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Chatbot Rain for Grade 5 in Water Cycle Material of Science Subject

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Abstract: The water cycle is science material for grade 5 in elementary schools, this lesson is very important because it relates to student experiences or real life. Not a few students have difficulty in learning it. Therefore researchers created Chatbot Rain to develop and produce products that help students better understand concepts and can improve learning outcomes in the process of learning water cycle material. This study uses research and development (R&D) methods with the ADDIE model (Analysis, Design, Development, Implementation and Evaluation). The analysis technique used is qualitative and quantitative which are then converted into a Likert Scale Interpretation table with a range of 5 scales. The research was conducted in several elementary schools with media applications that had been validated by media experts, material experts, and education experts as well as feasibility trials with small and large trials. The validation results of media experts were 88.23%, material experts were 92%, and education experts were 90% while media feasibility tests with large and small trials produced scores of 86.8% and 89.2%. While the effectiveness test obtained a score of 80.71%. Based on the results of these percentages, it can be concluded that the Chatbot Rain media is very feasible and effective to use and develop in the water cycle learning process in elementary schools.

Keywords: Chatbot; Grade 5; Water Cycle Material

Introduction

Media is a very important component in learning because it functions as an intermediary tool in encouraging learning (Junaidi, 2019). Learning media is very important for helping students' academic progress in the educational process because it can encourage student participation and collaboration (Savira and Gunawan 2022; Al-Rahmi et al. 2023). In addition, the media triggers students' interest, motivation, and feelings to be involved in the learning process which can help students to think and act critically (Hamid et al. 2020; Hidayah et al. 2020). Media in learning can be in the form of written and visual communication tools, along with several types of media, namely audio media (sound recordings), visual media (images or concrete objects), and audio visual (video) (Hidayah et al. 2020).

Based on the statement above, it can be concluded that the media is an introductory learning tool that can motivate students and convey the content of learning material. The right media is very important in learning because learning media is very motivating and effective in conveying ideas from various materials (Mulyawati, Arini, and Polina 2022; Wulandari et al. 2023). Media is said to be effective if it can be used in various contexts including facilitating students according to their learning characteristics Malahayati (2021) and to ensure the achievement of learning objectives, teachers must use materials and media that can attract students' interest so that in interactive student learning according to their learning style (Eliyasni et al., 2023). This is in accordance with the characteristics of grade 5 elementary school students who are at the concrete operational thinking stage, students learn to think so that concrete object media are needed besides that, students tend to like interesting things, and have high curiosity (Istianah et al. 2020; Safitri et al. 2022). Following are some of the advantages of using media according to Kemp and Dayton (1985), among others: Submission of topics/learning materials can be uniform, learning is clearer and more interesting, interactive learning increases, time and energy are used effectively,

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increases the effectiveness of student learning outcomes, media is very flexible, can help students develop positive attitudes towards learning materials and the teaching process, abstract learning can become concrete, media can help with sensory limitations (Karo- karo and Rohani 2018; Firmadani 2020).

All learning can use media, including water cycle material. Water cycle material is material that is closely related to knowledge of the surrounding natural environment that occurs in students' real lives, namely the event of the water cycle or the process of rain. This learning is very important to learn because it relates to student experience. In fact, there are still many students who do not understand the water cycle material. This is based on interviews conducted by researchers with various elementary school teachers. In the interview, it was found several problems faced by the teacher when teaching water cycle material in grade 5, namely students having difficulty understanding foreign terms, students being unable to focus when learning activities took place, and students not understanding each process of the water cycle. Based on previous research, it shows that learning in schools is currently more focused on delivering textbooks, less relevant to students' daily lives, tends to be abstract, and teachers pay less attention to their students' thinking abilities, or in other words they are less creative (Handayani et al., 2019). Next, according to (Lee et al., 2019) explained that teachers have conceptual knowledge that is lacking in science so that it can impact on the lack of media utilization in learning.

Based on the problems above, researchers develop innovative and creative learning media, namely, develop Chatbot media because the Chatbot System is one of the most popular AI tools to assist teaching and learning activities (Okonkwo & Ade-Ibijola, 2021). Chatbots are thought processors and mentors that use a series of messages to impart knowledge to beginners or professionals based on an analysis of their learning styles and understanding who use artificial intelligence technology and have a lot of data to interact with (Thomas, 2020) in integrating learning in the form of writing, gifs (moving images), images and learning videos to present information to students in various media formats that can help their understanding of subject matter, Chatbot is multimodal (Mou, 2023) so that it can be used for student learning in developing water cycle learning teaching resources.

