



DEVELOPMENT OF SCRATCH LEARNING MEDIA ON SCIENCE SUBJECTS FOR GRADE V SDN 2 KREYO AND SDN 2 DANAMULYA CIREBON REGENCY

Nur Afiah^{1*}, Muhammad Iqbal Al Ghozali², Ratna Purwati³, Somantri⁴, Iskanda Mubarak⁵

^{1,2,3,4,5}Universitas Islam Bunga Bangsa Cirebon, Indonesia

Email : afiahnur597@gmail.com

Received: 2023-12-05 ; Accepted: 2024-01-11 ; Published: 2024-02-29

Abstract

In science learning, there are science process skills that involve activities such as measurement, observation, classification, and inference. One very important topic in science learning in elementary schools is the "Water Cycle". The difficulty of students understanding the water cycle material in science learning. This difficulty is due to the delivery of material shown directly on symbols that are abstract and the unavailability of learning media as a real operational stage that suits what learners need. This study aims to determine the feasibility of using Scratch media in science subjects for grade V SD / MI in the 2022/2023 academic year. This research is included in the Research and Development (R&D) development research category using the Dick & Carey model. The stages carried out in this research and development include: (1) needs and objectives, (2) learning, (3) learner and environmental context, (4) specific objectives, (5) assessment, (6) strategies, (7) learning materials, (8) formative design and evaluation, (9) learning revision, and (10) summative evaluation development. In this research and development, the data needed are qualitative and quantitative data. The data collected were analyzed using the Validity Test, Practicality Test, and T Test (Paired Sample T Test). The results of this study are (1) the development of scratch learning media produces a product in the form of a link <https://scratch.mit.edu/projects/715703844>. (2) the results of the theoretical validation test validated by three experts/experts, stating that the scratch application learning media is very suitable to be applied in the process of learning science in grade V elementary schools. (3) the results of empirical validation of scratch media based on the assessment of students obtained a percentage of 100% during the individual test, 100% during the small group test. (4) Scratch learning media proved effective in improving student learning outcomes. Judging from the statistical test using the paired sample t test, the value obtained is $t_{count} = 11.335 > t_{table} 2.0395$ which means that H_a is accepted and H_o is rejected. The results of the above study concluded that the scratch application media is very suitable and appropriate to be applied to learning science grade V SD/MI.

Keywords: *Development, Scratch, Science*



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INTRODUCTION

Education is a stage that aims to change the attitudes and behavior of self or group through teaching and training, with the aim of increasing maturity. Although at the time of the Messenger of Allah (sallallahu 'alaihi wasallam), education was not like today, he has emphasized the importance of education. For example, Rasulullah sallallahu 'alaihi wasallam could create an ideal learning process and achieve the desired goals and objectives.

Law No. 20 of 2003, education is the first step that is structured to create a learning atmosphere and learning methods that encourage students to actively develop personality, spiritual, intelligence, train morals, and an ability needed by themselves, the environment and the wider region. (Law, 2003). In learning, there are goals that must be achieved, where the focus is to encourage students to be more active with the intention of not getting bored in learning (Budiningsih, 2012; Parwati et al., 2023; Suardi, 2018; Mulyasa, 2013). By continuing to carry out science learning renewal activities, it is an important point to complete learning facilities (Fatimah & Kartika, 2013; Susanto, 2013; Trisanti et al., 2021).

In science learning, there are science process skills that involve activities such as measurement, observation, classification, and inference. In addition, science also includes the application and development of scientific attitudes in the learning process (Susanto, 2013). One very important topic in science learning in elementary schools is the "Water Cycle", which has a significant connection to human daily life and has relevant implications for the future (Triatmodjo, 2008).

