

## The Development of Comics Based on Algebraic Literacy for 7<sup>th</sup> Grade Students of Junior High School

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### Abstract

This research aimed at describing the development process and the effectiveness of mathematics media using comics based on algebraic literacy for 7<sup>th</sup>-grade students of junior high school (SMP). The kind of research, that conducted, was Research and Development (R&D) by using the ADDIE model. In which the model was Analysis, Design, Development, Implementation, and Evaluation. The media was tested into 24 students of 7<sup>th</sup>-grade. The average result of the media validation test both the validators were 3,7 in which is categorized as very valid with a feasible description to be tested. While the average result of material validation was 3,39 which is categorized as very valid with a feasible description to be tested. The effectiveness analysis result obtained that the students gave very positive responses with the obtained percentages of 85,21% and the mastery percentages of the class were 87,5% ineffective category. Therefore, it can be concluded that the comics based on algebraic literacy is effective to be used in algebra material for 7<sup>th</sup>-grade students SMP.

**Keyword:** Media Development, Comics, Algebraic Literacy, Algebra

### INTRODUCTION

According to the OECD (2013), mathematical literacy is a person's ability to formulate, use and interpret mathematics in a variety of concepts. Covers mathematical reasoning and the use of concepts, procedures, facts and mathematical tools to describe, explain and predict a phenomenon. Mathematical literacy helps individuals to recognize the role of mathematics in life as a consideration for making judgments and making good decisions needed by society.

Based on research conducted by the Research and Development Agency, Ministry of Education and Culture on literacy skills based on the content it turns out that students do not understand the subject matter related to algebraic concepts (Mahdiansyah & Rahmawati, 2014). The results of research conducted by Mujulifah, Sugiatno, & Hamdani (2015), also stated mathematical literacy in terms of understanding, students have not fully understood algebraic expressions and algebraic simplifications.

In terms of application, students are able to work on routine questions, but cannot work on non-routine questions as well as stories in algebraic material. In terms of reasoning, students still cannot prove the ideas and reasons that can support the answer. Viewed in terms of communication, students still cannot express ideas and use mathematical language correctly (Mujulifah et al., 2015).

Given that mathematical literacy is also very broad in scope, so researchers try to narrow and focus on algebraic literacy. Based on the description of the definition of mathematical literacy, the researcher redefined algebraic literacy as a person's ability to formulate, use and translate algebra in various life contexts.

Highlighting certain difficulties encountered by students in school while learning algebraic difficulties can be broadly classified in three main categories, namely, students are not familiar with algebraic sentences, students are confused with the use of different letters in algebraic symbols, students find algebraic procedures too abstract (Toh, 2009).

The things that influence the realization of algebra literacy include personal, instructional and environmental factors. Personal factors are the views and self-confidence of students in facing mathematics. Instructional factors include how intense and how qualified the teaching method is. Environmental factors include the presence of learning media in the classroom. (Mahdiansyah & Rahmawati, 2014).

Based on several factors that can realize literacy, there are environmental factors, namely the availability of learning media in schools. Therefore, it is necessary to integrate algebraic literacy and learning media. Integration can be done by using learning media as the delivery of information based on algebraic literacy. Mediawati (2011) states that the position of learning media is very important in learning because teaching and learning activities that are not yet clear in its delivery can be helped by the media as an intermediary. Material that feels complicated can be simplified with the help of the media. The media is also able to represent what the teacher cannot convey. The media also helps make abstract things concrete. So, students are more helped in understanding the lesson that without media assistance.

Media that according to researchers is capable of delivering information based on algebraic literacy is comics. Comics as learning media have an important role, which is to foster interest in learning students and facilitate students in remembering subject matter (Mediawati, 2011). Comics are a cartoon that tells a character in a story in tight order. Designed with images that are interconnected to provide entertainment to readers (Novianti & Syaichudin, 2010). If associated with mathematics learning, comics have their own uniqueness, namely, comics which can help readers to develop visual imagination (Negara, 2014).

Mass communication research has raised interesting ideas about how the commercial world has succeeded in using cartoons and comics to attract teenagers to commercial products. This is the origin of the idea of connecting cartoons and comics with mathematical education: because most students in school like to read cartoons and comics, why not use them in teaching mathematics? (Toh, 2009). This comic media is very interesting for students and many are available in reading shops. The fact is that most of the students know and remember the characters of the comics they see (Saputro, 2015). Novianti & Syaichudin (2010), states that in terms of images, mathematical comics must emphasize clear images, contrasting colors, easily digestible languages, and continuity between images and text. So, mathematical comics have a simple concept but are still clear in terms of their depiction.

Based on the explanation above, the researcher was interested in developing an algebraic literacy-based comic media for class VII junior high school students. So the purpose of the research is to describe the process of developing an effective media of algebra-based comic literacy for seventh-grade junior high school students.

