Development of Mathematics Learning Media *E- Comic* Based on *Flip Book Maker* to Increase the Critical Thinking Skill and Character of Junior High School Students

Dr. Rasiman, M. Pd.
Agnita Siska Pramasdyahsari, S. Pd., M. Pd., M. Sc.

Lecture of Mathematics Department, Universitas PGRI Semarang, Indonesia
Correspondence address : Jl. Sidodadi Timur No. 24, Semarang, Indonesia
Email: mpdrasiman@yahoo.co.id

ABSTRACT

The purpose of this study was (1) to develop mathematics learning media e-comic based on flip book maker, (2) to know the effectiveness of mathematics learning media e-comic based on flip book maker observed from critical thinking skills and character of junior high school students.

This study is developmental research that used four phases of Thiagarajan namely define, design, develop, and disseminate. The subjects were eighth grade students of SMP N 15 Semarang, Central Java, Indonesia.

The study showed that: (1) the development of mathematics learning media e - comic based on flip book maker has reached a valid indicator, (2) the mathematics learning media e-comic based on flip book maker effective to improve junior high school students' critical thinking skills and (3) the mathematics learning media e-comic based on flip book maker can foster the character value such as: discipline, cooperation, honesty, confidence and perseverance.

Keywords: *Critical thinking, e-comic, flip book maker, character.*

1. INTRODUCTION

Curriculum 2013 develops two models of learning process namely direct instruction and indirect instruction. Direct instruction is the education process where the students develop the knowledge, cognitive and psychomotor skills through the straight interaction with learning sources which is designed in the syllabus and lesson plan that organized as learning activities (Kementrian Pendidikan dan Kebudayaan, 2013). In the direct instruction, the students do the learning activities

such as observing, questioning, gathering the information, associating or analysing, and communicating what they have already found in the analysing activity. The direct instruction process produces the knowledge and skill that is called as instructional effect.

Related to the questioning activity in the learning process, the expected competences are to develop creativity, curiosity, the skill to formulate the question to shape critical thinking that necessary to live smart and live time. Mathematics is one of the important branches of knowledge to increase the quality of human resources. Through the increasing of human resources quality, the quality of the nations will increase. Therefore, school mathematics plays role in training the students to have a logical, critical and practical thinking, and also have positive attitude and creative (Suherman, 2001: 58). Thereby, each nation will try to keep and increase the quality of mathematics education.

Considering the important of mathematics learning, the students have to master the mathematics. NCTM (2000) determined that there are five of processing skills that have to be mastered by the students through mathematics learning that coming within standard process, namely: (1) problem solving; (2) reasoning and proof; (3) communication; (4) connection; and (5) representation. Those skills include in high order mathematical thinking.

The paradigm of contemporary learning stated that the function of mathematics learning is not only as a development skill but also must fulfil four principles, namely: mathematics as a media to develop reasoning, problem solving skill, communication media, and connection between concepts in mathematics (NCTM, 2000). Now, training the reasoning skill, problem solving, communication, and connection in mathematics have not civilized yet. Most of students accustom to do the learning activities by paying attention the teacher explanation, duplicate, and then memorize it. To cope this problem, the researcher be convinced that necessary to do effort of development learning media that full of joyness appropriate with the development of junior high school students.

One of the media that interesting for students is *e-comic* based on *flip book maker*. Rahardjo (2002) stated that *e-comic* is a transformation of technology comic media that initial by printed comic into digital comic with electronic format. While using a flip book maker software, students will be more interested in learning because it contains the displays that more interesting. Flip book maker is software that has a function to open each page to be like a book. Software flip book maker can create and convert PDF files, image into a book or physical album when we open per page. The final result can be stored in .swf format, .exe, .html (Wijayanto, 2011).

To enhance critical thinking skills and accommodate the junior high school students' character was needed the learning media which well-designed and properly fit the character of junior high school students. It should integrate in the teaching materials such that enabling students to learn actively, collaborative, and fun and also appropriate to the stages of their mental do the mathematics.

The research problems of this study were (1) how to develop a valid mathematics learning media *e-comic* based on flip book maker? and (2) is the mathematics learning media *e-comic* based on flip book maker effective to increase critical thinking skills and character of junior high school students?

2. LITERATURE REVIEW
2.1 Critical Thinking

Critical thinking and creative thinking are the two types of higher order thinking. Both require a relatively high cognitive competence that needs to be mastered everyone dealing with a problem. Critical thinking is a kind of thinking to compare two or more information, review, selecting alternatives, make decisions, and draw conclusions. If there are differences or similarities of the information, then he will ask a question or comment with the intention to get an explanation.