However, in practice, there are challenges in learning material about the "Water Cycle" at the fifth grade level in elementary schools. These challenges were revealed through research at SDN 2 Kreyo and SDN 2 Danamulya in Cirebon District, West Java. Through interviews and needs analysis, it was revealed that the material "Water Cycle" was perceived as difficult by the majority of learners, with only 40% of 32 learners reaching the Minimum Completion Criteria (KKM) in daily tests (interviews with grade V teachers of

SDN 2 Kreyo and SDN 2 Danamulya). This material has importance because it is related to the survival of students.

According to the information obtained, the application of learning media has a very big impact in the sense that it greatly affects the enthusiasm for learning of students. Media that they think is new, then curiosity will arise and from here the active sense arises until motivation in learning is spurred in students. In the gadget era as it is now, students really want learning media that is relevant to the times as well, namely such as learning videos that they often watch on their respective gadgets and also learning media that creates pleasure in themselves such as games but within the scope of learning.

The questionnaire instruments filled out by the fifth grade teachers of SDN 2 Kreyo and SDN 2 Danamulya related to teacher obstacles in achieving science learning objectives, can refer to the following data:

1. The majority of students have kinesthetic learning style preferences, which makes teachers required to be more creative in the use of media or teaching materials in the learning process.
2. Regarding facilities and infrastructure at school in supporting learning activities in science subjects, it is already available but the condition is damaged so it needs the creativity of teachers and students to make learning media.
3. In the process of learning activities in science subjects, teachers are very supportive in inviting students to direct nature or the surrounding environment because science learning needs to be done contextually.
4. Simple tools available around the environment are used as media.
5. Using learning resources in accordance with the curriculum. In addition to using textbooks, teachers also utilize the internet, LKS, and other books as sources of teaching materials.
6. Students are very enthusiastic and motivated if invited to participate in KBM during practicum and democracy activities, for that media or teaching materials are needed so that students can learn new things in the learning process.

Meanwhile, the data on the results of filling out the questionnaire by class V students are attached in the following table:

Table 1.1 Test Results of Student Questionnaires

No	Question	SDN 2 KREYO					SDN 2 DANAMULYA				
		SS	S	C	TS	STS	SS	S	C	TS	STS
1	Learners like to learn in groups	0%	0%	55%	45%	0%	0%	10%	50%	0%	40%
2	Learners like independent learning	85%	15%	0%	0%	0%	0%	90%	10%	0%	0%
3	Like audio learning	0%	80%	20%	0%	0%	0%	75%	25%	0%	0%
4	Prefer audio learning	50%	50%	0%	0%	0%	70%	10%	20%	0%	0%
5	Like audio-visual learning	100%	0%	0%	0%	0%	100%	0%	0%	0%	0%
6	Prefer visual learning	0%	30%	10%	60%	0%	0%	0%	50%	50%	0%
7	Likes learning media that can be used in one lesson	90%	0%	10%	0%	0%	100%	0%	0%	0%	0%
8	Prefer Reading	90%	10%	0%	0%	0%	80%	20%	0%	0%	0%
9	Likes computer-based teaching media	80%	10%	10%	0%	0%	100%	0%	0%	0%	0%
10	Likes a learning video that can be interacted with	100%	0%	0%	0%	0%	100%	0%	0%	0%	0%
11	Prefer a learning video that is full-color	100%	0%	0%	0%	0%	0%	100%	0%	0%	0%
12	Like black and white learning videos	10%	0%	10%	80%	0%	10%	0%	20%	0%	70%
13	Interest in interactive video and game-based teaching media	40%	60%	0%	0%	0%	100%	0%	0%	0%	0%
14	Interest in book-based teaching media	50%	30%	20%	0%	0%	0%	50%	50%	0%	0%
15	Interest in a computer-based	100%	0%	0%	0%	0%	90%	10%	0%	0%	0%

teaching media application										
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In the table above, the conclusions are as follows:

