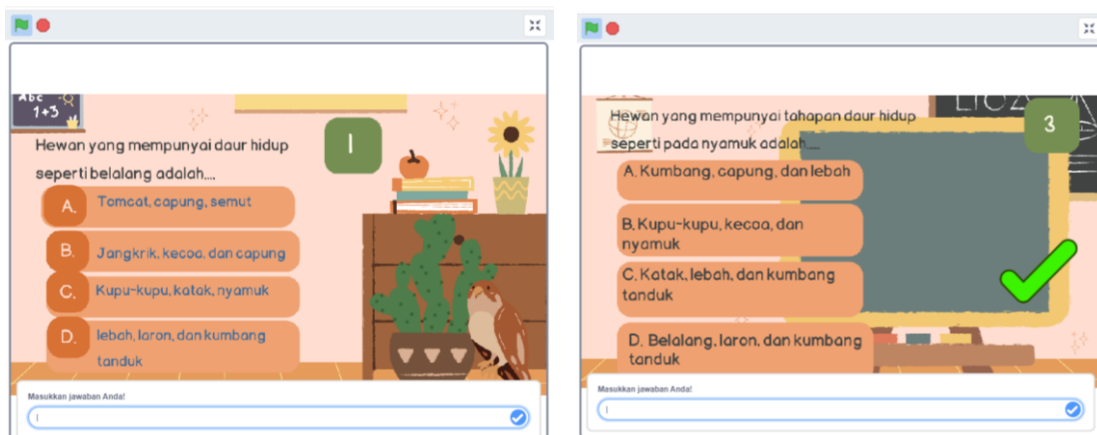

Figure 5. View of Evaluation

In figure 5, you can see the practice questions in the form of multiple choice. Students are asked to do questions based on the knowledge gained after receiving an explanation of the material. After reading the questions and answer choices, students can enter the answers into the answer field and press the checklist button on the right. When the answer is correct, a green checklist symbol will appear and the sound is correct. Meanwhile, when the answer is wrong, a green cross symbol will appear and the wrong sound will appear.
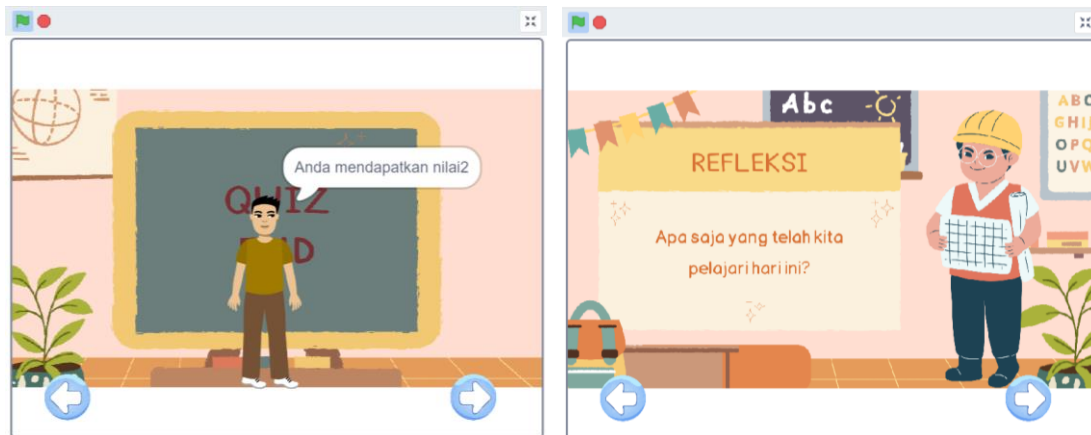
Figure 6. View of Result Evaluation and Reflection

After doing the practice questions, students will be redirected to the question practice results page. As seen in figure 6 there is a teacher animation that displays a chat in the form of many correct answers that students can work on. After that, students will reflect on the learning received.

5) Testing

At the testing stage, researchers perform repeated checks every time one part is completed at the assembly stage. This is done so that the program can run smoothly in every part. If an error or error occurs, the program can be corrected immediately.

6)Distribution

At the distribution stage, this learning media program is stored in a storage medium, for learning media, this animal metamorphosis material is stored on the Scratch Website which can be accessed for free by registering or logging in first on the web.

B. Functionality Test Results

Functionality testing is carried out after the learning media has been created to assess the suitability of program functions. Each display on the learning media is checked, whether the results can run well and in accordance with the storyboard created.

Table 3. Functionality Test Results

View	Hope	Result
Opening View	Displays material titles, class descriptions, themes, and sub-themes.	Suitable
Menu View	Displays a menu view, with button options material and practice questions. If the button is clicked, it will perform according to its function, which is to display the display	Suitable

in question.

