THE DEVELOPMENT OF COMICS FOR PHYSICS LEARNING BASED ON GRAPHIC DESIGN FOR JUNIOR HIGH SCHOOL STUDENTS

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Abstract: *Based on observations made to physics teachers and students at the Junior High School (SMP) 7 Bandar Lampung and SMP PGRI I BumiAgung, it is known that the physics learning process undertaken by teachers often does not teach physics applications in students' lives. In addition, print-based learning media at this time are also verbalistic and have not been able to link physics with life around students. The learning process and the lack of media that can link theory and application in student life make students feel bored studying physics. Physics learning comics are media that are able to link the concepts of physics with life around students. This condition is the background of conducting research, developing physics learning comics as supplement media which are thought to be interesting and effective for students. This research is a research and development (R&D) of comics for based on graphic design that aims to describe the characteristics of Physics Learning Comics. Research and development of comics for physics learning is carried out by following procedures (1) needs analysis, (2) making goals, (3) determining the subject matter, (4) synopsis writing (5) initial script writing, (6) prototype production, (7) evaluation, (8) revision, (9) final script writing, (10) trials and (11) final comics. The results of tests with operational tests show that 84.21% of students can pass the KKM SMP N 7 Bandar Lampung and the results of the attractiveness test taken from a questionnaire score of 3.51 indicate that this comic of physics learning is effective and very interesting to learn.*

Keywords: research and development,physics comic**,** graphic design,

INTRODUCTION

Teaching and learning activities in general only rely on teachers and books as learning resources. But the existing textbooks are actually verbalistic books. So that makes students bored because the sentences used are stiff and not communicative. The development of teaching materials is a teacher's creativity to help students understand and absorb the information in the lesson, given that the characteristics of students in heterogeneous classes. Development of teaching materials can also be used to eliminate the negative impression of a subject, such as physics.

Physics is a branch of natural science that studies the nature of matter and energy and the phenomena that occur in the universe. Physics is an interesting branch of natural science to study. However, based on observations, physics is still one of the most difficult subjects for students. This is due to the monotonous and the unpleasant presentation of physics learning. Students' perceptions that physics is only a formula or equation make physics one of the subjects to be feared. Actually physics is humanist, fun. Because it is fun, physics should be delivered pleasantly.

Comics for physics learning are an alternative media that can be used to overcome problems in understanding a material. The use of analogies and portrayals of stories in everyday life can help students to better understand a material. Comic was shown that students had

understood more than when presented with a 'traditional' lesson (Baldacchino, 2010)

The ability of comics to manipulate time and space can invite students to go anywhere, even though it is limited by the classroom.Objects that are too small, too big, dangerous or even cannot be visited by students can be presented through learning comic media. Learning comics are print-based media, so they can be used in various schools with different conditions. Educative learning comics can convey elements of the message clearly and communicative. The depiction of stories that are based on daily experiences, allows students to easily follow the storyline. This makes students more creative in doing a problem solving.

Comics are not only as entertainment media, but also very good educational media to give to students. Many comics have been created by comic artists with a variety of different styles. From various subject areas, one of them is physics comics. Some physics comics that have been made to be used as a learning media include the KartunFisikaby Larry Gonick and Art Huffman (Gonick, 2001), FisikaAsyik by Yohanes Surya (Surya, 2007), Calvin and Hobbes by William Boyd Watterson (Watterson, 2012), and Cindy in Space by Marry Urquhart and Marc Hairston (Urquhart, 2005).

The purpose of this study describes (1) the characteristics of comics for physics learning based on graphic design which is suitable as a supplement for motion material in junior high school students and (2) know the attractiveness and effectiveness of comics for physics learning based on graphic design.

METHOD

The development was used is modified from the Sadiman instructional media development model that included 11 phases of activity that is (1) needs analysis, (2) making goals, (3) determining the subject matter, (4) synopsis writing (5) initial script writing, (6) prototype production, (7) evaluation, (8) revision, (9) final script writing, (10) trials and (11) final comics. (Sadiman et al, 2008)

Product trials carried out are field trials. This field test is imposed on students by giving assignments at home to study interactive modules developed at the end of learning. If 75% of students who study using an interactive module have completed KKM, then the interactive module can be said to be effective as a learning resource.