1. The majority of learners tend to prefer learning independently rather than in groups.
2. The average learner is less familiar with audio learning media so most do not like audio-based learning media.
3. Learners like visual learning.
4. In kinesthetic learning, learners show enthusiastic attitude towards kinesthetic/audio visual learning.
5. Learners like learning media that can be used in one subject rather than teaching media in all subjects.
6. Learners like learning media in the form of animation.
7. The majority of learners have a preference for computer-based learning media.
8. Dominant Learners tend to prefer interaction and moving video teaching media.
9. The majority of learners like video learning media that display a lot of colors.
10. Few Learners are interested in video learning media that only displays black and white colors.
11. Learners have more interest in interaction and game-based video teaching media than book teaching media.
12. Learners need a computer-based teaching media with the application of interaction applications and games that can help increase motivation in the learning process.

By conducting a needs analysis through face-to-face questioning and distributing statements to respondents, efforts were made to find solutions in creating the right learning media that they needed. The learning media needed is based on ICT (Information and Communication Technology) technology. The purpose of using this media is to encourage students to focus on learning, facilitate understanding of the material, and increase efficiency in completing tasks. In addition, the use of ICT media also In addition, the use of ICT media also allows students to more accurately obtain information related to learning (Arsyad, 2011; Fransisca, 2019; Muijs, D. & David, 2008).

Based on observations and interviews, currently science learning uses various learning tools such as lesson plans, syllabus, thematic package books from the government, and assessment tools. However, the learning media used is still in the form of pictures in the package book. Because the concept of learning

has an abstract nature, students face difficulties in understanding it. A solution is needed to implement learning media for students that can arouse their curiosity in science lessons.

In this digital era, gadgets have become part of everyone's life, including elementary school children. Children are able to easily use gadgets and are skilled at using touch screens. The rapid advancement of technology also has an impact on the field of education. Therefore, teachers need to teach learners to use technology wisely and appropriately. Teachers can innovate in learning by utilizing technology, such as computers. With the help of computers, learners can increase their understanding of technological developments and support the learning process.

Media in learning can help as an intermediary for understanding the material. Media that use technology or simple ones can still increase learner curiosity (Hasan et al., 2021; Ismail, 2006; Rohani, 2020; Sri, 2008). In era 4.0, technological advances in education are increasingly diverse and encourage the use of technology in the learning process. One strategy that can be used is to utilize ICT technology-based learning media to create a more interesting learning environment for students. By utilizing ICT media, learners can be actively involved in the learning process, understanding the material more easily. Learning process, understand the material more easily, and are able to complete tasks more efficiently (Anshori, 2017; Hanannika & Sukartono, 2022; Muijs, D. & David, 2008).

One example of learning media that can be utilized is scratch, which can encourage learner engagement and concentration in the learning process. Scratch is an application that is simply designed to introduce programming concepts to various groups, including children aged 8 to 16 years. This is in accordance with the age range of learners in grade V elementary school, which ranges from 10 to 11 years old. Technology-based learning media such as Scratch presents learning materials in the form of interesting animations and challenging quizzes, encouraging learners to work independently and develop critical thinking skills. Independently and develop critical thinking skills. Based on this information, it is necessary to develop Scratch-based learning media for the material "Water Cycle" which can be used as a learning resource in grade V elementary school. An evaluation will be conducted to measure the suitability and effectiveness of the learning media, including compliance with competency standards and basic competencies, as well as determining the appropriate time for its use. The purpose of developing Scratch learning media on the material "Water Cycle" is to create effective science learning tools and support students in achieving learning objectives in grade V elementary school.

METHOD

This research applied the research development method (Research & Development). In this study, the model developed by Dick & Carey was used. The Dick & Carey development model consists of ten steps as follows.

