

The Development of Education Comic as Science Materials for Lower Secondary on Topic of Light and Optic to Improve Student Learning Outcomes

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Abstract

The research was aimed to describe the effectiveness of educational comic learning media for lower secondary on topic of light and optic. The effectiveness of this media was carried out from the improvement of student learning outcomes based on the results of pretest (before using education comic) and posttest (after using education comic). The effectiveness of educational comic learning media for lower secondary on topic of light and optic obtained from the result of student learning outcomes tests that was achieved well. There was an increase of gain score between pretest and posttest which is 0.64 with medium category. It can be concluded that education comic as science material effective to be used as learning media to improve student learning outcomes.

Keywords: education comic, light and optic, learning outcomes

INTRODUCTION

Since 2013 the government has implemented a new curriculum known as the curriculum 2013 (K13). Kemendikbud (2013: 8) explains about competencies K13 that must include 4 core competencies which include aspects of attitudes (religious and social), knowledge and skills (application of knowledge). This is because in the learning process there are goals to be achieved, one of which is the learning outcomes obtained by students after going through the learning process. To make this happen, the teacher needs to take appropriate actions in explaining the subject matter. One of them is the subject of Natural Sciences (IPA).

Science learning presented in scientific discipline is considered too early for children aged 7-14 years, because at this age children still in transition from the level of concrete operational thinking to abstract thinking. In addition, at that age students still see the world around them holistically. Therefore, science learning should be presented in a form that is intact and not partial (Puskur, 2006: 7). In science learning, choosing a theme or topic is associated with problems that occur in everyday life.

Based on the results of interviews and questionnaires at SMP Al-Azhar 13 Surabaya, science material that will be used as a research topic is about

light and optical devices. The choice of this topic is based on students who have difficulty understanding the concept of science. Learning difficulties in science, according to Ornek, Robinson & Haugan (2008: 30), are caused by many factors, one of them being from students themselves.

In overcoming these learning difficulties, international labeled schools including SMP -Azhar 13 Surabaya chose to use the Cambridge curriculum which had been integrated with the 2013 curriculum SMP Al-Azhar. This curriculum was used as a stakeholder in learning activities. The aim is schools to be able to create maximum learning in schools for students, which is able to realize the development of high-quality student abilities. In Indonesia, the use of the Cambridge curriculum reaches a fairly high level. A number of schools have organized 28,000 examinations with Cambridge's international curriculum. This number has increased by 15% since 2012 (Antaraneews, 2013).

The hope of developing the educational comics media is that students interpret the learning process that can motivate and encourage creativity and intelligence in learning through fun media. Through the media of educational comics, students can understand the concept of science learning, especially the material of light and optical devices, as well as being able to broaden the knowledge of students in

learning light material and optical devices. Educational comics are presented by raising fiction stories with adventure themes and combined with learning material so that students do not feel bored. Educational comic language uses English using daily vocabulary, making it easier for students to understand the contents of stories and material in comics. Learning media for educational comics on light material and optical devices are expected to help students understand the concept of science and can improve student learning outcomes.

The pre-research results at SMP Al-Azhar in Surabaya found that the learning outcomes of Natural Sciences (IPA) of students were not in accordance with the demands of the absorption capacity that had been determined. The minimum completeness criteria (KKM) determined are 72.00 and 85% for classical absorption. Based on the results of interviews, science learning in junior high school is also included in the exact science especially in light material and optical devices. One of the counting skills that is not well mastered by students. This is usually because at the time of learning students are still in the stage of concrete thinking while most classroom learning is not supported by adequate learning media the science learning process.

According to Levie & Lentz (1982) about the function of learning media, especially visual media. In the visual function of visual media it is stated that visual or image symbols facilitate the achievement of goals to understand and remember information or messages contained in the image. Learning media is a tool of instruction from the source of the message to the recipient of the message so that it stimulates the thoughts, feelings, attention, and interests of the recipient in the process of achieving learning outcomes (Sadiman, 2012).

According to Scott Mc Cloud (2002: 9), comics are a collection of images that function to convey information or produce an aesthetic response for those who see it. All story texts in comics are arranged neatly and interconnected between images (visual symbols) with words (verbal symbols). Images in a comic are interpreted as static images arranged sequentially and interrelated between one image and another so that it forms a story. Comics can be developed into educational comics that can be used to overcome students' problems in understanding material. In addition, educational comics can function as intermediaries in delivering material so that students can understand a material easily. The use of educational comics as learning media can improve

students' thinking skills, because by presenting an image, students are required to associate with concepts that have been studied before.

The use of analogies and descriptions of stories in everyday life can help students to understand a material. Comics have five advantages when used in learning, images that are media that can improve the quality of learning, are permanent in nature can foster interest in reading and direct students to reading discipline, especially those who do not like reading, comics are part of popular culture, and comic motivates students during the teaching and learning process (Wurianto, 2009). Some studies that have been conducted on the use of comic media get good results on student learning outcomes.