Johnson (2002) explained that critical thinking organize the process which used in the mental activities such as problem solving, decision making, persuading, analysing the assumptions and scientific discovery. Critical thinking is the ability to reason in an organized manner. Critical thinking is also an ability to evaluate systematically the quality of thinking of ourselves and others. Creative thinking is a mental activity that pays attention the originality and insight of the idea. By critical and creative thinking allows the students to learn mathematics problem systematically, brings a lot of challenges in an organized manner, formulating the innovative questions and designing the accurate solutions.

Critical thinking which developed by Intercollege Committee on Critical Thinking which consists of : (1) the ability to define the problem, (2) the ability to select information for problem solving, (3) the ability to recognize the assumptions, (4) the ability to formulate hypotheses, and (5) the ability to draw conclusions. If related to the mathematical problem solving, the ability at point (1) and (2) showed the students' ability in understanding a problem. Meanwhile, the ability at point (3) and (4) the students have an image to make a settlement plan. Then, the ability at point (5) the students were able to implement the plan that already created.

Based on the description above, then the critical thinking that is intended in this study is characterized by the ability to : (1) identify the facts given clearly and logically; (2) formulate the problem issues carefully; (3) apply the method which already learned accurately, (4) reveals data/ definitions/ theorems to solve problems appropriately; (5) determine and implement the steps correctly, (6) evaluate the arguments that are relevant in solving a problem carefully, and (7) distinguishes between conclusions that based on the valid or invalid logical.

2.2 E-Comic

Bahasa Indonesian Dictionary (2008: 742) stated that the comic means a picture story. Ajidarma (2011: 36) stated that the term is derived from the word comic that has a meaning funny. It usually in the form of narrative and there is a particular page in the newspaper. Based on the description above, it can be concluded that the comic was illustrated stories that have a plot and has a special attraction for readers.

Along with advances, technology greatly affects the planning of learning strategies. Teachers can use a variety of media in accordance with the needs of the learning process; one of them is by using *e - comic*. Rahardjo (2002) stated that e - comic is a transformation of technologies media comic that began in the form of print out into digital with the electronic format. Thus, it can be

concluded that e - comic is illustrated story that has a certain storyline in the digital form with an electronic format that has a role as a learning media for students.

2.3 Flip Book Maker

Sugiyanto et al (2013: 103) stated that media creation multimedia-based can be done by using software. Flipbook Maker is software used to create books appearance or other teaching materials into an electronic digital book shaped flipbook. Wijayanto (2011) stated that Flip book maker is software that has a function to open each page to be like a book. Flip book maker software can create and modify pdf files, image / photo into a physical book or album when we open a page. The final result can be saved in .swf format, .exe, .html.

Flip Book Maker is software designed to convert PDF files to digital. This software changes the appearance of the PDF file to be more interesting like a book in digital form. By using the software, the media appearance will be more varied because not only in the text form (Sugiyanto, et al , 2013 : 103). Besides, by using flip book maker is expected that students will be more interested in learning because it contains the more attractive displays.

2.4 Education and Character Development

Based on Bahasa Indonesian dictionary the word "character " is defined as the nature of the human mind which affects all thoughts and behaviour. The means of character related to the moral strength, the connotation of "positive" and not neutral. Thus, the people are said have character if he or she have a specific moral quality that positive. Thus, education builds character, implicitly implies to establish the nature or pattern of behaviour that is based on or related to the moral dimensions that positive or good, not negative or bad (Raka , 2007: 5).

The character is all of the natural disposition and dispositions that have stably controlled that defines an individual in the overall psychological behaviour system which makes it typical in the way of thinking and acting. The characters can be mapped in two important aspects within the individual namely, the unity (coherent way of acting) and the stability (the continuous of unity in time series). Therefore there is the psychological structuring process in the individual that are naturally reactive nature to the environment. Some of the characters criteria are: the stability of behaviour patterns, the continuity in time series, and the coherence way of thinking in the act.