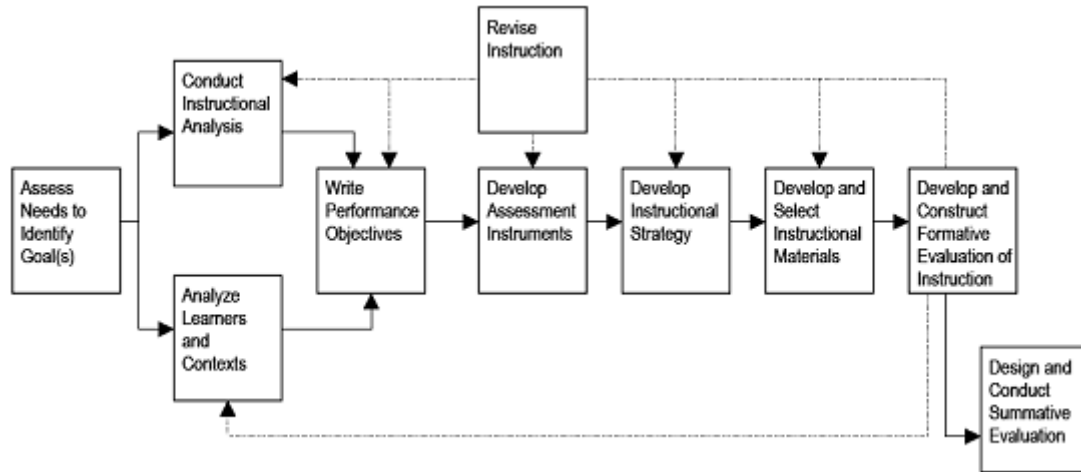


Figure 1: Dick & Carey model

This research was conducted in two elementary schools as research sites. The elementary schools used as research sites are SDN 2 Kreyo and SDN 2 Danamulya. SDN 2 Kreyo is located in Cirebon Regency. The data collection instruments used are validator assessment and interview sheets, student response questionnaires and also learning outcomes tests. The data analysis technique used is qualitative and quantitative data analysis.

RESULTS AND DISCUSSION





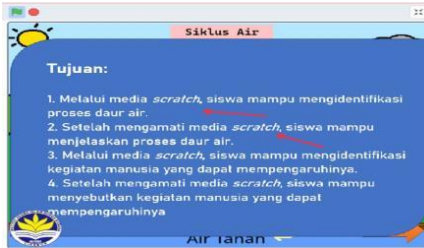
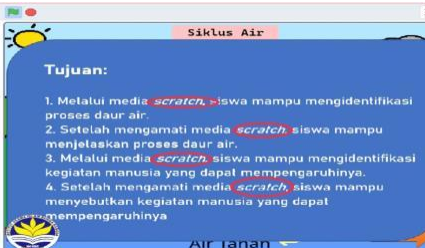