## **RESEARCH METHOD**

This research was R & D (Research and Development) research using the ADDIE model which has five stages, namely analysis, design, development, implementation, and evaluation. This research was conducted in the odd semester of the 2018/2019 academic year. Limited trials were conducted at Ma'arif 03 Malang Islamic Middle School with research subjects, 24 students of class VII who had not taken algebraic material.

The research procedure used in accordance with the ADDIE development model. The stages of analysis activities were conducted needs analysis, curriculum analysis, and student

character analysis. The design stage was designed products and research instruments. The development stage was production and media validation. The implementation phase was a media trial activity on the research subject. And the evaluation phase aimed to measure product quality and achievement of media goals.

The data collection instruments used media validation questionnaires, material validation questionnaires in the media, student response questionnaires and learning outcomes test sheets. The media validation questionnaire used to measure the level of validity of the media. Questionnaire for material validation in the media to measure the validity of material in the media based on algebraic literacy indicators. Student questionnaire responses and learning outcome test sheets were given after students use the media to determine the effectiveness of media products.

Data analysis techniques included validity analysis and effectiveness analysis. Validity data analysis was obtained by calculating the average of each criterion from the validator, the average of each aspect and the average total validity. Analysis of media effectiveness was measured by analyzing student response questionnaire data and analyzing the results of student learning completeness. The results of the data obtained from the responses questionnaire of recapitulated students by changing into quantitative data according to Likert calculation scores.

## RESULT AND DISCUSSION

The steps used in the development of this product adopt and adapt the ADDIE development process which consists of five stages namely analysis, design, development, implementation and evaluation. The activities of each stage in the product development process are as follows.

The initial stage is the analysis phase which includes needs analysis, curriculum analysis and character analysis of students. Needs analysis was carried out by interviews and observations at Ma'arif 03 Islamic Middle School in Malang, obtained by identification of problems, namely teachers still rarely use the media of learning while teaching, students still have difficulty connecting algebraic lessons with everyday life. Curriculum analysis is in accordance with the curriculum used in schools, namely K13 with the following basic competencies

Table 3: Basic Competencies and Indicators of Achievement

Basic Competencies	Indicators of Achievement
3.5 Describe algebraic forms and perform operations on algebraic forms (addition, subtraction, multiplication, and division)	(i) Understanding the basic concepts of algebraic forms (ii) Complete operations on algebraic forms (addition, subtraction, multiplication, and division)
4.5 Resolve problems related to algebraic forms and operations on algebraic forms	(i) Resolve the typical contest problem in the operation of algebraic forms (ii) Resolve a real problem in the operation of algebraic forms

Source: Kemdikbud (2016)

The results of the analysis of the characteristics of student researchers concluded that junior high school students were less interested in reading ordinary textbooks. Students are more interested in books that contain images such as comics. This analysis phase is in line with Saputro's (2015) opinion that before comics are used as learning media, comics must be developed correctly whether the characteristics of the comics are in accordance with the needs

of the students and how the characteristics of these students. Submission of educational messages through comic media can attract student learning interest.

The second stage is the design stage. The design of the product itself goes through several stages, namely, preparation of material, making figures, storyline writing, an initial depiction of comic sketches, digital coloring, adding dialogue, making covers and planning materials to be used. Preparation of materials using BSE class VII revised K13 2017. The comics are divided into 4 chapters, namely recognizing algebraic forms, summarizing and subtracting algebraic forms, multiplying algebraic forms, and division algebraic forms.

Making characters is done by drawing manually on a sketchbook. The name of the character is the result of writing by the author. Character traits created to adjust to the description of teenage children. This is done so that students feel close to the characters in the comic.

Writing the flow is made to adjust the indicators of algebraic literacy namely mathematizing, reasoning and argument, and using symbolic, formal and technical language and operation according to the initial purpose of making media. The storyline is written based on stories that are close to students' daily lives by adding problems related to algebra.

The initial depiction of the comic sketch is done above the sketchbook by adjusting the storyline that has been made. After drawing the sketch manually, through the scanning stage the image is changed in digital form. The next step is the image editing stage using Adobe Photoshop CS6 software. Then, the coloring process itself is done with Corel Draw X7 software. After the process is complete, the process of compiling the pieces of the image is done, in Corel Draw with A5 size paper.

The selection of materials used in this media is based on criteria that are durable, strong and harmless. Based on these criteria the paper material used for the cover is 210 gr art paper and for its contents using 150 gr art paper.