According to Hamalik (2004: 31) learning outcomes are patterns of actions, values, knowledge, attitudes, appreciation, ability and skills. Factors that influence learning outcomes include physical and spiritual factors of students, this is related to health problems, both physical conditions in general, while environmental factors also greatly influence. Learning outcomes in junior high school are 70% influenced by students' abilities and 30% are influenced by the environment.

Based on student response questionnaires given to 15 students, stated that as many as 48% of students felt difficulty in understanding the science concept, as many as 86% of students agreed, if learning about "Light and Optic" was presented using comic media. Students have known educational comics and have read them as much as 81%. Students like to read comics as much as 95% and as many as 70% of students need learning media that support the learning process and help students to understand the concept of science independently.

This is also supported in a research by Qurotu A'yun (2014) "Development of Scientific Approach-Based Comic Bulletin Learning Media on Integrated Science Learning" concluded that the use of comic media in learning especially science in light refraction material could increase participants' interest and attention educate and effective as learning media. The results of using comic bulletins obtained 3.32 attractiveness scores with very interesting categories, 3.41 ease scores with very useful categories and effectiveness with 81.48% students completing KKM.

METHOD

The type of research used One Group Pretest and Posttest Design which was tested on 15 students on lower secondary SMP Al-Azhar 13 Surabaya.

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The result of the data that obtained will be processed using the N-Gain calculation to determine the increase in student motivation and learning outcomes. Here is the formula N-Gain used:

$$N - Gain = \frac{(posttest\ score - pretest\ score)}{maximum\ score - pretest\ score}$$

The result of that calculation then determined by the value increase category between the pretest and posttest through the following assessment criteria:

Table 1. The Range of value for Improved Learning Outcomes

Limitation	Category
$N-Gain > 0,7$	High
$0,3 < N-Gain \leq 0,7$	Medium
$0,3 \geq N-Gain$	Low

(Riduwan, 2010)

Based on predetermined criteria, science education comics about light material and optical is feasible in knowledge assessment if the gain score is > 0.3 with moderate or high criteria.

RESULT AND DISCUSSION

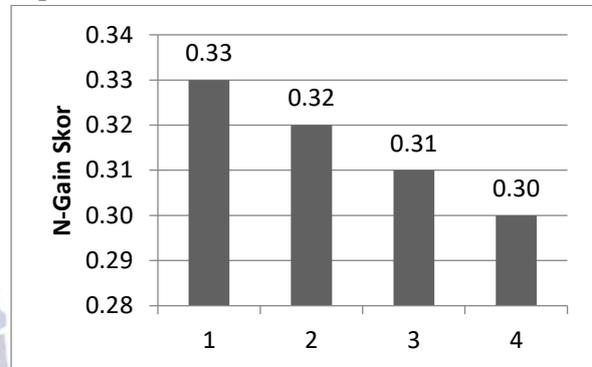
The results of effectiveness science education comics are viewed from the student learning outcomes before and after doing pre-test and post-test. Assessment of student learning outcomes includes three aspects, namely aspects of knowledge, skills and attitudes. In this study, the expected goals were to achieve classical completeness and increase student learning outcomes related to aspects of knowledge.

The assessment phase on the knowledge aspect uses a one group pre-test post-test research design, namely by giving a test at the beginning of the learning activity (pre-test) to determine students' abilities before being given learning using media science education comics and tests at the end of learning activities (post -test) to find out the success of learning and use of science education comics media through improving student learning outcomes.

Stating that the assessment of learning outcomes on lower secondary as many as 15 students obtained an average N-gain value of 0.64 with moderate criteria and N-gain total average sub-material amounted to 0.31 by category is being On the assessment of learning outcomes per student, indicated by the acquisition of the pre-test value averaged 38.93 and an increase in the value at the post-test level was 78.27. The lowest value is obtained for students with serial number 9 with a pre-test value of 22.00 and a post-test value of 56.00, so that the N-gain value is 0.44 with the medium category. The highest value is obtained for students with serial number 15, with a pre-test

value of 42.00 and get a post-test value of 90.00, so that the N-gain value is obtained at 0.83 with a high category.

Table 1. Result of Student N-Gain Score Each Sub Topic



- Nb: 1. Characteristics of light
 2. Mirrors
 3. Lens
 4. Optics

Whereas in the assessment of learning outcomes per sub-chapter, on the sub-material of the light properties obtained an N-gain value of an average of 0.33 with a medium category, in the mirror sub-section the N-gain value was obtained by an average of 0.32 with the category while, in the lens sub-section, the average N-gain value is 0.31 with the medium category, and in the sub-section of the optical device the N-gain value is 0.30 with the low category. Whereas in the assessment of learning outcomes per sub-chapter, on the sub-material of the light properties obtained an N-gain value of an average of 0.33 with a medium category, in the mirror sub-section the N-gain value was obtained by an average of 0.32 with the category while, in the lens sub-section, the average N-gain value is 0.31 with the medium category, and in the sub-section of the optical device the N-gain value is 0.30 with the low category.

