

Development of Three-Dimensional Visuals Learning Media Using the Scientific Approach

Lala Jelita Ananda¹, Elvi Mailani², Desi Dwijayanti³

^{1,2,3}Primary School Teacher Education, Medan State University, Medan

¹ljananda@unimed.ac.id

The purpose of this study was to determine the effectiveness of three-dimensional visuals learning media using the scientific approach. The type of research is development research. The subjects of this study were students of class V-C Primary School (SDN) 101766 Bandar Setia and consisted of 28 students. Data collection techniques in this study used questionnaires and tests. Based on the results of the first media expert validation research an average score of 4.33 and 4.80 was obtained, while the results of the second media expert obtained an average score of 4.47 and 4.67. The results of the validation of the first material expert obtained an average score of 4.77 and 4.85, while the results of the validation of the second material expert obtained an average score of 4.38 and 4.69. The results of individual trials obtained an average score of 4.67, and the results of small group trials obtained an average score of 4.35. The results of field tests obtained an average score of 4.60. The results of the pre-test scores obtained an average score of 41.6 and the post-test results obtained an average score of 78.6. In regard to the pre-test and post-test scores on science subjects, the average score was 3.68 and 6.11.

Keywords: *scientific approach, visual learning media*

INTRODUCTION

Learning media is important in education because learning media can deliver messages and stimulate student interest and attention to achieve learning goals. Thus, there will be educational interactions between students and teachers, so that there are changes in the understanding, skills or attitudes of students. It is essential to teach children how to use different media from a very early age so that by the time they reach school age, they have become diverse media users who know how media is created, its different aspects of it, and can apply critical thinking, as well as take advantage of possibilities offered by media, such as communicating, information gathering and entertainment (Pöldots, 2016; Norris & Ennis, 1989; Watson, 1980; Ennis, 1993; Paul & Binker, 1990).

Based on interviews with the headmaster of SDN 101766 Bandar Setia, the school has visual social, science, mathematics, and sports media. However, teachers do not use it optimally in learning. The unavailability of projectors in schools affects the effectiveness of the delivery of learning materials (Löchtefeld, et. al. 2010; Löchtefeld, et. al. 2009; Mathur, et. al. 2011; Schöning, et. al. 2010). Incomplete media in schools is one of the factors inhibiting the the teaching and learning process.

Based on the results of interviews with teacher and students, the delivery of material was found to be very difficult for students to understand. This is due to the unavailability of learning media that can support the theme. Students prefer to use the media when the learning process takes place because students more easily understand the content of the subject matter provided by the teacher (McEwan & Bull, 1991; Burch & Spillane, 2003; Biglan, 1973). With this visual learning media students are expected to be more motivated and be able to attract learning interest and can improve student learning outcomes (Mayer & Massa, 2003; Kirby, et. al. 1988; Reid, 1995; Gilakjani, 2012; Park, 2000).

Based on the learning competencies and characteristics of students on the theme 8 (*Lingkungan Sahabat Kita*), Subtheme 1 (*Manusia dan Lingkungan*) was about the media of water cycle learning. Water cycle learning media was included in the three-dimension visual media (Ben-zvi-Assarf & Orion, 2005; Márquez, et. al., 2006; Bogusevski, et. al. 2018). Artificial media is a learning media that can focus on the most important parts, can show structure in objects, and gain direct experience (Daryanto; 2012; Provasoli, et. al. 1957; Belov, et. al. 2002; Provasoli & D'agostino, 1969).

METHODS

This research is a type of Research Development. Research and development are part of a process to develop a new or existing product, which can be accounted for (Sukmadinata, 2011; Gunawan, 2013; Gunawan, 2016). This research was conducted to develop a three-dimensional visual learning media in the form of a water cycle that is used to teach Theme 8 (*Lingkungan Sahabat Kita*), Subtheme 1 (*Manusia dan Lingkungan*) in Fifth Grade of Primary School. The steps of this research

refer to the steps put forward by Borg & Gall (1982), which consist of: (1) initial research and information gathering; (2) planning; (3) development of initial product forms; (4) individual trials; (5) revision of product results individual trials; (6) small group trials; (7) product revisions of the results of small group trials; (8) field trials; (9) final product improvement; and (10) dissemination and implementation. This study only reached the ninth stage, final product improvement.