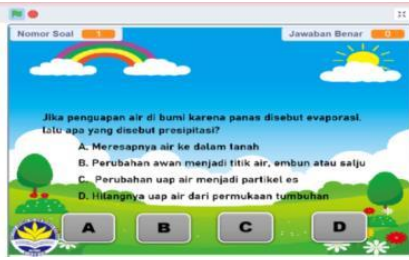
1. Research Results

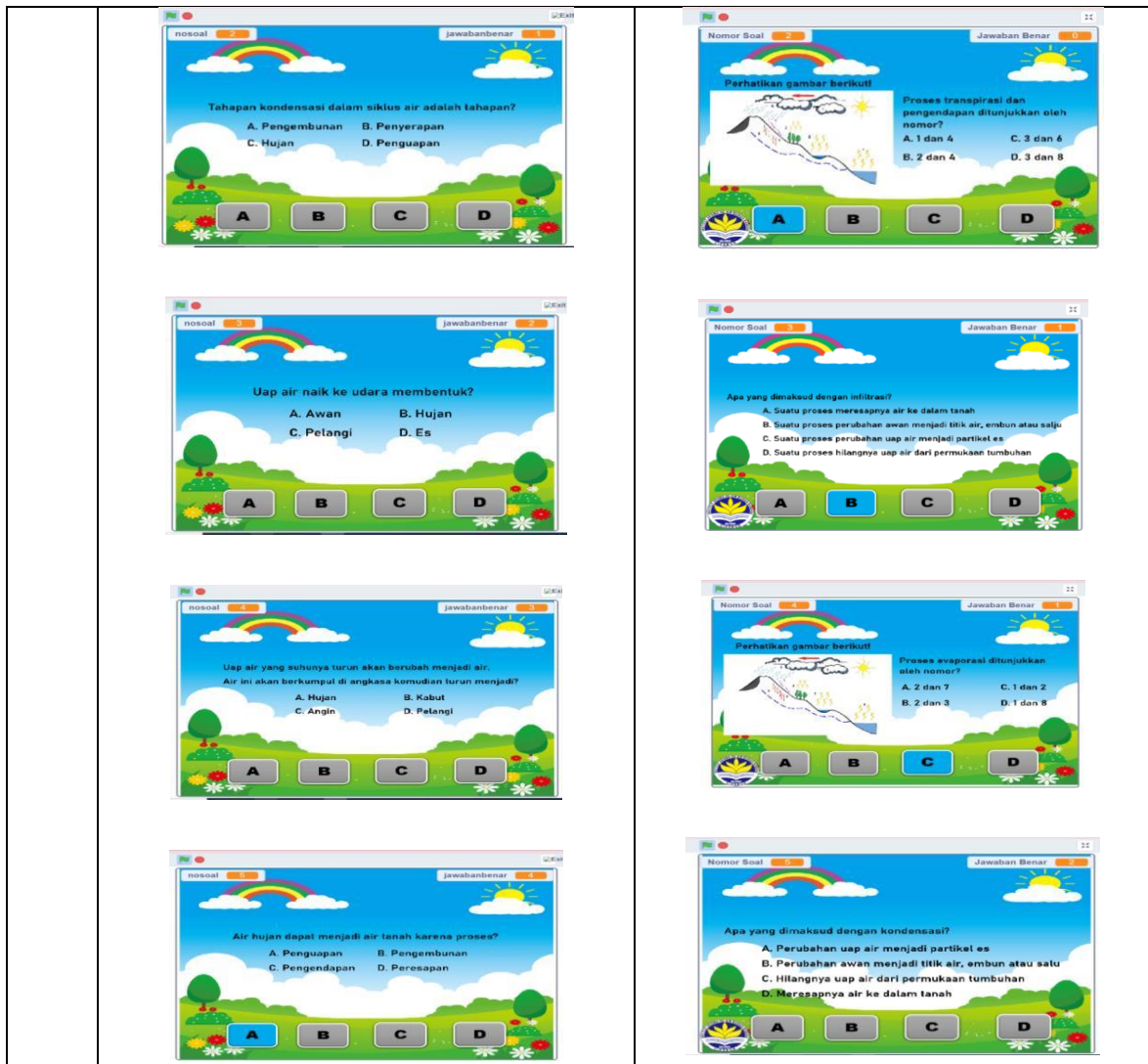
a. Expert Validation

Validation by linguists to provide constructive feedback related to several aspects of the language used in scratch learning media. Based on the results of questionnaires and interviews with language experts, it was found that scratch learning media received an average score of 3.6. Thus, it can be concluded that scratch learning media has an adequate level of feasibility to be used in learning in elementary schools, with a note that revisions need to be made according to the suggestions given.

Table 2: Corrections and Suggestions of Language Experts

No	Corrections and Suggestions of Language Experts	After Revision
1	The conjunction "And" in the first display should be written "and".	Revisions were made by changing the conjunction "And" to "and".