Apperception View	Displays the apperception of learning animal metamorphosis material with explanation through sound. Equipped with next and back buttons that can run according to their functions.	Suitable
Explanation View	Displays the notion of metamorphosis with explanation through sound. Equipped with next and back buttons that can run according to their functions.	Suitable
Metamorphosis Types View	Displays the notion of metamorphosis with explanation through sound. Equipped with next and back buttons that can run according to their functions.	Suitable
Example View	Displays examples of metamorphosis both perfect and imperfect with explanations through voice and teacher-animated chatter. Equipped with next and back buttons that can run according to their function	Suitable
Evaluation View	Featuring some exercises on animal metamorphosis. If the answer is selected correct, then the button will be green and the correct sound will appear. If the wrong answer is selected, then the button will be red and the wrong sound will appear.	Suitable
Resulr of Evaluation View	Displaying the teacher's animation accompanied by a chat of the results of the students' correct answers after doing the questions.	Suitable
Reflection View	Featuring flashes of metamorphosis learning that are relaxed together guided by teacher animation.	Suitable
Final View	Showing thanks and bye.	Suitable

C. User Acceptance Test Results

After testing the functionality and learning media can be used as expected. Then, the media was tested on a number of participants to find out the user's responses to the learning media that had been created. User acceptance testing is done through Google Forms and interviews.

Tabel 4. Questionnaire Results on Open-Ended Questions

Na	Questions

me	1	2	3	4	5	6	7	8
P2	The material presented is easy to understand	Complete and in accordance with basic competencies	The appearance of the image is good, only in the question session can be even more creative	**Yes, it works well**	Very interested	Happy	Yes this medium includes interactive medium	Very useful to be used as an interactive learning medium
P5	The material is very easy to understand	The content of the material in this material is complete and in accordance with the basic competencies competencies taught	The writing is clear and well legible.	Buttons and features on this medium can work fine	More interested because learning is more varied and feels shorter.	It is easier to understand the material because the material is packed with various animations.	quite interactive in my opinion	This medium is very helpful to the learning process.
P10	Yes, the material is complete and easy to understand	The content of the material is complete and contains the entire metamorphosis which is made more concise	The appearance of images is attractive and the writing can be read	Yes, it can function properly and make it very easy	8/10	Happy because learning is diverse	Yes, it is interactive because it asks students to fill in the answers to the questions themselves.	Very beneficial for learning with learners
P11	The material presented can be easily understood	Complete and in accordance with Basic Competencies.	In my opinion, the material is presented very interestingly.	Texisting buttons can work fine	Interest	Happy	Yes, interactive there are even quizzes too	This medium is useful for increasing interest and making it easier for students to learn about metamorphosis

material.

P14	Yes, I think the material becomes easier to understand because it is presented briefly and given an explanation.	In my opinion, the content of the material on this media is very complete and in accordance with basic competencies	The appearance of the picture is quite interesting. The writing used is also appropriate (not too big, not too small, and easy to read)	The available buttons can work fine. Maybe it can be added with another button button.	I am quite interested in using this medium	I feel good because the media display is attractive	I think this medium is quite interactive. Shown by providing audio that indirectly invites media users to interact	This medium is useful for increasing interest and making it easier for students to learn about metamorphosis material.
+	18	16	13	17	18	18	18	18
-	0	2	5	1	0	0	0	0
%	100%	88,9%	72,2%	94,4%	100%	100%	100%	100%

Based on the table, it can be seen that participants, in general, gave positive responses to the learning media that had been made with a percentage of 94.4%. This indicates that the learning media of Scratch-based animal metamorphosis material is included in the excellent category. Participants argued that this learning media is very good, the material is complete but easy to understand, and the material is in accordance with basic competencies. In addition, the overall appearance of the learning media is quite interesting, interactive, and useful for students to learn. However, there are still some things that need to be improved, namely the display on each backdrop is not full and the addition of other buttons that can make it easier for students to move around such as the home button. In addition, there are development suggestions in the form of adding examples of problems in the form of images so that they can be more varied.