This research is located at SD Negeri 101766 Bandar Setia with the subject of the fifth-grade students of SDN 101766 Bandar Setia with a total of 28 students, with 11 female students and 17 male students. Data collection techniques used in this study were questionnaires and tests.

RESULTS

The results of the initial product development consist of four stages of development, namely the initial research and information gathering stage, the planning stage, the initial product development stage and the validation stage.

1. Initial Research and Information Gathering Stage

Based on observations and interviews, it can be observed that problems occur in Fifth grade students of SD Negeri 101766 Bandar Setia, namely the unavailability of learning media which supports several themes. One of them is in Theme 8 (*Lingkungan Sahabat Kita*), Subtheme 1 (*Manusia dan Lingkungan*). The results of interviews with teacher explain that there are still limited learning media that can support thematic learning, especially in Theme 8 (*Lingkungan Sahabat Kita*), Subtheme 1 (*Manusia dan Lingkungan*). When learning in these subthemes teachers rely solely on teacher books and student books. Teachers also lack understanding of various approaches, especially scientific approaches. Based on interviews with Fifth grade students, students are more interested in learning when carried out using instructional media because, with the presence of media, learning material that is difficult becomes easier to understand.

2. Planning Stage

The next step is to plan the making of instructional media that can support the material Theme 8 (*Lingkungan Sahabat Kita*), Subtema 1 (*Manusia dan Lingkungan*). Researchers have also made test questions in the form of multiple choices in order to determine the effectiveness of instructional media. Media will be made in the form of a water cycle.

3. Initial Product Development Stage

The initial product development of the water cycle learning media can be seen in Figure 1.

4. Validation Stage

At this stage, validation includes media validation and material validation carried out by media experts and material experts as well as validity tests to fifth grade students of SD 101766 Bandar Setia.



a. Media Validation

In this study the media experts who assessed the feasibility of the water cycle learning media was a lecturer in the Primary School Teacher Education Department, Faculty of Education and a teacher of Fifth Grade students SD Negeri 101766 Bandar Setia.

The results of the assessment of media experts in the first stage obtained a score of 65 with an average score of 4.33. Based on the guidelines for converting quantitative data to qualitative data, the water cycle learning media are very good. The following are suggestions from water cycle learning media experts, namely: information on media (media name) using embossed ink, miniature terrestrials using beach sand, colour selection in the media, and a guidebook that can explain the use of media in detail and is easy to use.

The results of the second stage of media validation assessment gained a score of 72 with an average of 4.80. Based on the guidelines for converting quantitative data to qualitative data, the water cycle learning media is included in the criteria very well.

Furthermore, the results of the second media validation obtained a score of 67 with an average score of 4.47. Based on the guidelines for converting quantitative data to qualitative data, the water cycle learning media is included in the very good criteria, but improvements must still be made from media experts. The advice of media experts is that water cycle media should be covered with glass, and that the plug should be replaced by using a switch so that if there is a power failure the lights in the media remain on.

After completing repairs, the second stage of validation was carried out and the results of the assessment of the media experts on the second phase of the water cycle learning media were scored 70 with an average score of 4.67. Suggestions from media experts are as follows: the media already meet the expected criteria in the assessment. For more details can be seen in Figure 3.

b. Material Validation

The first step of validation obtained a score of 62 with an average of 4.77. When viewed from the guidelines for converting quantitative data to qualitative data, the material in the developed water cycle media is very good. Although included in the criteria is very good, it still needs improvement because there are still some components that cannot be achieved optimally. The revisions are as follows: the material was arranged more systematically, a table of contents was created, 5M activities from a scientific approach was laid out, and colour selection was more interesting.

Based on the advice from the first-stage material expert, the improvement is done in accordance with the advice given from the material expert. After completing repairs, the second stage of

material validation then obtained a score of 63 with an average of 4.85. When viewed from the guidelines for converting quantitative data to qualitative data, the material in the developed water cycle media is included in very good criteria, so no improvements were made.

The second material validation obtained a score of 57 with an average of 4.38. Based on the guidelines for converting quantitative data to qualitative data, the material in the developed water cycle media is very good. Although included in the criteria very good, it still needs improvement because there are still some components that cannot be achieved optimally. The revisions are as follows: use bright colours in the writing of the title song “Air Falls”.