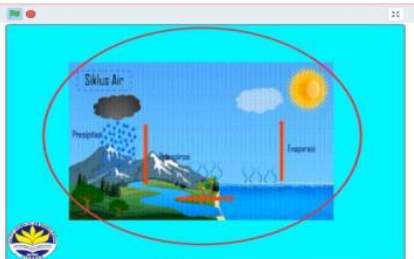
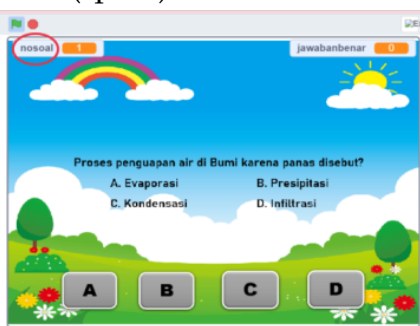
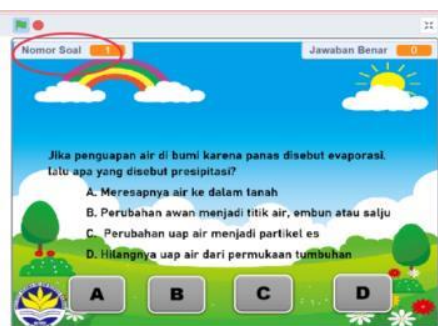
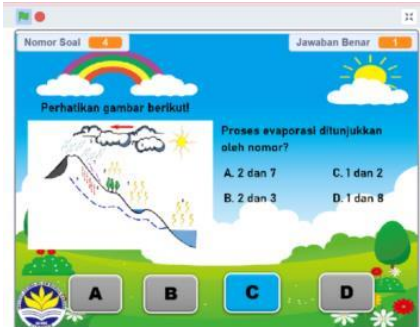
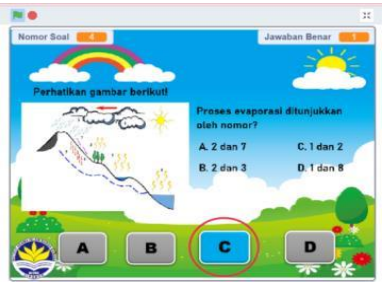
		
2	<p>There is an error in the writing of the word "analyze".</p> 	<p>Revision was made by correcting the word "analyze".</p> 
3	<p>In the use of foreign language, it must be italicized.</p> 	<p>Revision is done by italicizing the foreign language</p> 
4	<p>In quiz question number 3, the question sentence used is not logical</p> 	<p>Revision is done by changing the question sentence to be logical</p> 
5	<p>Quizzes are not questions Statement</p> 	<p>Revisions were made by changing all forms of quiz questions</p> 

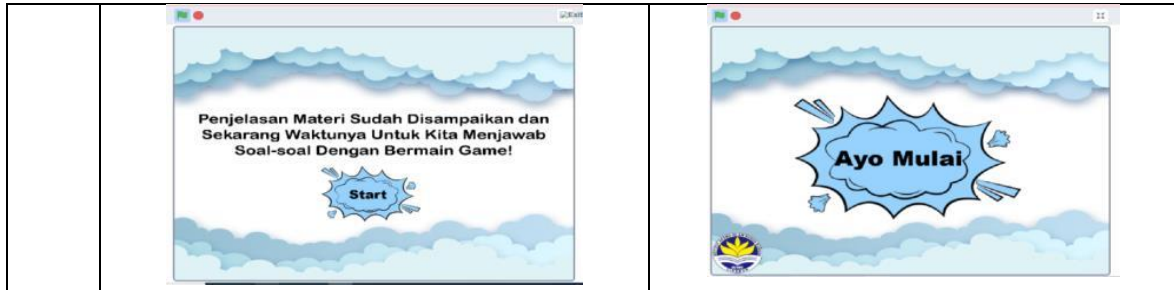


Validation by media experts provides constructive input related to several aspects of media design used in scratch learning media. Based on the results of questionnaires and interviews conducted with media experts, it was found that scratch learning media products received an average score of 4.9. Thus, it can be concluded that scratch learning media is very feasible to use in learning in elementary schools by making revisions according to the suggestions given.

