

Development of Water Cycle Comic Media to Improve Student Learning Outcomes

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ABSTRACT

The lack of use of instructional media affects student learning outcomes. While the characteristics of elementary school students prefer something interesting, concrete, accompanied by high curiosity. Therefore, researchers developed a water cycle comic media to improve the learning outcomes of fifth-grade students in elementary schools with the purpose of the study to discover the feasibility of a water cycle comic media including validity, practicality, and effectiveness. In its development, researchers used the ADDIE model which consists of five stages with evaluation at each stage. From the results of research on the development of comic media for water cycle material, the percentage obtained from media validity was 95.31%, material validation was 92.5%, and language validation was 93.75%. Furthermore, the practicality data of comic media about the material of the water cycle on the water cycle based on the student response questionnaire was 91.07%. Data on the effectiveness of the water comic cycle media from student learning outcomes in pre-test and post-test activities have a significant increase in n-gain analysis with an average increase of 0.71 which has a "high" category. So the use of comic media has an impact on student learning outcomes and student creativity.

Keywords: *Media Development, Comic Media, Water Cycle*

1. INTRODUCTION

Natural science is the knowledge of all events related to the universe [4]. Learning science itself examines natural events that are structured systematically based on the results of experiments and observations. By conducting experiments and trying to get children to think critically [4]. However, science learning is very interesting because it only contains a theory that makes students, in fact, difficult to understand the material so that it makes learning activities passive and students only receive textbook-based material [5]. Meanwhile, learning science in elementary schools becomes a forum for students to increase their curiosity so that they can improve their ability to ask questions and find answers based on evidence by thinking naturally [4]. To support student understanding, several components are needed in learning.

One of the most important components is learning media. In the learning process, the media acts as a form of communication which is learning necessary in order to achieve learning efficiency and effectiveness [7]. The application of learning media in learning activities can increase student motivation and increase student interest

during learning activities. In planning the use of instructional media, the teacher must pay attention to the suitability of the objectives, materials, and learning strategies. Also, teachers need to consider the level of attractiveness of using learning media. That way will increase the level of effectiveness of learning media.

The use of effective learning media can have an impact on student learning outcomes. This was confirmed by the opinion of [8] who also stated that students were more pleased with the use of effective learning and selection media because it made it easier for students to understand the material so that it had an impact on student learning outcomes.

Based on the researcher's experience when carrying out the PLP (School Field Introduction) activity at SDN Lontar 481 Surabaya, the implementation of learning activities in class V still did not involve grade V students during learning. The learning activities carried out by the teacher have been linked to several examples in daily life, which are sourced from textbooks and use several learning media, such as pictures in student books, picture posters posted on walls, and LCDs. Besides, from the results of observations during literacy activities in the

school library, most students chose picture books and students exchanged picture books to read. This is because observing and reading books with more pictures can attract students' attention and curiosity about the contents of the book.

In this study, researchers used water cycle material in grade V elementary school because this material was included material that was important for the daily lives of students. As is well known, most activities in daily life involve and require water. However, there are still many students who do not know how the water cycle on earth is. For students to be wiser in using water and protecting the environment, efforts are needed to increase students' knowledge regarding this matter. Also, to increase interest and quality in science learning, learning activities are needed that are innovative, fun, communicative, and intermediary for delivering material, namely learning media. That way, students who are initially reluctant to read books will be interested in it. One effort that can be applied to realize this is by utilizing comics as a learning medium as well as teaching materials in science learning.

The development of this comic media was carried out based on several findings obtained by field researchers at SDN Lontar 481 Surabaya, as described above. That is the characteristic of elementary school students who prefer something interesting, concrete, accompanied by high curiosity. So that researchers consider developing comics as a learning medium. Because comics have characteristics that are equipped with attractive image displays, they are considered able to attract students' attention and curiosity. Furthermore, the material applied to the comic is the water cycle material as described in the previous paragraph. This is done with the hope that by depicting water cycle material through comics, students will appreciate and understand more about the importance of water for living things. That way, students will appreciate the environment more from an early age.

The development of science comics is adjusted to the characteristics of the 2013 curriculum student book with several similarities such as the use of pictures, lifting material from students' daily lives, choosing the sentences used according to the level of thinking of students in which grade V students are still in the concrete operational stage, namely being able to think logically with concrete objects, but cannot think abstractly, and do not contain elements of violence or other negative elements in it. The use of comics is also adapted to the characteristics of water cycle science learning material which involves the ability to think scientifically through observations and facts contained in a series of stories in comics. Also, if comics are integrated into cartoon characters and storylines, they can be used as role models in student life, so that comics can affect students' attitudes, characters, and grades (Puspitorini, et al., 2014).