Based on the advice of the material expert in the first stage, the repairs are carried out in accordance with the advice given by the material expert. After completing repairs, the second stage of material validation was then obtained with a score of 61 with an average of 4.69. Based on the guidelines for converting quantitative data to qualitative data, the material in the developed water cycle media is included in the very good criteria. Based on the results of the validation of the first and second material there is a difference in average score. However, it is still within the same criteria, which is very good. For more details can be seen in Figure 9.

c. Test Validation

The validity of the test was carried out on Monday, March 18, 2019 in the fifth-grade students of SD Negeri 104209 Setia. There were 26 students in total. The researcher validates the test questions before the test questions are used. The number of validated questions is 30. Based on validity after calculating the data obtained $r_{\text{count}} < r_{\text{table}}$ with $\alpha = 0.05$, it is known from 30 questions, 20 valid questions and 10 invalid questions. The test is declared reliable if $r_{\text{count}} > r_{\text{table}}$ with $\alpha = 0.05$. Where the reliability test conducted by researchers obtained results $r_{\text{count}} = 0,838$ while $r_{\text{table}} = 0.388$. Because $r_{\text{count}} > r_{\text{table}}$ it can be concluded that this test is declared reliable.

Product Trial Results

1. Individual trials

This individual trial was conducted on Wednesday, April 10, 2019 with the respondents being 3 students of Fifth grade SD 101766 Bandar Setia who were randomly selected to represent students with low, medium and high needs. Based on data from individual trial results from the 3 respondent students above, a total score of 168 was obtained with an average score of 4.67. In accordance with the guidelines for converting quantitative data to qualitative data, the three-dimensional visual learning media of the water cycle is included in very good criteria.

2. Small group trials

A small group trial was conducted on Wednesday, April 10, 2019 with 6 respondents in the V-C class at SD 101766 Bandar Setia who were randomly selected and did not include individual trials and obtained a total score of 313 with an average score of 4.35. In accordance with the guidelines for converting quantitative data to qualitative data, the three-dimensional visual learning media of the water cycle that researchers developed is included in the criteria very well. When compared with the results of individual trials, small group trials obtained an average lower score of 4.35, while individual trials obtained an average score of 4.67.

3. Field Test

This field test was conducted on Wednesday, April 10, 2019 with 19 respondents in Fifth grade students of SD Negeri 101766 Bandar Setia. This did not include individual trials and small group trials. Based on the field test table of 19 student respondents, a total score of 1050 was obtained with an average score of 4.60. In accordance with the guidelines for converting quantitative data to qualitative data, the three-dimensional visual learning media of the water cycle that researchers developed is included in the criteria very well. So that it can be concluded that the three-dimensional water cycle learning media is valid and feasible to be used on the Theme 8 (*Lingkungan Sahabat Kita*), Subtheme 1 (*Manusia dan Lingkungan*), and Learning 2. More details on the results of the trial product validation can be seen in Figure 10.

DISCUSSIONS

Learning Media Analysis

The process of making media at an early stage involved researches making an aquarium with embossed ink to write information that shows the process of the water cycle (Seong, et. al, 2013; Tarn, et. al. 2007). At the same time, they looked for beach sand that will look like real land. They then put aquarium decorations in the form of plants on the miniature land. After that they make a series of lights to be used as the sun and the media is ready to be validated by the validator (Spotte, 1993).

After completing the process of making the learning media for the water cycle, the researchers showed that the media to the validator to assess the feasibility of the developed media (Ibrahim & Ledo, 2018; Everett & Moyer, 2009; Wilder & Shuttleworth, 2005; Sammel & McMartin, 2014). In the first stage of validation the media score obtained an average score of 4.33, if converted in qualitative data included in the criteria of “very good”. However, there are still improvements that need to be done to obtain media that is suitable for use. After that, the second stage is validated and an average score of 4.80, if converted into qualitative data, is included in the “very good” criteria.

The results of the validation of the feasibility of the media on the validation of the first stage media experts obtained an average score of 4.47, if converted into qualitative data, which was included in the criteria of “very good.” However, revisions are still needed to produce media that is suitable for use in field test stage. After that, the second stage of validation is done and an average score of 4.67 is obtained if converted into qualitative data and is included in the “very good” criteria.