Table 3. Corrections and Suggestions of Media Experts

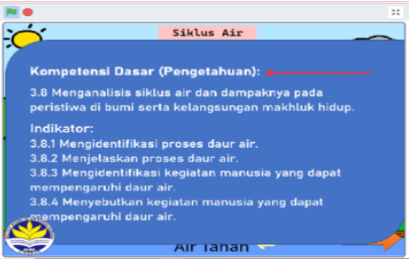
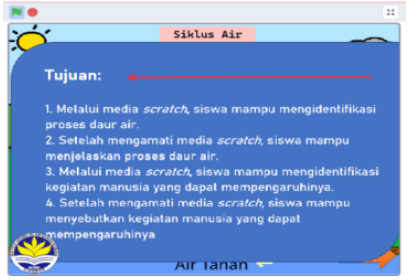
No	Corrections and Suggestions of Media Experts	After Revision
1	All media impressions should be given the university logo	Revision made by placing the university logo

		
<p>2</p>	<p>In the material explanation section, it should be a moving video not just writing (text)</p> 	<p>Revisions were made by changing the explanation of the material from text to moving images</p> 
<p>3</p>	<p>The writing of "question number and correct answer" should be given a pause (space).</p> 	<p>Revision is made by pausing the writing of "question number and correct answer".</p> 
<p>4</p>	<p>In the correct answer sound should be changed to a happy sound</p> 	<p>Revision made by changing the sound of the correct answer to the child's cheerful voice</p> 
<p>5</p>	<p>In the opening of the quiz, it is better if the button is enlarged to make it interesting</p>	<p>Revision made by changing the appearance of the quiz opening</p>



Validation by material experts to provide constructive input related to several aspects of SD / MI science learning material contained in scratch learning media. Based on the results of questionnaires and interviews conducted with material experts, it was found that scratch learning media obtained an average score of 4.5. Thus, it can be concluded that scratch learning media is suitable for use in learning in elementary schools by making revisions according to the suggestions given by material experts.

Table 4. Material Expert Corrections and Suggestions

No	Corrections and Suggestions of Material Experts	After Revision
1	In the initial appearance after the opening, the basic competencies and learning objectives to be achieved should appear	Revisions were made by adding basic competencies and learning objectives at the beginning of the display  

b. Field Test

The individual trial involved 5 learners with different levels of intelligence, including high, medium, and low. The results of the questionnaire given to the learners reflected their response to the individual trial. The questionnaire results

indicated that all indicators had received a very positive response from the learners, with the percentage level reaching 100%. The small group trial involved 9 learners representing low, medium and high intelligence levels. Based on the questionnaire results presented above, it can be concluded that all indicators received a very positive response from the learners, with the percentage level reaching 100%. Therefore, in this stage no revision of the media is needed because each indicator has received a very good response from students. The next step is to proceed to the field trial stage by involving a larger number of students.

c. Effectiveness of Sscratch Learning Media

The last stage of the formative evaluation is the field trial. Field trials have the aim of evaluating the extent to which the effectiveness of scratch learning media in achieving the expected goals and to get feedback from users regarding the use of the product. To measure the effectiveness of scratch learning media, learning outcomes tests are conducted through pretests and posttests. The results of the pretest and posttest will then be analyzed using the t-test. This field trial involved 32 students from two different schools, namely 18 students from SDN 2 Kreyo and 14 students from SDN 2 Danamulya.

1) Uji Normalitas

Tabel 5. Uji Normalitas

Tests of Normality

	Class	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
learning	pretest	.137	32	.133	.943	32	.090
outcomes	posttest	.160	32	.036	.938	32	.066

a. Lilliefors Significance Correction

Based on the given table, it can be concluded that the Shapiro-Wilk significance values for the pretest and posttest are 0.090 and 0.066. These values exceed 0.05, which indicates that the data has a normal distribution.