In improving the quality of teaching to encourage the involvement of grade 5 students to be active in learning, and to make it easier for students to understand foreign words in the water cycle material. Researchers seek to help students better understand learning the water cycle, so researchers create educational Chatbot learning media based on a website. Website is a type of media according to (Panjaitan et al., 2022). This website is a collection of interconnected pages that display various data such as text, audio, video, or a combination of these. Some studies use interactive media in an effort to develop. Web-based media that utilizes internet technology without regard to space and time limitations (Adesfiana, 2022). Regarding the development of chatbots that utilize websites that can be used anytime and anywhere by students so that chatbots are a good way for students to learn independently (Verawati et al., 2022).

A chatbot is a computer program created to emulate conversations with human users, especially over the internet, by definition in the dictionary chatbot is a smart bot, interactive agent, digital assistant, or artificial conversational identity (Adamopoulou & Moussiades, 2020) which allows communicating with a human interlocutor at some level via text or voice (Pérez et al., 2020), but they are not made just for that they help in applications like e-commerce, business, information retrieval (Sarosa et al. 2020; Yang and Evans 2019). In addition, Chatbots were developed in the world of education as a form of educational revolution or a form of change in the world of education because chatbots have many benefits for their users. Supported by previous research (Wollny et al., 2021) Chatbot as a form of efficiency in education and as a form of companion in learning. Therefore the researcher developed an application to support science learning activities for grade 5 elementary school to make it easier for students to remember and understand the water cycle material because there are still many students who find it difficult to remember foreign words from the stages of the water cycle and also don't understand the water cycle. Namely with Chatbot media called Chatbot Rain which aims to determine the feasibility of developing Chatbot Rain media.

Method

The method in this study uses the ADDIE Development model (Analysis, Design, Development, Implementation, and Evaluation) where this model is used for a systematic learning development approach. This is reinforced by research by (M. Safitri & Aziz, 2022) that is, in producing a teaching material development product one can use the ADDIE model because the ADDIE model at each stage has revisions and evaluations so that it can adapt very well to various situations.

The following are the stages of applying the Addie method to the author's research. The first stage, analysis by conducting interviews with 5th grade elementary school teachers regarding media needs to support the learning process, in addition to analyzing student material related to the water cycle in accordance with the syllabus and lesson plans based on learning objectives and Basic Competencies, after that analyzing tools in making media materials. Second stage, designing the

design and flow of creating a chatbot such as the chatbot rain icon, the displays on the chatbot rain, and the features contained in it. Third stage, development carrying out validation with media, material and education expert validators. Fourth stage, Implementation carrying out product trials to determine the suitability of the media for 5th grade elementary school students at SDS Muhammadiyah 3 Jakarta and SDN PASEBAN 01 Pagi through small and large scale trials. The last stage, evaluation a form of evaluation of the media, researchers provide students' response sheets to the media as well as *pre-tests* and *post-tests* of the media so that an assessment of the feasibility of the chatbot rain media is produced.

The research approach used by researchers is to combine qualitative and quantitative research. Qualitative research in the form of surveys or interviews conducted with teachers and evaluation results from validators when conducting validation, and quantitative in the form of calculations of data resulting from surveys (Hermawan, 2019). This qualitative research can be seen in the pre-test and post-test tests conducted on grade 5 students at SDN Paseban 01 Pagi, as well as the student assessment questionnaire on chatbot rain media conducted at SDS Muhammadiyah 3 Jakarta. and the validation activities of experts, namely media experts , education experts, and material experts in the form of media assessment instruments. Researchers use a scoring system in the form of a Likert scale (Hapsari and Zulherman 2021;

Tanjung et al. (2023) with five possible answers, namely: very feasible (5), feasible (4), sufficiently feasible (3), less feasible (2), not feasible (1). The following is a lattice of expert assessment instruments found in Table 1, Table 2, dan Table 3. As for assessing student responses through small and large trials on the eligibility of the media using a Likert scale with five possible answers, namely: strongly agree (5), agree (4), quite agree (3), disagree less (2), disagree (1). The following is a research instrument grid that can be seen in Table 4.