The comic attractiveness test is done by giving comic attractiveness questionnaires to students. The analysis of the questionnaire results uses the following equation:

$$\overline{x} = \frac{\sum_{i=1}^{n} x_i}{n}$$

with

$$x_i = \frac{Total\ Score}{\max score} x4$$

Table 1.Criteria for final evaluation of comic attractiveness test

Comic attractiveness score	Criteria
1,01 - 1,75	Less attractive
1,76 - 2,50	Quite attractive
2,51 - 3,25	Attractive
3,26 - 4,00	Very attractive

(Yuliani, 2011)

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RESULTS

The needs analysis was done by interviewing teachers and students of Bandar Lampung 7 Junior High School and SMP PGRI 1 BumiAgung. Based on the results of the preliminary analysis, it can be seen that teachers and students need an attractive and effective supplement media as an alternative learning resource. The ability to link physics with phenomena or events in the daily lives of students and with a greater proportion of images than writing, physics learning comics are an alternative to solving these problems. By describing the stories in daily life, students can directly understand what the problems and solutions that are around them uses physics.

The purpose in this comic for physics learning was developed based on the BSNP (BadanStandarNasionalPendidikan) Content Standards. The purposes covered by this comics for physics learning is students can show, define, and investigate the concepts of GLB and GLBB concept in daily life.

Synopsis of physics learning comics developed is a general description of comic stories from the beginning to the end of the story. The characters in the comic story and the physics concepts contained in the comic are also contained in the synopsis.

The initial manuscript is a technical document that explains in detail the physics learning comics developed. Starting from the details of narrative writing, conversations between characters, illustrated images, additional information in one panel, and a short list of questions included in the comics. The initial manuscript that has been produced, evaluated and revised then becomes the final manuscript.

The production of the comic of physics learning prototype is divided into two sequential activities, namely the making of comic sketches and the process of digitizing comics. The first activity is making comic sketches manually using a pencil with a thickness of 5H for basic sketches, 2B for the thickening process, and 4B for certain parts that require more thickness. The second activity is the digitization process using the CorelDRAW Graphic Suite X5 program.

The digitization process uses this program through four stages, there are making panels and layouts, line art process (drawing baseline), coloring, and placement of conversation text balloons as seen in figure 1.

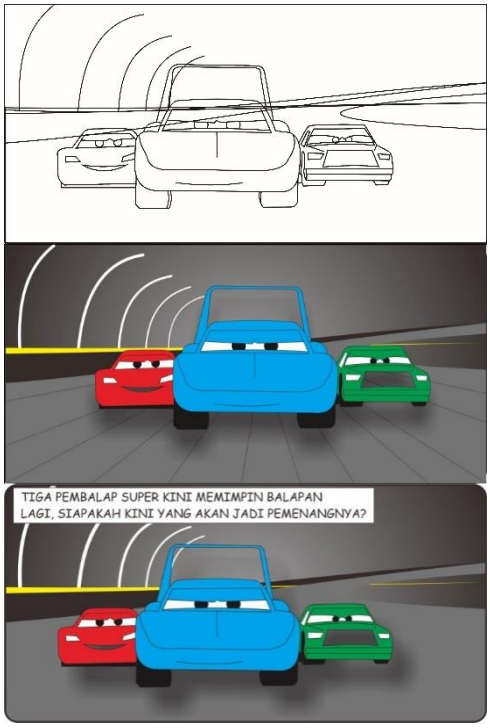

Figure 1.The digitization process of comic for physics learning through four stages

This comic prototype has been evaluated by comic experts and scientific experts. The design expert evaluator was evaluated by the national comic artist Mr. LalanKelana. Some suggestions for improvement given from the results of formative evaluation 2 are about the use of fonts, consistency of spaces, and dialog panels.The material expert test evaluator chosen was an expert in the physical sciences, Dr. Abdurrahman, M.Sc. Some suggestions for improvement given from the results of expert test material on the suitability of learning materials are the need to pay attention to the writing and use of formulas in comics, as well as the depiction of stories that are too global.

After conducting a formative evaluation in the form of a material expert test and the design expert test must be corrected and revised. Based on the results of the evaluation and revision of the development comics, the final manuscript is ready to be reproduced to get results in accordance with the revision.

Implementation of the trial, this comic of physics learning is given as an assignment material to students. To test the effectiveness and attractiveness, it was tested on 38 students of SMPN 7 Bandar Lampung in class VII.E. The effectiveness test was carried out by giving multiple choice questions. The attractiveness test is done through giving questionnaires to students.