2) Uji Homogenitas

Tabel 6. Uji Homogenitas

Test of Homogeneity of Variance

		Levene Statistic	df1	df2	Sig.
learning outcomes	Based on Mean	.086	1	62	.770
	Based on Median	.142	1	62	.707
	Based on Median and with adjusted df	.142	1	60.293	.707
	Based on trimmed mean	.105	1	62	.747

Based on the given table, it can be concluded that the significance value based on the mean is $0.770 > 0.05$, which means that the significance value exceeds the set significance value. Therefore, it can be concluded that the data is homogeneous.

3) Hypothesis Test

In this study, hypothesis testing was carried out using the paired sample ttest test because the data showed homogeneity and normality. The following are the results of the paired sample t-test that has been carried out.

Tabel 7. Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	PRE TEST - POST TEST	- 11.62500	5.80184	1.02563	- 13.71678	- 9.53322	- 11.335	31	.000

In the paired samples test table, the calculated t value is 11.335, which exceeds the t table value of 2.0395. This shows that the alternative hypothesis (Ha) is acceptable while the null hypothesis (Ho) is rejected. Therefore, it can be concluded that there is a significant difference in learning outcomes in science learning with water cycle material before and after the use of scratch learning media.

2. Discussion

Scratch visual application learning media was chosen in this study because it is in accordance with the learning needs of students. The intended learning needs are about learning styles and learning media applied in the learning process. The majority of learning media and often used are conventional learning media or learning books from the government and the surrounding environment that is used as a learning media object. However, students feel boredom in learning and are not right for their learning style. So a learning media development is needed which according to new students and is considered more appropriate for their learning style, namely by developing visual scratch learning media.

To develop a learning media before conducting research to schools, a validation is needed. Validation of learning media is carried out by three experts or experts. These experts or experts were chosen because they are appropriate

and relevant to the learning media to be developed. The three experts or experts in this study are media experts who will assess the media to be developed. The second is the material expert, which will assess the material that will be included or collaborated on a medium that wants to be developed. And the last is a language expert who will assess the grammar of the total of all experts who are assessed whether it is feasible or not if applied in a learning media.

After validation from three experts is complete in the sense of passing the assessment, the next step is to conduct research at school. In the process of research to schools, learning media that have been validated are tested with two learning processes. The first is an individual test consisting of 3 to 5 students and the second is a small group test consisting of 7 to 9 students. After the two tests were carried out, the research continued by giving a questionnaire to validate whether improvements were needed from the students' assessment of the learning media to be developed.

The last process is the media effectiveness test. This process is carried out after the individual test and small group test. The media effectiveness test is carried out on the total number of students. In this effectiveness test, pretests and post-tests are carried out where the results of these tests are to measure the effectiveness of the media to be developed. The results state that there are significant differences in learning outcomes in science learning with water cycle material before and after using scratch learning media. Many educational researchers pay attention to the topic of Scratch in science learning for the period 2013-2023 (Wulandari et al., 2021). This is because scratch media contributes that Scratch can be used as one of the effective learning media and can be recommended in improving student learning outcomes. (Kusumawati, 2022)

CONCLUSION

Scratch learning media has passed the theoretical validation conducted by three experts, namely media experts, material experts, and language experts. The validation results of the three experts stated that scratch learning media is feasible to use in the learning process in elementary schools, with a note that it is necessary to make revisions according to the suggestions given by the three previous experts.

The development of scratch learning media has gone through empirical trials, including individual trials and small group trials, to see students' responses to the learning process using the product. Based on the results of the individual trial questionnaire, the scratch learning media received a very good response from students with a percentage level of 100%. In addition, the results

of the small group trial questionnaire data also showed a very good response from students with a percentage level of 100%.

The effectiveness of using scratch learning media can be seen from the learning outcomes after the field trial by giving pretest and posttest. The data obtained shows that $t \text{ count} = 11.335 > t \text{ table } 2.0395$, which means that the alternative hypothesis is accepted and the null hypothesis is rejected. Thus, it can be concluded that there are significant differences in learning outcomes in science learning with water cycle material before and after using scratch learning media.

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