From the description above, the research objectives of the development of water cycle science comic media include: (1) To determine the validity of the water cycle comic media material to improve the learning outcomes of fifth-grade students in elementary schools; (2) To determine the practicality of comic media for water cycle material to improve the learning outcomes of fifth-grade students in elementary schools; (3) To determine the effectiveness of the comic media of water cycle material in improving the learning outcomes of fifth-grade elementary school students.

2. METHOD

This research is included in the type of research and development commonly called Research and Development. This study applies to the ADDIE model. The ADDIE model is appropriate if it is developed as an innovative learning medium because it creates a systematic and effective learning process (Arini, 2013). ADDIE stands for Analyze, Design, Develop, Implement, and Evaluate [14]. The ADDIE model was chosen based on considerations which state that the ADDIE model in its development is carried out systematically and based on the theoretical foundations contained in the learning design. Also, the ADDIE model is arranged programmatically and there is a sequence of activities arranged systematically to overcome problems regarding learning related to the use of learning resources which should be adjusted to the needs and characteristics of students [15].

The trial subjects, including 5 students of Lontar 481 Surabaya Elementary School in trial 1 and 26 students of Lontar 481 Surabaya Elementary School in trial 2. In this research and development, there are two types of data, namely qualitative and quantitative.

Research and development of science comics require a data collection stage to achieve the research objectives. In this study, the validation instrument data used a closed questionnaire in the form of a rating scale. The percentage calculation of the validation results uses the following formula [16]:

$$P = \frac{\sum x}{\sum xi} \times 100\%$$

The criteria for the validation results as a reference used to measure the success rate of the product are by the following table:

Table 1. Percentage Criteria for Validation Result [16]

Percentage	Action	Criteria
80%-100%	Valid / Eligible for use	No need to revise
60% - 79%	Quite valid / Quite worthy of use	No need to revise
40% - 59%	Less valid / Not suitable for use	Needs to be revised
0% - 39%	Invalid / Not suitable for use	Needs to be revised

The data analysis from the questionnaire results was obtained from student questionnaire sheets and used by researchers to determine student responses to the existence of comic science learning media for water cycle material. Furthermore, the score is calculated from each answer from the student questionnaire sheet. The calculation of the percentage of the questionnaire results for each aspect uses the following formula [17]:

$$PSA = \frac{\sum \text{alternative answers selected every aspect}}{\sum \text{alternative ideal answer for every aspect} \times N} \times 100\%$$

Furthermore, the score for the entire program or all aspects is calculated using the following calculation formula [17]:

$$PSP = \frac{\sum \text{value of all aspects}}{\sum \text{number of aspects} \times N} \times 100\%$$

The questionnaire results criteria as a reference used to measure the success rate of the product according to the following table:

Table 2. Criteria for Student Questionnaire Result [17]

Percentage	Action
0% - 20%	Not feasible
21% - 40%	Not worth it
41% - 60%	Pretty decent
61% - 80%	Worthy
81% - 100%	Very worthy

Table 3. Learning Success Levels (Arikunto, 2010)

No.	Score (%)	Success Criteria
1.	81 - 100	Very good
2.	61 - 80	Well
3.	41 - 60	Enough
4.	21 - 40	Less
5.	0 - 20	Very less

Furthermore, the data were analyzed through N-gain analysis to determine the increase in the value of the pretest and posttest results. The N-gain formula is used as follows:

$$\langle g \rangle = \frac{\text{Skor posttest} - \text{Skor pretest}}{\text{Skor ideal} - \text{Skor pretest}}$$

After the N-gain results are obtained, it is followed by calculating the student's score using the N-gain category in the table below:

Table 4. Normalized N-Gain Interpretation

Normalized Gain Value	Interpretation
$-1,00 \leq g < 0,00$	There has been a decline
$g = 0,00$	There was no decline
$0,0 < g < 0,30$	Low
$0,30 \leq g < 0,70$	Moderat
$0,70 \leq g < 1,00$	High

3. RESULT AND DISCUSSION

Development of comic media for water cycle material to improve learning outcomes of fifth-grade elementary school students in its development by applying the ADDIE model. Development through the ADDIE model has several stages, including analysis, design, development, implementation, evaluation.

First, at this analysis stage, several analyzes were carried out aimed at finding the constraints and needs of students in the water cycle material of science learning activities, including analysis of student books, educators, student books, literature studies, learning media, and continued with the evaluation stage.