The results of the effectiveness of the trial analysis showed that the average posttest score of students above the KKM was 84.21%. KKM in SMPN 7 Banda Lampung is 68. In the research method, it has been explained that if 75% of students' physics scores are above KKM then the media can be said to be effective. Based on the attractiveness test, it obtained an average value of 3.51 after being converted, so the media can be said to be very interesting.

Figure 2 comic page example

The comics for physics learning of motion was created as an independent learning resource for class VII of Junior High School studentwith specifications: (1) Dimensions: (21 x 29.7) cm, (2) Paper type: 80 gsm HVS, (3) Number of pages: 16 pages (1 cover + 1 introduction + 14 contents), (4) Main font type: Comic Sans MS, (5) Font size: 7 PT, (6) Image quality: JPEG 300 dpi (high quality), and (7) Color Form: RGB (24-bit)

Discussion

The final product of this research development is a physics learning comic book. Like comics in general, physics learning comics are developed with illustrated images that fit the story presented. However, the developed comic functions as a learning comic and supplements motion material, so in addition, there is a story or adventure of a character, in which there is also a description of

physical material about the regular straight motion, irregularly changing straight motion, free fall motion, and associated parabolic motion with the story in the comic.This is the characteristic of a learning comic.

As a graphic design-based comic, this comic is rich in branches of graphic arts. The majority of comics currently using line art techniques or manual techniques using pencils or other writing tools is drawn directly onto a paper medium with drawing expertise from the hands of comic artists.The result of this technique is a picture of a black and white illustration. Graphic design science is used to maximize the process of making comics. With graphic design, researchers can explore the ability to create better results from line art techniques that only produce black and white images.

Things that need to be considered in the process of making comics are about the details of images and text and the composition of both. By ensuring comics that are made easy to read, and stories that are made are not too monotonous or flat, the comics will be interesting. Variation or combination of several conditions needs to be done so that the reader does not get bored quickly. (McCloud, 2007)

The description of the material in this physics comic uses the inquiry approach. The storytelling follows the procedure in the inquiry approach, namely problem finding, planning and carrying out problem solving activities, and drawing conclusions.

The description of the material in this physics comic is a reinforcement of the material that has been given at school and additional knowledge that is not found by students at school. Supplement media are supplementary media or companion media from major media such as textbooks. Therefore, supplement media do not have to be exactly the same as the main media related to the material. This is because supplementary media is an additional medium that when used by students, students gain even more knowledge.

The attraction of this interactive module has also been tested through a questionnaire and the result is an average rating of attractiveness of 3.51. Based on the final assessment criteria of the attractiveness test module in chapter 3, the physics learning comics based on graphic design on motion material in junior high school students that are developed enter into very interesting critter. While the effectiveness of this physics learning comic can be seen from the number of students who complete the KKM reaching 84.21% or 32 students from 38 students with a KKM value of 68.

The advantages of the product developed: (a) This comic of Physics Learningcan be directly used by students without having to use additional tools such as computers, media players, and so on. So that it is expected to make it easier for users of these physics learning comics, (b) The comic of physics learning are done in full color so that comics users are more interested in reading them,(c) Increase reading interest and student interest to learn physics and increase bank of vocabulary of the student, and (d) The positive values contained in the Comic of Physics Learning make this comic can be used as an alternative supplement for student character education.

Weaknesses of the product developed: (a) More costs needed to print this physics learning comic due to its full color presentation, (b) Not all students like comics that are visual media, this depends on the type of student learning, and (c) Scope of material in physics learning comics this is still small when compared to the whole physics material of junior high school education units.

CONCLUSION

The results of research showed that the comic of physics learning is effective and very interesting to use for junior high school student. Based on the effectiveness test through the post test, Comic of Physics learningbased on graphic design for junior high school students was declared effective with a percentage of students completing learning at 84.21%. Based on the interesting questionnaire given to students, the results obtained were 3.52, which means that this comic is very interesting.

SUGGESTION

Based on the results of research and discussion, the authors provide the suggestion that the scope of the material presented should be expanded further, both the elaboration of the material and the practice questions are further enriched. The second suggestion is to maximize the ability of researchers to give effect to illustrations in images to make it look more real.

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