Table 1. Material Expert Validation Instrument Grids

Aspect	Statement	Item Number
Curriculum	Compatibility of the material with	1
Learning	achievements in Basic Competency (KD) and Core Competencies.	2,3,4,5,6,7,8
Materials	The material taught to students is relevant to the learning media used.	9,10,11,12,13,14,
Aspect	The material is easily understood by students.	15
Evaluation	The material presented does not give the effect of saturation / boredom to students.	
Implementation	The material presented is coherent and systematic.	
	The material presented attracts students' interest in repeating the material.	
	The use of foreign languages in materials that are easy for students to understand.	
	The material presented is appropriate/not ambiguous.	
	The questions given are in accordance with the material provided.	
	The questions presented are easily understood by students.	
	The delivery of material with the learning media provided.	

Table 2. Media Expert Validation Instrument Grid

Aspect	Assessment Indicators	Item Number
Appearance	The Chatbot Rain background display is in accordance with the water cycle material.	1,2,3,4,5,6
	The menu display on the Chatbot Rain is in accordance with the water cycle material.	
	Attractive layout and layout.	
Writing	Chatbot Rain design can attract students' attention.	7,8,9
Ease of Navigation	The use of text, images, animation, and audio/video on the chatbot is in accordance with the material.	10,11,12,13, 14,15,16,17
	The harmony of text, images, gifs and videos is in accordance with the material.	
	The writing on the buttons is easy to read.	
	The font size used is appropriate. The typeface used is appropriate.	
	Chatbot media is easy for 5th grade students to use.	
	The commands in the learning media program are simple and easy to understand.	
	The shape and location of the navigation are consistent throughout the display of learning media. The navigation is easier for students to operate.	
	The media runs well or doesn't easily hang/crash during operation.	
	Learning media activates student responses.	
	Learning media developed according to specifications that are easily accessible to schools, teachers, and students.	
	Overall, chatbot rain learning media can create a fun learning atmosphere.	

Table 3. Educational Expert Validation Instrument Grid

Aspect	Statement	Item Number
Quality of content and purpose	Material according to the needs of students.	1
Learning Quality	Chatbot Rain can give students a new impression of learning.	2,3
Technical Quality	Can motivate students in learning.	4,5,6
	Clarity of instructions for use.	
	Fluency in using the Chatbot Rain application.	
	Easy to use.	

Table 4. Student Response Sheet grids

Statement	Item Number
I really like the CHATBOT RAIN material and it looks very attractive.	1,2,3,4,5,6,7,8,9,10
CHATBOT RAIN helped me understand the water cycle material.	
I find it easier to understand the material	
water cycle with CHATBOT RAIN.	
CHATBOT RAIN is very easy to access.	
The buttons on the chatbot make it easier for me to see the menus on the chatbot.	
The magic word makes it easier for me to remember	
and knowing difficult words (foreign language) in the water cycle.	
The Interesting Facts section increase my knowledge.	
The Fun Room & lyrics guessing games feature helps me remember the stages of the water cycle process.	
Providing GIFs & videos keeps me motivated in learning and makes learning easier for me.	
Giving Medals & Leaderboard Features (leaderboard) keeps me wanting to learn and repeat water cycle material to improve my understanding.	

Quantitative descriptive analysis and qualitative descriptive analysis were used as data analysis techniques. Data validation results from experts and student response questionnaires through small and large trials are managed using descriptive quantitative analysis in the form of descriptive percentages. The following qualitative descriptive analysis technique is used to assist in decision making (Laksmi & Suniasih, 2021). The data obtained were then analyzed and compared according to the eligibility percentage table. The following is a table of the percentage of feasibility of learning media found in Table 5.

Table 5. Learning Media Eligibility Criteria

Percentage (%)	Eligibility Criteria
81- 100	Very Eligible
61 - 80	Eligible
41 - 60	Eligible Enough
21 - 40	Less Eligible
0 - 20	Not Eligible

Based on research from (Sitepu & Gandamana, 2023) the results of the response questionnaire from the expert validators can then be compared with the number of answers to all items (∑x) with the maximum value of all items (∑xi). Effectiveness test calculation formula

$$P = \frac{\Sigma x}{\Sigma xi} x\ 100\ \% \quad (1)$$

More accurate calculations, by doing overall calculations(Fitra & Maksum, 2021).

$$\text{Overall Completeness} = \frac{Score\ obtained}{Total\ number\ of\ students} \times 100\% \quad (2)$$

To find out the category of media effectiveness level can be seen in Table 6.