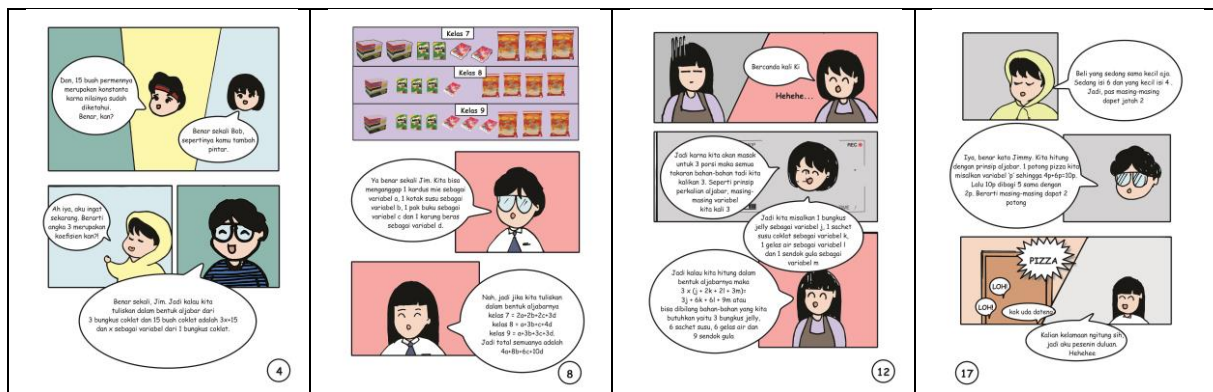
The third stage is the development which is divided into two, namely the manufacturing stage and the validation stage. At the manufacturing stage, all media components that have been designed are printed using pre-determined paper materials and combined into one unit. Media based on algebraic literacy comics for class VII junior high school students validated by 2 validators. The two validators were media expert validators who were UMM Mathematics Education lecturers and learning practitioners who were mathematics teachers at Ma'arif 03 Islamic Middle School Malang. The results of the assessment by the two validators, namely the content aspect obtained an average of 3.63; language aspects 3.84; presentation aspects 3.92 and compatibility aspects 3.75. Of the four aspects, obtaining an average of 3.79 is a very valid category with proper information. The acquisition of the results of the two validations, namely the appropriate media to be tested with several revisions according to the suggestions of the two validators.

The results obtained from the material expert validator obtained an average of each aspect, namely the Mathematizing aspect 3.5; 3.67 aspects of Reasoning and Argument and aspects of Using Symbolic, Formal and Technical Language and Operation 3.00. So, the average obtained is 3.39 said to be valid and worth testing. Each of these aspects is an algebraic literacy indicator taken from OECD (2013). The results of this validation are in line with the research conducted by Sri Adi Widodo & Pardimin (2017) who also developed the comic media in which the results of the validity of the media obtained a score of 3.93 categorized as very valid.

The visual appearance of an algebraic literacy based comic media is like the picture below.



Picture 1. Comic Cover and Figure Page



Picture 2. Example of Display of Comic Contents Page

The fourth stage is the implementation or trial phase. The algebraic literacy based comic media that has been developed and declared feasible is tested on 24th-grade students of Ma'arif 03 Islamic Middle School as many as 24 students on Tuesday, September 25<sup>th</sup>, 2018. Classes are divided into 5 groups randomly, each member consists of 4- 5 students. The teacher explains the media for algebraic literacy that will be used in learning. Students observe and read comic media. The teacher appoints groups randomly to advance in front of the class and read comics. Each group member acts as a character in a comic. Every time you finish reading one chapter, the teacher invites the students to conclude with the story in one chapter by asking questions and answers. After the learning is complete, students fill out the student response questionnaire and do the learning outcomes test.

The last stage is an evaluation, this stage is used to measure product feasibility and achievement of product development goals by analyzing the data that has been obtained. The level of media feasibility is measured through the validity value of the media, the level of media effectiveness is measured by the level of student response and from the results of student learning tests.

Media products are said to be effective if the student response is at least positively categorized and more than 75% of the test students are declared complete learning. Both of these must be fulfilled to state whether the media can be declared effective. The results of student responses after using comics based on algebraic literacy obtained an average student response score of 85.21%. This is in line with the research conducted by Anip Dwi Saputro (2015) which results from the percentage of student responses gaining an average of 86.9% which is very positive. While the results of the percentage of class completeness of 87.5% are positively in line with the research conducted by Michael Amin Manalu et al. (2017) who also

developed a comic media in which the results of classical completeness reached 83%. Based on these two things, the media is declared effective to be used as a learning media for algebraic material in class VII junior high school students.

## CONCLUSION

The development of algebraic literacy-based comic media for class VII SMP students is carried out in accordance with the procedures for R & D development using the ADDIE model. In the analysis phase, the researcher analyzes the needs, curriculum, and character of students. At the design stage, the researcher makes the characters in the comic then make a storyline that is adjusted by algebraic literacy indicators, followed by sketching, then scanning the image in digital form, editing, coloring and adding text is done with the help of Adobe Photoshop CS6 and Corel Draw X7 software. In the development phase, the researcher prints media and media validation by validators of media experts, material experts, and learning practitioners. During the implementation phase, a product trial is carried out to determine the effectiveness of the media. In the evaluation phase, a data analysis phase is carried out to measure product feasibility and effectiveness.

The comic media based on algebraic literacy was declared effective in algebra learning for class VII SMP. The results of the percentage of student responses after using the media amounted to 85.21%. The results of student learning completeness revealed that 21 out of 24 students with a percentage of 87.5% were declared complete. So that the media is categorized as effective because it has exceeded the minimum level of classical completeness which is 75%.

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