
DEVELOPMENT OF MOTION COMIC BASED ON DIGITAL LITERACY TO OPTIMIZE ALGEBRAIC THINKING ABILITY IN ELEMENTARY SCHOOL

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ABSTRACT

Algebraic Thinking is a skill needed today. Algebraic thinking skills are skills in solving problems is not known its completion through the proper analogy and found his own way. Based on previous research that can be familiarized algebraic thinking since elementary school. Other research findings, there are obstacles in algebraic thinking, namely epistemology obstacle, didactical obstacle, conceptual obstacle. The aim of this research will be to develop a motion literary learning media based on digital literacy. The method used is Research and Development (R&D) which involves 10 elementary school students in fourth grade. Instructional media based on local comic-based wisdom have material content that can improve students' algebraic thinking skills.

Keywords: Algebra Thinking, Digital Literacy, Elementary School, Motion Comic.

INTRODUCTION

Algebraic thinking is a process of thinking about describing certain situations using appropriate representations, concrete models and symbols, and using a balance strategy to find something that is not yet known (Warren, E., et.al, 2009). Algebraic thinking can also be interpreted as an activity of manipulating numbers and number signs to solve something that is unknown how to solve it (Powell, S.R. & Fuchs, 2014). Based on these two definitions, it can be interpreted that the ability to think algebra is an expertise in solving a problem whose solution is not yet known to be solved through an appropriate example and the method found for itself.

The ability to think algebra needs to be done since elementary school. Based on the results of several previous studies show that algebra is one of the materials that is difficult for high school students, especially on the concepts and operations of algebraic counts, so it must be accustomed to thinking algebra since elementary school (Hidayati, F. 2010; Marsetyorini, A. D. & Murwaningtyas, C. E., 2012; Herutomo, R. A. & Saputro, T. E. M. 2014; Permatasari, B. A. D., et. al, 2015). In addition, based on research conducted Kilpatrick, et al states, there are activities that make algebraic habitual thinking can be done by predicting the continuity of patterns, applying the principle of "=", making representations into various forms, and others (Kilpatrick, J., Swafford, J. & Fidell, B., 2001)

The implementation of algebraic thinking in elementary schools must pay attention to the characteristics of students who are in the concrete operational phase (7-11 years). In this phase, students have been able to think rationally, such as reasoning to solve a concrete problem. So, learning media are needed that can bridge mathematical concepts about abstract algebraic thinking with concrete student thinking. In addition, the selected learning media must be able to clarify the subject matter, increase student motivation and be able to overcome the difficulties faced by students.

Internal Correspondence Version 2 (2013) said that, the learning media chosen to facilitate students in doing algebraic thinking activities are comics that are presented in digital form and are given interesting sound and graphic effects or often referred to as motion comics. This learning media is relevant to technological developments in the current 4.0 era. Along with the progress of the era in the era of disruption, comics published digitally are increasingly in demand by the public. Based on the Internal Correspondence Version 2 report in 2013, the growth of digital comics in the world has reached 300% since 2011. In addition, McCloud states that digital comic provider sites are currently in great demand. Besides being used in the learning process about thinking algebra, it can also be used as a form of education for readers to positively utilize technological developments (McCloud, Scott., 2006).

According to M. Keith Booker (2014) that motion comics are a combination of traditional comic grids with animation elements, including animated transitions, panning and zooming in details, and with soundtrack. Simply put, motion comics are comics that are presented in digital form and

are given interesting sound effects and graphics. The meaning of the comic itself is a series of storytelling images, which are used for entertainment media for readers. Comics are a cartoon that expresses a certain character and exhibits a story in a tight order, connected with pictures and designed to provide entertainment to the reader. The components of motion comic are not much different from comics in general, which consists of pictures that illustrate the character and place of the incident, material or story, and language as a means of communicating the material or story to the reader.

