Mathematical Comics on Class X Trigonometry Learning

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Mathematical Comics on Class X Trigonometry Learning

Meilantifa[1], Herfa Maulina Dewi Soewardini[1], Ratna Ayu Supratiwi[1], Ananias Serin[2], Mariana Ulfah Hoesny[3], Muh Barid Nizarudin Wajdi[4], Sunu Hastuti[5], Agus Setiawan[6], Erli Lumban Gaol[7], Chitra Dewi Yulia Christie[8]

[1]Universitas Wijaya Kusuma Surabaya, Surabaya, East Java, Indonesia
[2]SMA Negeri Unggulan Saumlaki Indonesia
[3]Politeknik Negeri Malang, Indonesia
[4]STAI Miftahul Ula Nganjuk, Indonesia
[5]Universitas Muhammadiyah Kupang, Indonesia
[6]Institut Agama Islam Ma'arif NU Metro Lampung, Indonesia
[7]SMKN 3 Batu Malang Indonesia
[8]Universitas Kahuripan Kediri, Indonesia

herfasoewardini_fbs@uwks.ac.id

Abstract. Learning with the trigonometric material is considered difficult by students, so they feel less interested in learning and also affect learning outcomes. By this, math comics are used to help students quickly learn trigonometry. This study aims to 1) describe the application of mathematical comics in learning trigonometry, 2) find out the results of trigonometry learning after the use of mathematical comics, and 3) find out the students' responses to mathematical comics. This type of research is a development study that uses Borg and Gall development models consisting of research and data collection stages, planning, product development, field implementation testing and refinement of final products. The test of field implementation located in Wachid Hasyim 2 Vocational School 2 Surabaya by using students of class X-AK 3 as the subject of research. Observation of student activities in the implementation of learning in Wachid Hasyim 2 Vocational School in Surabaya analysed descriptively. The results of the feasibility test by material experts, media experts and practitioners (teachers), the quality of mathematical comics that have developed categorised as very feasible with an average score of 4.67. Student responses to comics were positive

1. Introduction

Mathematical comic media is a tool in the form of a story that uses a series of still images and visualised in the way of frames and speech balloons and certain symbols used to convey messages containing mathematical calculation problems[1]–[3]. Comics used as a medium for delivering trigonometric material because reading comics is a fun activity for students[4]. Comics include very high elements of art, which in comics not only present material but also provide touches of humour through the images and stories that are in it so that students who read comics do not feel that they are learning about math material. Also, with comic messages in the form of knowledge, problems are delivered clearly, coherently and pleasantly.

The characters who use comics in the learning process include: Robert Thorndike who collaborated with DC Comics to create language training books that use superman images, educators in America also use comics to support the educational curriculum[5]. Richard W. Campbell integrating comics into

reading programs[6], Robert Schoof considers comics useful for language learning, especially in teaching dialogue and characterization[6], while Bruce Brocka advocates comics as a bulwark of defense against tools that threaten the reading culture of television[7].

In trigonometric learning which is still difficult for students, this comic is used to help students understand the concept of triginometry. In addition to understanding the concept, students will more easily understand the application of trigonometric problems in everyday life. Student activities in learning trigonometry will also be more active and responsive to the use of comics that interest students. This is consistent with what was conveyed by Hamalik [8] who argued that the use of learning media in the teaching and learning process can generate new desires and interests, generate motivation and stimulation of learning activities and even bring influence - psychological influence on students. In addition, learning media can also help students improve understanding, present data with interest and reliable, facilitate interpretation of data and compress information. According to Wahyuanto [1], comics as learning media are tools that function to convey learning messages, in this case learning refers to a process of communication between students and learning resources. Learning communication will run optimally if the learning message is delivered in a clear, coherent and interesting manner so that it fosters students' curiosity and the student is motivated to learn.