After completing the validation of the learning media, the next step is to validate the material to the material expert. The results of material validation in the first stage obtained an average score of 4.77 if converted into qualitative data included in the criteria of “very good”. The first stage of validation shows that revisions are still needed to get better product results. The second stage of the assessment obtained an average score of 4.85, if converted into qualitative data, which is included in the criteria of “very good”.

Furthermore, the results of the second material validation in the first stage of validation obtained an average score of 4.38, if converted into qualitative data. This made it included in the criteria of “very good”. However, further revisions need to be made to get even better product results. In the second stage, the assessment obtained an average score of 4.69 and if converted into qualitative data can be included in the “very good” criteria.

Analysis of Product Trial Results

The product trial results in individual trials were conducted on Fifth grade students of SD Negeri 101766 Bandar Setia with 3 individual student trials. The results from individual trials obtained an average score of 4.67 which was included in the “very good” criteria. In individual trials there is no revision so that it can proceed to the small group trial stage. At the trial stage a small group of 6 students obtained an average score of 4.35 and was included in the “very good” criteria. In the small group trial phase, there was no revision, so it was continued to the field test phase. At the stage of the field test results, an average score of 4.60 was obtained and included in the criteria of “very good.” There was no revision.

Analysis of the Results of the Pre-test and Post-test

In addition to the media being validated by material experts and media experts, the media was also tested on Fifth grade students by using questions in the form of pre-test and post-test to determine the effectiveness of the three-dimensional visual learning media of the water cycle. The results of the pre-test score obtained an average score of 41.6, while the results of the post-test scores obtained an average score of 78.6. So, the pre-test and post-test scores increased by 37.0. This is because the teacher used a scientific approach to learning Theme 8 (*Lingkungan Sahabat Kita*), Subtheme 1 (*Manusia dan Lingkungan*), and Learning 2.



Therefore, the often-used visuals in five selected schools were videos, power point, television, computer and internet. This indicates that by use of visual aids in classroom teaching the attention of learners is drawn toward the lessons. Visuals are valuable because they increase teacher and student interest in the subject matter (Ilomo, 2017; Brumberger, 2005; Kovalerchuk, et. al. 2004).

CONCLUSION

Based on the formulation, objectives, results of research and discussion on research in the development of three-dimensional visual media of the water cycle using the scientific approach presented in the previous chapter, the following can be concluded:

1. The results of media validation by validator 1 in the first stage, the average score was 4.33 and in the second stage, the average score was 4.80. The media that has been validated in two stages can be categorized in the “very good” criteria. The media validation by validator 2 in the first stage obtained an average score of 4.47 and in the second stage obtained an average score of 4.67. The media that has been validated in two stages can be categorized in the “very good” criteria.
2. The results of the material validation assessment conducted by validator 1 in the first stage have an average score of 4.77 and in the second stage, the average score was 4.85. The material that has been validated in two stages can be categorized in the “very good” criteria. The material validation carried out by validator 2 in the first stage obtained an average score of 4.38 and in the second stage obtained an average score of 4.69. The material that has been validated in two stages can be categorized in the “very good” criteria.
3. The results were obtained from of trials that included individual trials, small group trials and field trials. Individual trial results obtained an average score of 4.67, which is included in the “very good” criteria. Field test results obtained an average score of 4.35, which was included in the “very good” criteria. Field test results obtained an average score of 4.60, which was included in the “very good” criteria.
4. The results of the pre-test and post-test results on the thematic learning that has been done have an average score of 41.6 pre-test. The post test results obtained have an average score of 78.6.