Motion comic has more value than other learning media. Hermawan, et al explained that comics that are closely related to cartoons can provide motivation and attract students' attention and foster student interest in learning (Rohani, A, 1997). In addition, Bolton-Gary states that the emotional (humorous) and visual (image and text) elements of comics, including digital comics with sound effects can help improve students' understanding of conceptual material (Hermawan, A. H., et.al. 2007). Lessons that are too conceptual make it difficult for students to visualize and understand processes in complex systems (Bolton-Gray C, 2012). Thus, concrete efforts to get elementary school students to do algebraic thinking researchers will develop learning media based on digital literacy. One indicator of algebraic thinking is to make generalizations about geometric patterns and numerical patterns in class IV. Then a study to optimizing the algebraic thinking ability of elementary school students through development of motion comic.

METHODS

This research method uses the method of research and development (R&D) with the model of Borg and Gall with the steps of research development namely the collection of research and information, planning, initial product development, initial field testing, major product revisions, main field testing, improvement operational results, operational field tests,

improvement of final results, distribution and distribution, based on needs and field conditions, the steps in the development of motion comics based on the Borg and Gall theory above are adjusted to five stages (Borg, W.R., & Gall, M.G., 1989).

This research was carried out at the Teluk Pucung I Elementary School and Harapan Baru III Elementary School in Bekasi. The first step, the research will be carried out in Class IV. The study involved 25 students, teachers, students and elementary school mathematics and literature experts. In addition, this research involves various parties who participated in the design and development process.

This study involved experts in basic mathematics as an instrument validator whose job was to assess the suitability of elementary school mathematics material contained in comic stories. Indonesian Language and Literature Expert (comic script) as the validator of the suitability of the story with the criteria of elementary school level whose task is to check the accuracy of the use of language rules that are in accordance with the characteristics of elementary school-age children, and finally the graphic design expert as a validator of the suitability of comic illustrations with the contents of the story assigned to check the accuracy of the illustrations chosen to illustrate an educative story line and appropriate elementary school mathematics material. In addition to involving experts, in this study involving elementary school teachers. The teacher participates in providing data (as an observer) to explore algebraic thinking skills. The teacher also responds to motion comics developed in extensive tests.

The research variable that was targeted in this study was the development of motion comics. To test variables, research instruments are needed. The instrument at the design stage uses an observation sheet. Observations were made to load preliminary data on what should be in motion comics, what kind of story scripts would be designed by including the content

of numerical and geometric patterns, stories and displays of motion comics that are liked by elementary school children and how students utilize digital technology in everyday life -day. So the instrument made in the form of an observation sheet is divided into two, namely an observation sheet of algebraic thinking abilities and an observation sheet of digital literacy intelligence.

After the motion comic script is designed and becomes an almost finished product, then the design of the motion comic model is validated. The instrument at this stage was made to measure the suitability of the manuscript with numerical and geometric pattern material, the criteria for elementary school level and its suitability with the 2013 curriculum. The instrument made was in the form of an expert validation sheet.

After that, the instrument used at the stage of the model trial phase is to use a response questionnaire. The questionnaire developed was a yes and no questionnaire to assess overall motion comics both in terms of content, language, content of algebraic thinking, and appearance, as well as general comments in the form of hopes for further development of the motion comic. This questionnaire was developed from aspects of Tarigan analysis. The results of this response questionnaire are used for the final revision (Tarigan, H.E., 2011).

Data processing in this study uses content validity. Content validity is carried out to find out how valid the instrument to be used is estimated through testing the appropriateness or relevance of the test content through rational analysis by a competent panel or through expert judgment. The results of data from documentation studies, observations, interviews, and questionnaires will be processed and analysed by means of qualitative data analysis Miles and Huberman include, the formation of a codification data coding cycle of data, data presentation, and conclusion drawing or verification (Sugiyono, 2012; Afrizal, 2014).

RESULTS AND DISCUSSION

Results

Generally, algebraic thinking in elementary schools is conceptualized more broadly, so that the emphasis on algebra shifts from symbol manipulation activities to reasoning including generalization based on patterns, facts, phenomena or data available, solving problems and communicating ideas through symbols, tables, diagrams, or other media to clarify the situation or problem. Found difficulty in presenting students data in the form of tables or diagrams. Difficulties that are found are classified into three categories namely epistemology obstacle, didactical obstacle, conceptual obstacle.