From the results of the analysis phase obtained from several aspects, namely educators, students, student books, literature studies, and the learning media used. Then the last step in this analysis stage is evaluating. The evaluation stage at this stage the researcher is assisted by a supervisor. The results obtained from the analysis activities that have been carried out show that the fifth-

grade students of SDN Lontar 481 Surabaya do not understand the material in-depth due to ineffective learning media and student books that affirm the name of the stages at each stage of the air cycle image. So that it can be seen that one of the supporting components of learning activities that are needed by teachers is learning media.

From the results of the description above, the researcher has the idea of developing learning media that can be useful for students to facilitate understanding of the air cycle material and can also help teachers in delivering air cycle material. Learning media that will be packaged in a form that is as attractive as possible, concrete, and still pays attention to the details of the material contained therein. So that students will be interested, more enthusiastic, and focused on participating in learning activities. Therefore, to overcome these problems or problems, the researcher aims to develop comic media for learning science on water cycle material.

Second, from the results of the analysis stage, testing the problems or problems that students have in learning. Furthermore, the researchers conducted a design or design to develop science comic media for air cycle learning materials. The following is the design of the media that teaches the science air cycle material: (1) This learning tool will be applied when carrying out learning activities in class; (2) The material developed is invincible with the sub material that will be applied to comic media so that the material contained is more focused; (3) The design of this media is built on a storyboard which aims to facilitate researchers as the basis for developing comic media for science learning air cycle material.

After the design stage is carried out on learning devices, materials, and media, it is followed by the evaluation stage. In this evaluation stage, the researcher is assisted by a supervisor to evaluate the learning tools, the material used, and the background design, stories, and characters in the media. So that the supervisor can provide input to improve the science comic media, the water cycle material is even better.

Third, this development stage is a stage to realize the natural science comic media air cycle material based on the analysis stage and the resulting design stage. The next step after the making and printing of water cycle material comic media is the process of validating science comic media for water cycle material by experts. As for the validation carried out on comic media, the material for this water cycle is the validation of material, media, language, learning tools, questionnaire sheets, pretest, and posttest question sheets. The results of the validation and also input from experts will later be used as a basis for media revisions or improvements. So that the developed media will be more optimal and better.

The validation of the natural science comic media material on the air cycle was carried out by media experts in the primary school teacher education (PGSD) department. The validation score for the science comic media air cycle material is 59 out of a total score of 64. Furthermore, presenting the calculation of the validation results of the science comic media, the water cycle material obtained a score of 95, 31% in the valid/suitable category as well as some suggestions from the validator.

Validation of the material in the natural science comic media material on the air cycle was carried out by a validator of science material experts in the primary school teacher education department. Furthermore, the calculation of the presentation of the results of the validation of the material on the natural science comic media material on the water cycle obtained a score of 92.5% with the category valid/suitable for use as well as some suggestions. from the validator. Validation of the language in the science comic media of this water cycle material is carried out by expert validators in the field of language. Furthermore, presenting the calculation of the results of the language validation score on the science comic media water cycle material obtained a score of 93.75% with the category valid/feasible to use and some advice from the validator.

The learning device validation learning tools include lesson plans, syllabus, teaching materials, LKPD, lattices, and pretest and posttest question sheets. Based on the results of the calculation of the percentage of the validity of the learning tools on the natural science comic media, the water cycle material obtained a score of 88.63% and the percentage of the validity of the pretest and posttest questions was 90%. So, the results of the presentation can be said to be valid because they are in the range of 80% - 100%. There is also some input from the validator.

The validation of the student response questionnaire sheet, based on the results of the calculation of the percentage validity of the student response questionnaire on the science comic media, the water cycle material obtained a score of 90.38%. The results obtained are in the range of 80% - 100% with valid categories. So that the student response questionnaire sheet on the science comic media air cycle material can be said to be valid with some input from the validator.

After several steps have been carried out above, the development with an evaluation phase. The evaluation stage at this development stage is assisted by validators or experts. Then the evaluation stage is carried out through the process of revising instruments, media, materials, language, learning tools assisted, and guided by a validator.

Fourth, the implementation stage in this study was carried out in two stages, namely trial 1 on a small scale and trial 2 on a large scale. The following is an

explanation of the process of implementing the media trial: (1) The process of trial 1 was carried out on a small scale, for 5 grade V students of SDN Lontar 481 Surabaya. Also, the results of the questionnaire responses received 92.8% of student prizes in the category of "very feasible" and from the response of students can also state that students want to apply comic media to other subjects.; (2) The trial process 2 was conducted on a large scale, to 26 students in class V SDN Lontar 481 Surabaya. From the results of the questionnaire, the students' responses during the second trial showed that the number of questionnaires obtained from 26 students was 1.776. That way, the calculation of the results from all aspects is 91.07%. So it can be said that the science comic media material cycle water has a very suitable category to be used. Furthermore, from the results of the pretest and posttest scores, the students' average score at the pretest was 58.69 and the students' average score at the posttest was 87.23. That way, the average increase in student scores from the pretest and posttest was 28.77. It is estimated that the percentage of learning completeness in classical posttest activities is 100%. The results of the n-gain calculation show that there is an increase in value with an average of 0.71 and it is in the high category. That way, the use of science comic media on water cycle material affects improving student learning outcomes.