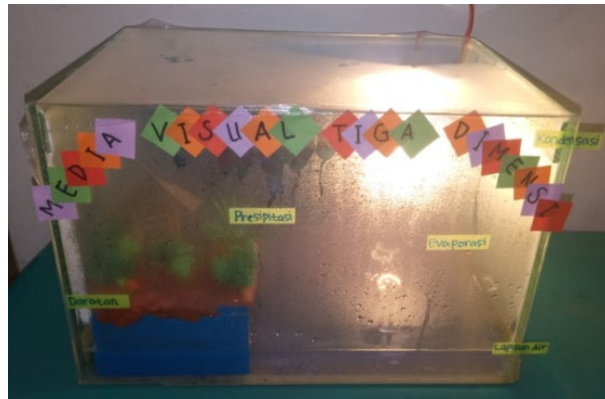


Fig. 1 Initial Product of the Water Cycle Learning Media

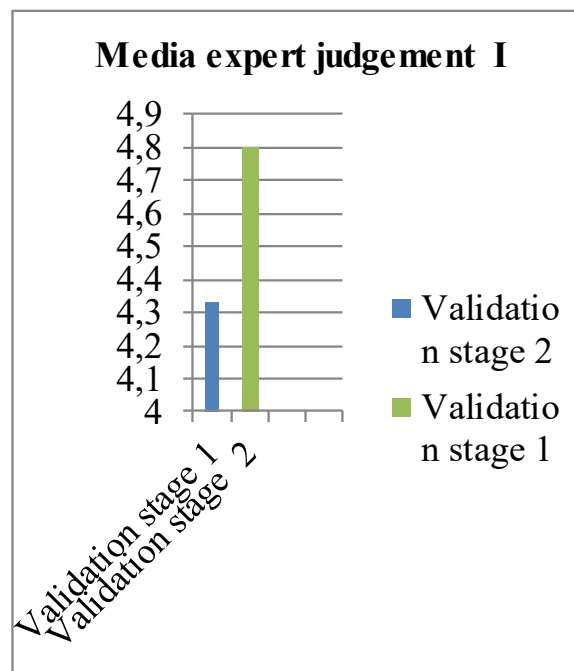


Fig. 2 Media Expert Judgment Diagram I

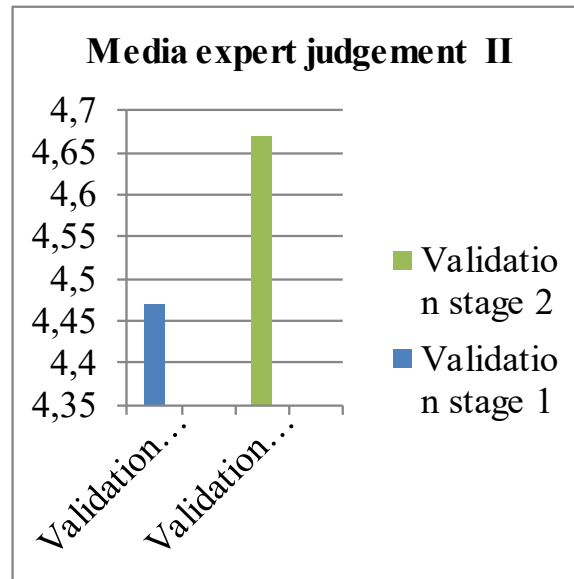


Fig. 3 Media Expert Judgment Diagram II

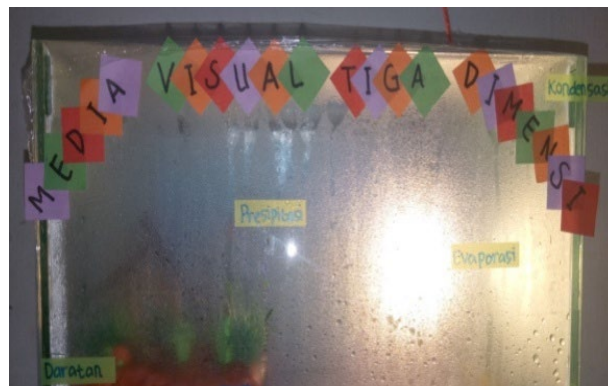


Fig. 4 Title of Water Cycle Media Before Revision



Fig. 5 Title of Water Cycle Media After Revision