How to make a motion comic is not much different from making a comic in general. Osa explains how to make comics, which are determining themes, determining characters, characterizing, making plots, making scripts, making story boards or names, making panels, drawing, making word balloons and making covers (Osa, A., 2007). The process of making motion comics uses Sketchbook Pro software and is presented in digital form. While the design principles refer to: Model (Form) of Motion Comic, Intervention Objectives, Intervention Objectives, Intervention Context, and Motion comic characteristics. Motion comic models or forms are developed in digital form based on digital literacy (story line and characterizations). This form was chosen because it is in accordance with current technological developments. The intervention is carried out on the storyline which is a stage of thinking algebra by understanding the basic concepts of fractions and introducing the symbols of fractions through a series of stories in motion comics. The material chosen was the basic concept of fractions and the introduction of fraction symbols. After understanding the essence of the concept of fractions students will be introduced to the symbol of fractions.

Motion comic characteristics, including several aspects, namely (1) Teaching material refers to the basic concept material of fractions in class IV in which there is a close symbolic process to the algebraic thinking of elementary school students. (2) Plot The selected flow is a forward groove. The flowchart is simple. The plot is made to make children interested to keep reading until they run out. Thus, the grooves are made to move live as attractive as possible. (3) The setting or setting includes place, time and atmosphere. (4) The place is displayed by showing authenticity, so that children can be imagined. The time contained in the story influences the character's actions and shows if at that time an event had actually occurred. The character's mood is the mood that is able to influence the events in the story. (5) development perspective used is the all-round third person. This viewpoint is considered appropriate for use in children's books. (6) Don't too many figures and characters directly involved in children's story books. Developing this book there are only a few characters that are involved, according to the timeline of the story. There are only 4 main characters, the other characters are either side characters or helpers. The attitude of the characters displayed is convincing and real. (7) The Storytelling style pays attention to the wants of children who are curious and presents a variety of vocabulary words, to increase the child's vocabulary wealth.

The procedures undertaken to develop motion comics are as follows, Analysis of learning obstacle thinking in algebraic students. Both analysis of test questions and analysis of the results of the interview. Then, development of the principle of motion comic. Next, development of comic scripts about algebraic thinking. After that, development of layout designs and illustrations. Then, making motion comics using Scethbook Pro. Next, analysis of motion comics (expert validation). Doing response test. Then, analysis of response test results. The last motion comic improvement based on the results of the response test analysis.

DISCUSSION

Motion comic has more value than other learning media. Comics that are closely related to cartoons can provide motivation and attract students' attention and foster student interest in learning. In addition, the emotional (humorous) and visual (image and text) elements of comics, including digital comics with sound effects can help improve students' understanding of conceptual material. Lessons that are too conceptual make it difficult for students to visualize and understand processes in complex systems. The design principle is the development of motion comic models or forms of motion comics that are developed in digital form based on digital literacy (story line and characterization). This form was chosen because it is in accordance with current technological developments. In motion comic, the appearance of sheets such as comics will be tespace

CONCLUSION

The research resulted in the design and principles of motion wisdom design based on digital literacy in learning algebraic thinking of elementary school students. The development of motion comic design and the principle of development are based on an analysis of intervention needs (including analysis of learning obstacle algebraic thinking on elementary school students) and the validity of experts (judgment expert). The results showed that there were some obstacles in student learning in thinking algebra. The most basic of algebraic thinking is modelling symbols or symbols in mathematics. Given the level of thinking of elementary school students in the concrete stage underlies the making of learning media that can bridge concrete thinking towards abstract. Additionally selected content that is close to the daily lives of students or elevates digital literation content and is in line with current technological developments. There is no representative learning media available in the schools. The final design resulting from this study is a digital

literation motion comic model to improve the algebraic thinking skills of elementary school students.

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