The evaluation stage at this implementation stage was obtained from the results of the response questionnaire and the pretest and posttest sheets that had been filled in by grade V students. That way, all the results that have been obtained can be used as conclusion drawers related to the final development of the science comic media product air cycle material.

Based on the results of research conducted on fifth-grade students at SDN Lontar 481 Surabaya, it was found that the development of the science comic media for this water cycle material is suitable for use. This media is suitable for use with the support of the results of obtaining validity, practicality, and effectiveness which confirms that the science comic media water cycle material can be used as a learning medium to increase student understanding and can improve student learning outcomes.

The validity data on the development of science comic media for water cycle material were obtained from the validation results. The validation process which is an important process in the development of this media has several validations. First, material validation with a percentage score of 92.5%. Second, media validation received a percentage of 95.31%. Third, language validation obtained a percentage of 93.75%. Fourth, the validation of learning tools with a score of 88.63%. That way, from the results of the validation, the science comic media of cycle material can be said to be suitable for use because it is in the 80% -100% range [16].

Furthermore, practicality data were obtained from student response questionnaires when implementing this comic media in small-scale trials and large-scale trials. From the results of filling out the questionnaire, it was found that students became easier to understand the water cycle material after using the science comic media on the water cycle material. This statement was evidenced by the results of a student questionnaire stating that this comic medium was able to improve understanding of the water cycle with a percentage score of 96.92%. So that this statement is in line with the opinion of [6] that one of the functions of related learning media can make the material conveyed in detail. By conveying the material in detail, students understand the material better and it is easier to apply it to everyday life and evaluation questions.

Also, according to [18], learning media are useful for increasing student interest in learning. This statement is evident from the results of the student questionnaire on the aspects of students who are interested in learning to use comic book media with a percentage of 90%. Furthermore, learning activities using science comic media made students not get bored quickly when learning to use comics with the acquisition of a questionnaire of 94.61%. This is supported by the opinion of [19] which states that involving learning media in the learning process can make students' interest to learn more increase and also students who can be directly involved in the use of media. By doing so, students feel the learning activities undertaken to be fun and not boring. Therefore, students also become interested in using this media. This was obtained from the results of student questionnaires with a percentage of 87.69%.

The effectiveness of this development research was obtained from the results of the pretest and posttest activities given to 26 fifth grade students of SDN Lontar 481 Surabaya. In this case, the increase was significant with an average pretest score of 58.69 and an average posttest score of 87.23. Furthermore, in the n-gain analysis, there is an increase with an average of 0.71. The n-gain results are in the range of $0.70 \leq g \leq 1.00$ with the high category [20]. There is an increase in student learning outcomes as intended by increasing the use of natural science comic media on-air cycle material. That way, it can be said that the science comic media water cycle material affects student learning outcomes. The successful use of science comic media for water cycle material is in line with the opinion of Suparmi (2018) who used the use of comic media in the science learning process to improve understanding of material better, thereby increasing student learning outcomes.

From the results of the implementation that has been done, the use of natural science comic media of this water cycle material does not only affect student learning outcomes. However, it also affects the level of creativity because of the illustration, so that students produce

students. This result is supported by the opinion of Saputro (2018), namely reading comics in addition to motivating to read also inspires children's motivation based on the development.

4. CONCLUSION

Based on the results of the development research as well as a description of the discussion related to comic media on natural science learning water cycle material to improve student learning outcomes in class V SDN Lontar 481 Surabaya, it can be concluded as follows: (1) From the results of the acquisition of good, media, material, language validation values, learning tools, and student response questionnaire it is known that the science comic media for water cycle material is a valid or appropriate media to use; (2) The data obtained from the practicality of science comic media for water cycle material based on the student response questionnaire obtained a percentage of 91.07% in the very feasible category; (3) The results of the data collection on the effectiveness of the science comic media of the water cycle material were obtained from student learning outcomes in the pretest and posttest activities. That way, it is known that there is a significant increase in the n-gain analysis with an average gain of 0.71 and the "high" category.

From the results, there are several suggestions as follows: (1) During implementation activities it is better if the teacher guides students to review the material contained in the media. comics, to minimize the occurrence of misconceptions. (2) Mentoring students when using comics to check students' focus on reading comic media.

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