2. Method

The research method used in this study is the research and development method, namely the technique used to produce a particular product and test the effectiveness of the product [9]. Before data collection was carried out, prior validation (validation) was carried out by experts as well as the results of the use of comics based on the student use test which included student learning outcomes (dependent variable). The subjects of this study were students of class X AK-3 at Surabaya Vocational School of Wachid Hasyim 2. The object of this research is mathematics comic of trigonometric material as a learning media for vocational school students of class X AK-3. The instruments used in this research are:

2.1. Observation Sheet which used as a means of collecting data on trigonometric learning in Surabaya Vocational School of Wachid Hasyim 2.

2.2. Interview Sheet to find out the opinions and statements of the teacher/students about the conditions of trigonometry learning so far.

2.3. Validation sheets for expert lecturers and teachers used for assessing the quality of comic learning media. Assessment consists of material, media and language aspects.

2.4. Student test sheets to measure the level of students' understanding of trigonometric material given.

3. Result And Discussion

The results obtained in the study are prepared based on the procedures that have carried out, namely:

3.1. Research and Information Collecting (Research and Initial Data Collection).

According to preliminary observations conducted at Surabaya Vocational School of Wachid Hasyim 2 on January 23, 2018, it revealed that the implementation of learning had used learning resources in the form of textbooks as supporting learning processes. In the presentation, the teacher also uses various kinds of learning methods such as discussions, lectures and question and answer. Thus, these conditions are following the theory put forward by Sudrajat [10] that learning resources are all sources in the form of data, people and certain types that can be used by students in learning, both separately and in combination to facilitate students in achieving learning goals or specific competencies. However, as long as the learning process takes place, it uses less learning media. Such learning processes make students look bored and lazy to learn. It is also not by the theory put forward by Sugandi[11] that teaching and learning activities or learning have components that are interconnected and cannot separate from one another. Elements that must consider in education are the subject of knowledge, the nature of the material, the methods and media used, the situation, and learning resources.

According to the results of the question and answer session with students at Surabaya Vocational School of Wachid Hasyim 2, 3 out of 5 students admitted that they did not like mathematics subjects,

especially trigonometry material because according to them this lesson was filled with formulas-formulas that must be understood and only presented in writing so that they looked dull. Also, less readable learning media used. Whereas according to the results of the interview with Surabaya Vocational School of Wachid Hasyim 2, Vocational School teacher, Mrs. Siti Nurhasanah, S.Pd revealed that the majority of students do not like mathematics, especially trigonometry material because this material has a lot of formula applications that are applied so that many students experience difficulties and finally the value achieved by students for this material is still not satisfactory. Also, current textbooks have not been able to arouse students' interest in learning.

Based on the results of observations and interviews conducted by researchers, it can conclude that the majority of students have difficulty understanding the trigonometric material. Therefore, the material used in this research and development is trigonometric material. Whereas to overcome boredom and increase student learning interest, the researcher chose to develop comics as a learning medium. Comics are selected from as learning media because comic media are visual media that can present more exciting material to increase student learning interest. A comic press is also able to perform more concrete material so that students more easily absorb learning material.

3.2. Planning (Planning)

In general, the purpose of learning to use this comic is that students can understand the trigonometric material. While the specific purpose of using this media is that students can explain trigonometric ratios, able to generalise trigonometric ratios for angles in various quadrants and related aspects, able to explain sine and cosine rules. At the selection, stage Materials selected for the materials to use in comics, including collecting literature relevant to trigonometry material, collecting literature pertinent to the development of comic media, preparing documents as an evaluation in learning media.

At the stage of creating a Media Framework: The preparation of trigonometric comics was preceded by the development of a framework so that trigonometric comics could write in a structured manner. The first part is the outer cover, the introduction, the introduction of characters and the table of contents. On the outer coat consists of images, types of material and authors. Whereas in the introductory section, it explained in its entirety related to the explanation of the contents of the comic and the ultimate goal of studying comics. Next, the second part is content. This stage contains material angular size, trigonometric comparisons on right triangles, trigonometric comparisons at unusual angles, angular relations, trigonometric identities and sine and cosine rules. In the final part of this comic presentation consists of evaluation and bibliography. Finally, the module closes with a back cover containing the history of the trigonometric comic writer.