Table 6. Media Effectiveness Level Criteria

Achievement Level (%)	Criteria
90 – 100	Very Effective
80 – 89	Effective
65 – 79	Effective Enough
55 – 64	Less Effective
0 – 54	Not Effective

Result and Discussion

Result

The results of this study discuss the development of Chatbot Rain media and the feasibility of Chatbot Rain. In developing the Chatbot Rain product, researchers used the ADDIE model, following the stages: **The first stage,** namely the analysis stage. At this stage the researcher analyzed the problems that occurred when students did not understand the meaning of absorption words (foreign terms) at the stages of the water cycle, students were less focused on learning because of a lack of media to support learning. So that the impact is that students do not understand the material explained and tend to feel bored. **The second stage,** namely the design in making the product. Researchers are looking for material according to the syllabus that comes from the internet, books, and learning videos. Then enter material, questions, photos, videos and gifts into the chatbot application through coding which is done on the Smojo.AI website.

The third stage is the development in making the research material by adding interesting fact features to increase students' knowledge, then adding pictures, video and audio to increase student interest in learning. There are quizzes containing questions that students can fill in as a form of understanding after studying the material. Furthermore, there is a game about the water cycle that is added to the chatbot application. Here's the Chatbot Rain link https://app.smojo.org/nidafarhana2412/Rain and Chatbot Rain's look in the image.

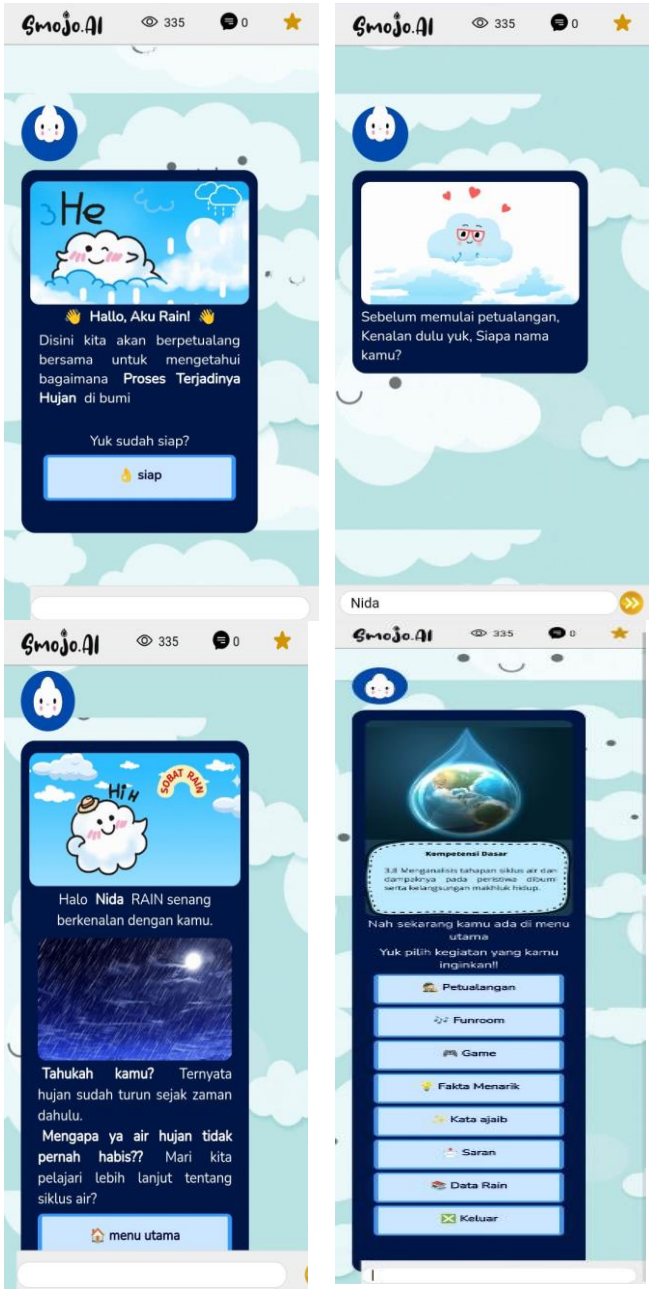

Figure 1. Menu display on Chatbot Rain

The fourth stage is the implementation stage of validating media experts, materials and education experts followed by product trials on grade 5 students at SDN PASEBAN 01 Pagi and SDS Muhammadiyah 3 Jakarta. Chatbot feasibility test with a small trial of 5 students and a large trial of 10 students at SDS Muhammadiyah 3 Jakarta. As well as testing the effectiveness of Chatbot Rain media on all 5th grade students at SDN Paseban 01 Pagi. Based on the results of **media experts validation**, a percentage of 88.23% was obtained which stated that the media was very feasible to apply. The assessment was based on several aspects, namely appearance, writing, and ease of navigation. Furthermore, the results of the **material expert validation** with several aspects of the assessment are based on aspects of the curriculum, learning materials, evaluation, and implementation. A percentage of 92% was obtained, namely with very decent qualifications and material experts suggested writing indicators of learning objectives in the application and adding HOTS questions to practice questions in chatbots. The results of the validation of **education experts** based on aspects of the assessment, namely the quality of content and objectives, learning quality, and technical quality, obtained a percentage of 90% which stated that the media was feasible to be tested.