The education of character should be developed in a holistic manner so that the result will be more optimal. Since, in building human character not only from the cognitive dimension, but also in their process must be able to develop human potential. As explained by Lickona (1991, 53-54), in order to develop the education of character, it needs to consider the principles to be effective namely:

a. *Character education in holds, as starting philosophical principle, that there are widely shared pivotally important, core, ethical values, such as caring, honesty, fairness, responsibility, and respect for self and other.*

b. *Character must be comprehensively defined to include thinking felling, and behaviour.*

c. Effective character education requires an intentional, proactive, and comprehensive approach that promotes the core values in all phases of life.

d. The program environment must be a carrying community.

e. To develop character children need opportunity for moral action.

f. Effective character education includes a meaningful and challenging curriculum that respects all learners and helps them succeed.

g. Character education should strive to develop intrinsic motivation.

h. Staff must become a learning and moral community in which all shared responsibility for character education and attempt to adhere to same core values that guide children.

i. Character education requires moral leadership and program must recruit parent and community members as full partners.

j. Evaluation of character education should assess the character of the program; the staffs' functioning as character education and the extent to which the program is effecting children.

Based on the above principles can be understood that in order to develop the education of character should be based on a comprehensive and holistic understanding in all relevant role in the learning process. Even with the principles of the education characters can be prepared the appropriate ways with the problems faced by individuals and groups. Besides that, in the process of character education is not only for idealism, but also has a meaning in building a welfare society.

3. RESEARCH METHOD

This research included to the developmental research. It develops the valid and effective mathematics learning media e-comic based on flip book maker to increase critical thinking skills and character of junior high school students. The procedures of development in this study refer to the development of 4D Thiagarajan. This development consists of four phases, namely define, design, develop, and disseminate. In this study is limited to the develop phase.

The types of instruments which developed in this study are an instrument for the development of e-comics media based on flip book maker. The instrument that was developed consist of: (1) validation sheet for e-comics media based on flip book maker, (2) critical thinking skills test items, and (3) observation sheet of the students' character.

4. RESULT AND DISCUSSION
4.1 Result of Development Learning Media
a. *Define*

This phase was conducted to determine and define the necessary conditions for learning by analysing the purpose and limitations of the material. The activities that were carried out at this phase are a preliminary and final analysis, the students, analysis of material, analysis of task, and specification of learning objectives.

b. *Design*

This phase was carried out to plan a learning media. The plan for mathematics learning media that produced was mathematics learning media e-comic based on flip book maker. In addition, it also produced questionnaires to measure the critical thinking skills and observation sheet to find out the character of students. The activities in this phase were made criteria for compiling the test, selecting the media, selecting the format and preliminary design which started after set a specific of learning objectives.

c. *Develop*

This phase was carried out to produce a draft of e-comic mathematics learning media based on flip book maker which has been revised based on suggestions from the experts. The results of this draft then tested in the junior high school to know the students' responses about the use of mathematics learning media e- comic based on flip book maker and the data obtained from the results of this trial which showed that junior high school students are very happy to use the media. The are two activities that involved in this phase, namely: (1) the assessment from the experts, it was used to revise the first draft into a second draft, and (2) testing e-comics media based on flip book maker, it was used to revise the second draft into the final draft.

Based on the results above, the first discussion will be discussed about the results of the development mathematics learning media e-comic based on flip book maker. The process of developing mathematics learning media e-comic based on flip book maker begins with compiling the initial draft (first draft) which contains mathematics materials with image of comic, then transfer into flip book maker. The results from the first draft, subsequently validated by an expert in media and an expert in mathematics matter of junior high school to assess the feasibility of e-comic media based on flip book maker. The suggestions from the experts, was used to revise the first draft in order to obtain the second draft. The next phase after the second draft obtained, and then was carried out to test in the junior high school students to know the readability. During the process and after the implementation of testing media, was carried out revision based on field demands or the suggestions from outsider in order to obtain the final draft (third draft). It is in line with Geddes (2004) stated that learning media ICT-based is process gathering the knowledge information knowledge and skills through the use of technologies that can be done anytime and anywhere to produce a change in the behaviour of its users.

4.2 The Effectiveness of Media toward Critical Thinking Ability

The results of the second study obtained the junior high school students' critical thinking skills for the experimental class was 82.95. It was better than the critical thinking skill from the control class which has average 67.35. Based on these results, it can be concluded that the use of mathematics learning media e-comic based on flip book maker is effective observed from the junior high school students' critical thinking skills.

After all of the e-comic media based on flip book maker revised (second draft) in accordance with the suggestions from validator, then the trial was carried out to obtain the

suggestion to refine the e-comic media based on flip book maker become the final draft. The next step was to test whether the ability of junior high school students' critical thinking on the experimental class is better than the control class. The implementation of the testing process was given in 3 meetings in the experiment class and one meeting for the implementation of thinking skills tests in the experimental class and control class.