While at the material collection stage: The material in question is all information related to the topic in the form of concepts, theories, examples, drawings and all things related to the issue to be created. Books used as sources include Step-by-Step Mathematics by Yosep Dwi Kristanto.

The fifth stage consists of making research instrument grids which are the criteria for measuring trigonometric comics. The lattice of the instrument that has complete will then developed into a research instrument. The research instrument that will be used is a validation sheet and questionnaire. Validation sheets are used to determine the feasibility of trigonometric comics based on the assessment of material experts, media experts and teachers. The material expert gives an evaluation based on material and scientific aspects; media experts provide an assessment based on media aspects and language. While the teacher provides an evaluation based on all points. Questionnaire sheets are used to find out students' responses regarding the use of trigonometric comic media. Instrument validation is carried out by the supervisor.

3.3. Develop a preliminary form of the product (development of product draft)

After the planning stage completed, the next step is the development of a product draft: 1) Character Building. There are four characters in this trigonometry comic with different styles, including: Dewi (smart, unyielding student and very fond of mathematics that is always related to everyday life), Ahmad (A class X student who has strong determination, believes self, ridiculing and bright to bring the

atmosphere), Tiwi (A person who is attentive, likes to be jealous and does not want to lose in everything). The main character in this trigonometry comic is Dewi. While the accompanying figures are Ahmad and Tiwi. 2) Making Story Board. The making of comics based on the storyboard that has created. The making of comics is done through several stages, namely: a) Sketching Comics. This trigonometric comic sketch described on HVS A4 paper based on the storyboard. The trigonometric comic drawings that have made then scanned so they can make in digital form. b) Digitizing Comics. Digitizing comic trigonometry is done by using scanned sketches that have been made beforehand. The trigonometric comic digitisation process created with the help of pen tablets and Adobe Photoshop CS5 programs. c) Coloring. When the digitization process sketches the picture is complete, the next step is coloring the image. This colouring is done using digital painting through the Adobe Photoshop CS5 program. d) Making Cover Designs. The cover design consists of the front cover and back cover. The front cover contains images, types of material and authors. While the back cover includes the history of the trigonometric comic writer. e) Making Additional Information. Additional information needed in this trigonometric comic is the introductory page. This page contains an explanation of the contents of the comic and the ultimate goal of studying comics. f) Image Arrangement. After the illustration drawing process, the cover design and additional information finished, the next step is to arrange the image. Image arrangement made with the Adobe in Design CS5 program. g) Printing of Comics. Trigonometric comics printed on A5 size paper. The trigonometric comic cover page uses AP150 paper and the contents of trigonometric comics using HVS Full Color paper. h) Product Assessment and Revision. Validation of material experts. Assessment by material experts prioritised on aspects of material content and language. The assessment results obtained from the evaluation of material experts in the form of quantitative data score each element of the item. The quantitative data is then converted into qualitative data to determine the feasibility of the material and language aspects. The results of validation by material experts produced an average score of 4.67. When converted into qualitative data based on a five-scale assessment according to Widoyoko[12], the category is "very feasible". Whereas media product validation obtained an average value of 4.20. This value when converted is based on the guidelines for converting quantitative data to qualitative data based on a five-scale assessment according to Widoyoko[12] then the category is "feasible".

Completeness of classical learning outcomes has fulfilled that is equal to 92.3%, exceeding the limit of artistic learning achievement that determined at 85% of 75 individual completeness minimum scores. From the learning outcomes test, there are only 2 of 26 students of class X AK-3 Vocational High School Wachid Hasyim 2 Surabaya whose value is below 75.

4. Conclusion

Based on the results of research and discussion, it can conclude that the comic media developed quantitatively and qualitatively are very suitable to be used in learning. The feasibility of comic press shown by the assessment of material experts amounting to 4.67 which included in the category of "very feasible", the assessment of media experts amounting to 4.20 which included in the category "feasible" and assessment by the teacher of 4.16 which belongs to the category "feasible".

The results of the use of this comic learning media on the completeness of classical student learning outcomes are declared complete based on the percentage of 92.3%.

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