Based on the explanation above, it can be concluded that, the use of science education media comics as teaching material for seventh grade students of junior high school can be declared effective on the knowledge aspect. This can be indicated by an increase in student learning outcomes which are included in the medium category with the acquisition of an average N-gain score of 0.64 and the assessment per sub material is 0.31. This is in accordance with the theory of Oemar Hamalik (in Umar, 2013) that media is a technique used as a tool to streamline communication between teachers and students in the process of education and teaching and learning in schools. Learning media is a tool or medium to

facilitate the continuity of the learning process to achieve effective and efficient learning goals.

The role of learning media is very important to achieve maximum learning outcomes, therefore a cognitive process is needed to support effectiveness in learning. According to Krathwohl and Anderson (2001), cognitive processes are processes of seeking and gaining knowledge and organizing knowledge through activities of remembering, analyzing, understanding, judging, reasoning, imagining and speaking. The revision was carried out by Krathwohl and Anderson, taxonomy being: (1) remember (remember); (2) understand (understand); (3) apply (apply); (4) analyze (analyze); (5) evaluate; and (6) create (create).

The cognitive processes applied in this study can be assessed from student activity data and student responses to science education comics media. The acquisition of student activity data at the first meeting was quite high at 98.73%, at the second meeting which was 97.28%, and the third meeting was 97.99%. The overall average result is 97.85% with a very good category. It can be concluded that the use of science education media comics is very effective for teaching materials and can be used as a very feasible learning media. According to Afrizal (2006: 2) student learning outcomes by using comics accompanied by student activity tend to increase. In addition to student activities, student responses to media also influence the success of learning.

Based on data acquisition, it can be concluded that the results of student responses to science education comic learning media obtain an average percentage of 8.33%, so the media of science education comics as teaching materials in light material and optical devices are very feasible to be further developed as media practical learning. The results of this good response are influenced by students' preferences in reading comics, because comics are presented and packaged in different ways, namely by entering light material and optical instruments into adventure-themed stories. Comics are useful and helpful media because they present a pleasant nuance of learning with favorite characters who are readers' favorites and help to arouse children's interest in reading, stimulate discussion activities, build understanding and extend memory (Mallia in Beard, et al, 2002).

The success of students in learning is also influenced by the learning activities carried out. The acquisition of mode values in the overall implementation of learning is as much as 3, so that the

implementation of learning can be stated to be good in its implementation. During the learning process, students are required to carry out cognitive processes, one of which is the analysis stage, namely students are given practical activities related to the material to support the knowledge that has been obtained through reading comic activities. The goodness of learning is supported by the validity data from experts, consisting of media experts, material experts and science teachers. Learning tools including science education comics media have gone through a validation process before being used for learning activities. The acquisition of mode values from the validation of science education comics media is as much as 4, so that it can be declared very feasible to be tested to students as a valid science teaching material.

Based on the overall learning activities that have been carried out, extreme data is obtained which is the strongest or most prominent data during the research process. This data can be seen from the sub-material with the highest N-gain and the highest activity carried out by students. The first meeting is the meeting with the highest acquisition between the second and third meetings. The acquisition of N-gain in the sub-material of the light properties carried out at the first meeting was 0.33 and the percentage of student activity was 98.73%. This is because at the first meeting students are more maximizing in doing activities by reading comics, paying attention to the teacher, asking questions, expressing opinions and conducting observation activities compared to conducting irrelevant activities such as being busy and not paying attention to the teacher. The interesting things done by students during the learning activities took place, namely in concave mirror practicum activities, students seemed very enthusiastic, because the students' curiosity was very high about the concave mirror's workings. At the time of filling out the response questionnaire, students expressed criticism and suggestions that the presentation of comic characters was too childish and wanted the presentation of comic characters to be made as in the webtoon application.

CONCLUSION

Conclusion

Based on data result, it can be concluded that the media of educational comic as teaching materials for lower secondary on topic of light and optics is proven to have feasible effectiveness based on the result of student learning outcomes test there was an increase of gain score between pretest and posttest is 0.64 with

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medium category. And the assessment for each sub material is 0.31, so it can be categorized as medium category.

Suggestions

Based on the research that has been done, it is necessary to suggest several things as follows:

1. For students, the results of this study provide opportunities for students to more easily understand light material and optical devices through the comic storyline.
2. For teachers, the results of this study can help teachers determine effective learning strategies and in accordance with the characteristics of the material and mental development of students and can be used as alternative learning to improve skills that vary for teachers so as to improve teacher professionalism in teaching.
3. For researchers, this research provides the latest teaching knowledge and innovations in the science concept that can be applied and useful in everyday life, interrelated between science, environment, technology, and society in the science curriculum.

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