Based on the results of student responses to Chatbot Rain media, seen from the small and large trials that have been carried out, namely the results of a score of 86.8% (small trial) and 89.2% (large trial) from the two data obtained, it can be said that the Chatbot media Rain has very decent qualifications to use if the two results are combined to get 88% which means it is very feasible to use.

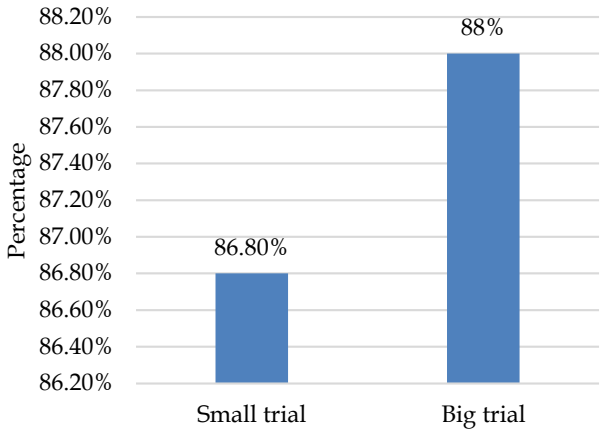

Figure 2. Diagram of media eligibility test

To find out the effectiveness of Rain's Chatbot media, researchers used a pre-test and post-test conducted by 28 students at SDN PASEBAN 01 Pagi to find out how much students' understanding before using Rain's chatbot media on the water cycle material, and to find out how much students' understanding after using the Rain chatbot media. using ChatbotRain. It can be seen from the following data that there has been an increase.

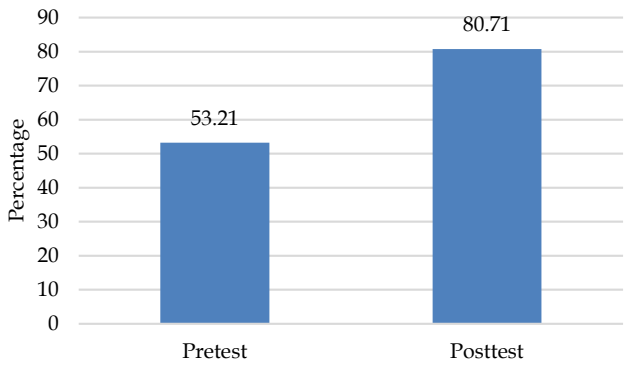

Figure 3. Diagram of recapitulation of pre-test and post-test results

Based on the results of the pre-test, the results obtained were 53.21% and the post-test results were 80.71%, from these data there was a significant increase because there was an increase of 27.5% so that it can be said that Chatbot Rain was effective in increasing students' understanding of cycle material. water. Based on the results of the documentation, students are very enthusiastic in learning using chatbot rain and students easily understand each navigation button, they learn material in the form of writing and videos. They remember every process of the water cycle with songs and sing it with joy. It can be seen that students' knowledge of the water cycle material was very different before being given treatment using rain chatbots and after being given treatment with chatbot rain media.

Figure 4. Chatbot Rain Media Testing Process

The fifth stage, namely evaluation of the results of filling out student response sheets to Chatbot Rain media which was tested through small and large trials, as well as evaluating the results of assessments from media expert validators, materials, and education experts, in testing the effectiveness of Chatbot Rain. So that the resulting assessment for chatbot rain media is very feasible to use and effective as a water cycle learning media.