To confirm the participant's responses to the open questionnaire, researchers conducted interviews with 3 participants. The results of the interviews with P2, P5, and P14 are presented as follows,

Table 5. Interview Results

Questions	Name	Answers
1	P2	The material presented is easy to understand. Supported there is a voice-over on each material.
	P5	The material is very easy to understand because it is presented in sequence starting from the basic concepts first such as the notion of metamorphosis even

		to evaluation and reflection
	P14	Yes, I think the material becomes easier to understand because it is presented briefly and explained
2	P2	Complete and in accordance with basic competencies. You can give practice questions with pictures to make them more varied.
	P5	The content of the material on this medium is complete and in accordance with the basic competencies taught. The sequence of learning in this medium is also complete starting from apperception, material, practice questions, and reflection.
	P14	In my opinion, the content of the material on this media is very complete and in accordance with basic competencies. Starting from the notion of metamorphosis, types, to examples.
3	P2	The appearance of the picture is good, it's just that in the question session, it can be even more creative. Questions can be in the form of a small image or an answer choice in the form of an appropriate image
	P5	The writing is clear and well-legible, but the image display on each backdrop is not full. Not so much a problem indeed, but it looks less presentable.
	P14	The appearance of the picture is quite interesting. The writing used is also appropriate (not too big, not too small, and easy to read)
4	P2	Yes, it works well. interesting because it features sound effects.
	P5	The buttons and features on this medium can work fine. There are no constraints regarding buttons and features available.
	P14	The available buttons can work fine. Maybe it can be added with another button button for example when students want to go directly to the metamorphosis example, namely with the button going to the background of the example, so it will be faster to access it.
5	P2	Very interested. The presentation is short and concise, but the core of the material can be conveyed to students.
	P5	More interested because learning is more varied and feels shorter.
	P14	I am quite interested in using this medium. The use of Scratch is also not as much as other medium so it feels innovative.
6	P2	Happy. This learning is supported by many images and audio that make it easier to understand.
	P5	It makes it easier to understand the material because the material is packed with various animations.
	P14	I feel happy because the medium display is attractive both in terms of content

and features.

7	P2	Yes this medium includes medium interactive. Involves the role of students in answering quizzes and is innovative because learning media using scratch is the first time I have heard so this is an interesting idea to develop and implement in elementary schools
	P5	It's quite interactive in my opinion because students don't just explain and there are step-by-step activities that make it easier for students to understand the material slowly.
	P14	I think this medium is quite interactive. Shown by providing audio that indirectly invites media users to interact.
8	P2	It is very useful to be used as an interactive learning medium. Can hone students' abilities in a non-boring way.
	P5	This medium is very helpful for the learning process and makes students happy to learn.
	P14	This medium is useful for increasing interest and making it easier for students to learn about metamorphosis material.

The results of the confirmation in the interview session , found some information that was not explained in the answers to the open-ended question questionnaire. Overall, P2, P5, and P14 argue that learning media is interesting and useful for grade IV elementary school students because it is supported by complete material according to basic competencies, attractive appearance, and interactive features. Furthermore, P2, P5, and P14 provide more details on different matters. P2 gives suggestions to give more variety to the practice questions. Practice questions can be interspersed with pictures of either questions or answer choices so that students' knowledge can later be more holistic. When P2 provides advice regarding the material, P5 comments on the appearance of learning media. The image display on each backdrop is not full. This results in learning media looking less neat. Meanwhile, P14 provides a review of buttons that can still be added to make it easier for students to use learning media. Creators can provide advanced buttons after pressing the materials button, such as the understanding button, type, and metamorphosis example.

Regarding interest indicators, P2, P5, and P14 argue that this learning medium is interesting and innovative because it is still rarely used, especially in elementary schools. P2, P5, and P14 feel happy after using this learning media because it can increase student interest in the learning process. This is in accordance with Aulia et al. (2021) and Pratiwi & Bernard (2021) that the learning process using the Scratch application can increase interest in learning. P2, P5, and P14 also add that these media are interactive and useful in streamlining the learning process. This statement is supported by a statement from (Pamungkas et al., 2021) that learning media can make it easier for teachers to deliver material in the classroom and help students in fostering student motivation and learning outcomes..

SIMPULAN

Based on the results of the research obtained, this scratch-based learning media deserves to be developed, especially on animal metamorphosis material. According to the concept that has been created, this learning media can be accessed online through a website that can be accessed for free. From the results of the functional testing that has been carried out, this scratch learning media can run well according to the storyboard that has been designed. The test results addressed to several participants proved that in general participants responded after seeing the results of this scratch-based animal metamorphosis learning media. Indicating that the learning media that has been made is included in the excellent category, the material presented is also complete, easy to understand, and in accordance with the basic competencies that must be achieved. This media is also quite interesting because it displays a combination of various elements of combined animation, visual and audio which makes this media an intercative and useful media for students of course.

The recommendation from the results of this study is that there need to be variations in terms of giving practice questions, the presence of pictures on the practice questions will also increase students' interest in doing the existing practice questions. The appearance of the media also needs to be improved to make it more attractive and there need to be more and more varied helper buttons to make it easier for students to use it. So, the results of this learning media will be more optimal than before. Therefore, the development of scratch-based animal metamorphosis material learning media will be more effective if it is developed in the current world of education, especially among elementary school students where this media is able to trigger student motivation in learning so that it will have an impact on satisfactory learning outcomes..

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