The critical thinking skills that were measured are the classical critical thinking skills. It has been stated that the classical critical thinking skills in the experimental class was 82.95. It showed the real success of the learning process that used mathematics learning media e-comic based on flip book maker. While the critical thinking skills in the control class reached 67.35. Based on the results of comparing the critical thinking skills between experimental and control class, it can be concluded that the experimental class had higher critical thinking skills compared to the control class. It showed that the learning process which uses the e-comic media based on flip book maker better than the learning process which applied conventional method. This is in accordance with the opinion of Traxler (2005), he stated that media ICT-based is a learning strategy that involves the use of technology in mathematics learning can foster a process of thinking that is patterned. The learning media e-comic is a transformation of technology comic media in the form of a digital comic with an electronic format that can foster the students' interest in mathematics learning because it contains the displays which more attractive. This is consistent with the level of thinking and characteristics of junior high school students.

4.3 Mathematics Learning Media *e-comic* based on *Flip Book Maker* Foster the Character Value

The character value of junior high school students which is integrated in the mathematics learning process that use *e-comic* media based on *flip book maker* is discipline, cooperation, honesty, confidence and perseverance.

Details of the integration of the characters values in the learning process can be presented in Table 1, as follows:

Activities	The Implanted Character				
	Discipline	Cooperation	Honesty	Confidence	Perseverance
Preliminary Activities	✓			✓	✓
Core Activities	✓	✓	✓	✓	✓
Closing Activities		✓	✓	✓	✓

These values are explicitly stated in the lesson plan and the worksheet class discussions (LKDK). The integration of the character values was carried out by entering the indicator achievement of competence affective aspects which include:

1. Junior high school students follow the learning process with enthusiasm and discipline.
2. Junior high school students realize the importance of learning mathematics.
3. Junior high school students appreciate others opinions of others in a group discussion.
4. Junior high school students are able to work in teams.
5. Junior high school students have the responsibility either individually or in groups.
6. Junior high school students have high confidence with the results of their work.
7. Junior high school students are able to work honestly in doing their tasks.

These characters values are a character value that is explored in the mathematics learning process in the junior high school using e-comics media based on flip book maker. Regarding to the results of the table above, it showed that the results of this study support the Lickona's opinion (1991) that stated character education should be developed in a holistic manner in the learning process, so the result will be more optimal. Since, in building human character not only of the cognitive dimension, but the process must be able to develop human potential.

5. CONCLUSION

Based on the results of study and discussion that has been described, it is obtained conclusions as follows: (1) the development of mathematics learning media e-comic based on flip book maker for junior high school students have reached a valid indicator, (2) the use of mathematics learning media e-comic based on flip book maker is effective observed from the critical thinking skills of junior high school students, because the critical thinking skills of experimental class was higher than the control class, as indicated by the critical thinking skills of experimental class reach 82.95 and control class reach 62.35, and (3) the use of mathematics learning media e-comic based on flip book maker can foster the characters such as discipline, cooperation, honesty, confidence and perseverance.

6. REFERENCES

Ajidarma, Seno Gumira. (2011). *Panji Tengkorak: Kebudayaan dalam Perbincangan.* Jakarta:Kepustakaan Populer Gramedia

Johnson, Elaine B. (2002). *Contextual Teaching and Learning: What it is and why it's here to stay.* Thousand Oaks: Corwin Press,Inc.

Lickona, Thomas. (1991). *Educating for Character.* NewYork : Bantam Books.

NCTM. (2000). *Principle and Standards for School Mathematics*. Reston VA: NCTM.

Kementerian Pendidikan dan Kebudayaan. (2013). *Permendikbud nomor 81 A*. Jakarta

Rahardjo, Budi. (2002). *Rancangan ABC e-Book.* Makalah disampaikan pada Seminar Sehari pada tanggal 20 Agustus 2002 di Departemen Fisika ITB. Bandung.

Raka, Gede. (2007). *Pendidikan untuk Pembentukan Karakter.* Available at: http:www.kti.guru.net

Sugiyanto, dkk. (2013). Modul Virtual: Multimedia *Flip Book* Dasar Teknik Digital. *INVOTEC. Volume IX, No.2, Agustus 2013 : 101-116.*

Suherman, Erman, dkk. (2001). *Strategi Pembelajaran Matematika Kontemporer*. Bandung: JICA-Universitas Pendidikan Indonesia.

Tim Redaksi KBI. (2008). *Kamus Bahasa Indonesia*. Jakarta: Pusat Bahasa

Wijayanto, Agung Ardhi. (2011). *Ncesoft flip book maker membaca ebook lebih nyata-referensi spesifikasi, berita terbaru_new trik tips computer.* Available at http://www.tombolesc.com/ accessed 7 Mei 2014.