Discussion

In this era of globalization, various technological, information and communication innovations are increasingly being used, one of which is artificial intelligence (AI) technology, namely chatbots. (Siti et al. 2023; Peniarsih 2023). Based on the research results, the website-based Chatbot Rain learning media is very feasible and effective to use to help facilitate students' understanding of water cycle material learning, because Chatbot plays a very important role in helping learning, the material presented is quite interesting, and the chatbot application does not burden the performance of students' cellphones because their use is based web so it is very light when used via mobile (Sarosa et al., 2020). So that students not only know the material but can understand every process of the water cycle in a fun way. According to research (Hamid et al., n.d.) media as a bridge or introduction between message sources and audiences, triggering their interest, motivation, and feelings to encourage and involve them in the learning process.

Based on previous research, Chatbot can provide convenience for its users and is one of the newest fun learning innovations. Chatbot Rain trains students' abilities by providing quizzes, interactive lessons, and other learning materials for students (Zulkarnain et al., 2020). This supports the science learning process because students must be actively involved in learning, therefore researchers choose Chatbot Rain to be able to explore their abilities, improve problem solving skills, and curiosity. (Laksmi & Suniasih, 2021).

The ADDIE model has proven to be effective in the Chatbot Rain media development process supported by research from (Andi Rustandi and Rismayanti 2021; Cahyadi 2019) states that the ADDIE model is widely used by educators in learning design because it is effective and efficient (Abdul Ghani & Wan Daud, 2018) must go through good planning. The ADDIE model is designed to produce effective, interactive, innovative and quality learning (Baharuddin, 2018) to improve learning outcomes (Spatioti et al., 2022). Furthermore, there are several aspects that influence the success of Chatbot, namely being relevant to school material, increasing student motivation, having an attractive design, and improving student learning outcomes. If you have met these criteria, Chatbot is included in the valid category so it is very feasible to be developed and used in the learning process (Siti et al., 2023). The advantages of Chatbot Rain media are easy to use because it can be used anywhere and anytime as long as there is a gadget and an internet connection, it doesn't take up a lot of quota and memory because it's web-based, students find it easier to memorize terms in the water cycle process because songs about the water cycle are presented in in the chatbot, it also has an attractive appearance and menu for students to access and there is discussion in the questions so that students can analyze the results of the answers.

Based on the research that has been done, the researcher is in line with previous research, which says

that Problem Solving-Based Chatbot Website Learning Media is included in the category of very feasible and very good (A. Safitri et al., 2022). The results of other studies conducted by (Zulkarnain et al. 2020; Wollny et al. 2021) states that the chatbot application as an e-learning medium helps teachers in the learning process effectively and efficiently. Furthermore, in previous research it was found that Chatbot is feasible and effective to use and develop in the learning process for elementary school students (Siti et al. 2023; Dhamantara 2022).

The researcher agrees with previous research which states that Problem Solving-Based Chatbot Website Learning Media is included in the very feasible and very good category (Fauziah et al., 2022). Next according to (Zulkarnain et al. 2020; Mad Daud 2020) chatbot applications as e-learning media help teachers in the learning process effectively and efficiently. In addition, chatbots are appropriate and effective for use and development in the teaching and learning process (Siti et al. 2023; Dhamantara 2022). According to (Kuhail et al. 2023; Pham et al. 2018) chatbot is the newest feature in motivating students and directing students in learning in stages according to student abilities. According to (Hasman et al., 2023) in his research, namely "Increasing Science Learning Outcomes Through Chatbot-Based Digital Interactive Media in Grade 4 Students" states that increasing Chatbot-based digital interactive media can improve science learning outcomes.

The implication of this research is to provide an overview of the utilization of technological sophistication in the form of Artificial Intelligence which is applied in science learning on the water cycle material, namely Chatbot Rain helps train students' abilities gradually, helps students learn independently so that learning is fun and meaningful and there has been an increase in learning outcomes after students using rain chatbot media in learning that is tested through the Pre-test and Post-test. This research is very useful for teachers, namely as a support for learning media and for students as an intermediary to support the process of learning activities. In this study has a limited scope. Therefore, it is hoped that future researchers can broaden and deepen the scope of chatbots in other studies.

Conclusion

Based on the results of discussion and data analysis as well as due diligence by validator experts, student responses and effectiveness tests in the form of pretest posttest, it is clear that chatbot products are very feasible, effective and useful as science learning media for 5th grade elementary school students on the water cycle material. This Chatbot Rain product can help teachers present material more interesting, effective and efficient. In addition, students are helped and understand more in learning the water cycle material in a more enjoyable way and can be used to recall learning flexibly, so that students can strengthen students' thinking concepts related to the water cycle.

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Nida Farhana: writing original draft preparation, result, discussion, methodology, conclusion; Novanita Whindi Arini Proofreading, review, and editing.

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