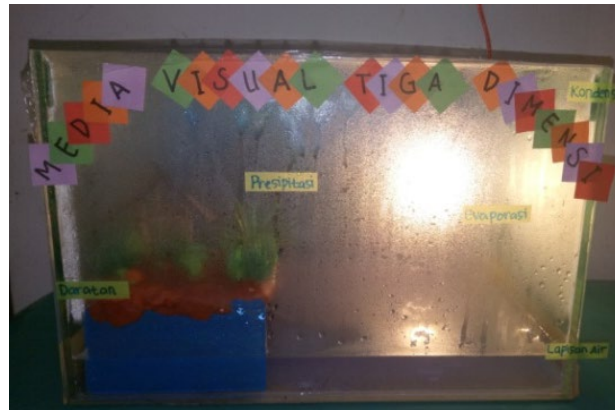


Fig. 6 Miniature Mainland Water Cycle Before Revision



Fig. 7 Miniature Mainland Water Cycle After Revision

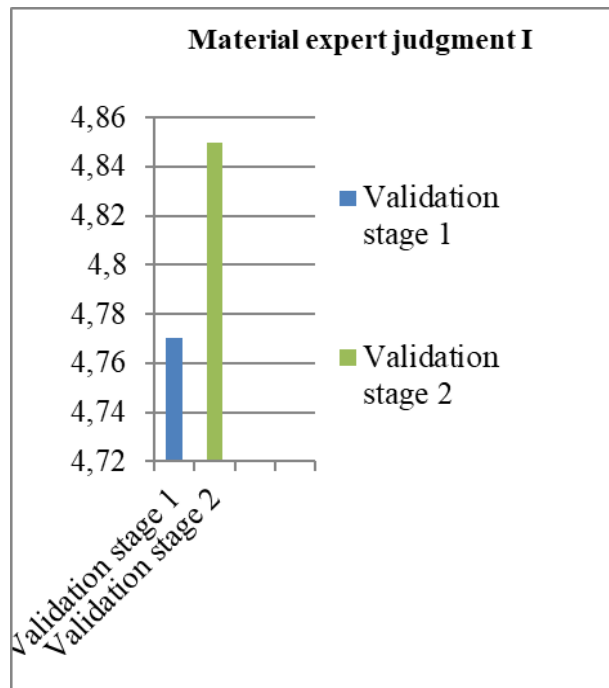


Fig. 8 Material expert judgment diagram I

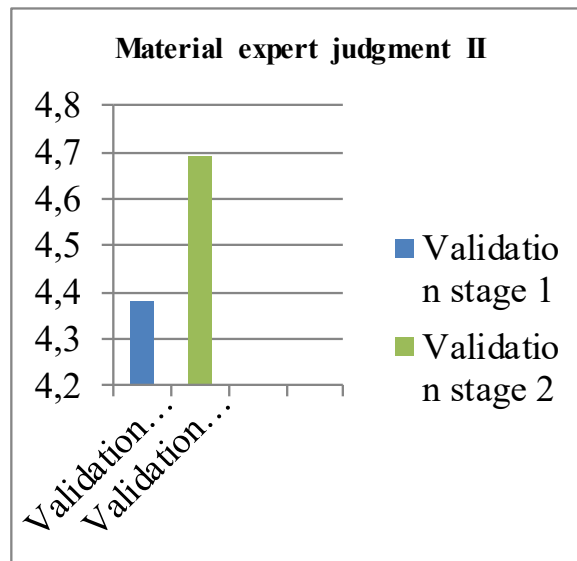


Fig. 9 Material expert diagram II

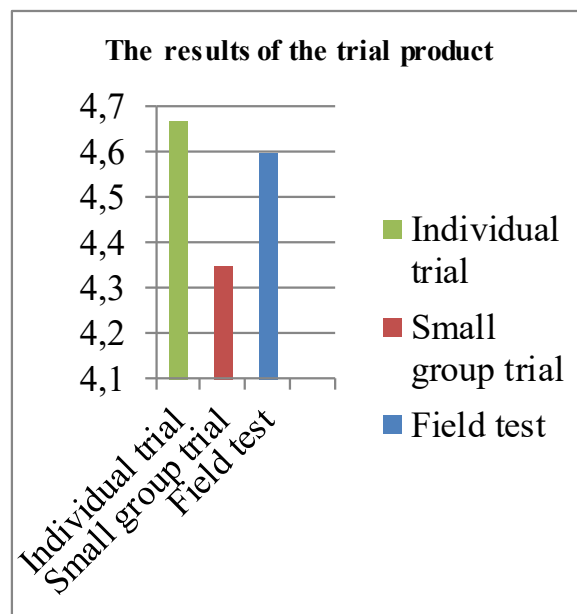


Fig. 10 The Results of Product Trial



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