

# Critical Thinking Skills Development Through Interactive Mathematical Learning Media

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**Abstract**—This research aims to design an interactive learning media in the subject of mathematics capita selecta, identify the beginning and ending of the ability of critical thinking math students. The method used is Research and Development, with the steps: identifying of teaching material that is given to subjects capita selecta mathematics, compiling teaching materials media interactive learning, designing interactive learning media, asking for consideration of experts, piloting interactive learning media and instruments research, initial tests critical thinking skills of mathematics, implementing of interactive learning media, the ultimate test critical thinking skills of mathematics. Data collection techniques include: test media interactive learning, critical thinking skill test mathematics. The research instrument is a matter of critical thinking skills math test. The population in this study is all students majoring in mathematics education of the third semester 2015-2016 academic year and the sampling used is cluster random sampling technique consisting of 3 classes. The results showed that the critical thinking skills of mathematics students with interactive learning media in Subjects Math Capita Selecta can be implemented in a lecture, the mathematics students early ability to think critically were on the low classification, while the ability of critical thinking of those at the end were in the medium. The highest average ability of the students in their critical thinking are on the indicators of inference and situation.

**Keywords:** *critical thinking skills of mathematics, interactive learning media, mathematics selecta capita*

## I. INTRODUCTION

Education in Indonesia, especially mathematics education, in improving the quality of education need to hold new innovations in learning, human resource development, as well as in the fulfillment of the educational facilities. In connection with the development of human resources, the learning process plays an important role in improving students' critical thinking skills of mathematics. This is consistent with the purpose of the Faculty of Education (Guidance and Counseling) Siliwangi University in Tasikmalaya is to prepare personnel of teachers in middle and high school, according to the needs of both quantity and quality. While one of the missions of Mathematics Education courses FKIP Siliwangi University is organizing a quality education to prepare educators in the field of mathematics professionals. Based on this, students in Mathematics Education courses as mathematics teacher candidates need to prepare themselves maximally to be able to fulfill the mission of Mathematics Education courses. Therefore, one of the subjects that a provision student teachers in middle and high school is Math Capita Selecta. The scope of the course includes: the essential topics in middle schools which have common misconception, or a topic that is considered to be difficult for students in secondary education and further.

The use of instructional media is one of the alternatives in the development process of learning to be better.

Munadi, Y (2008) argued that the position of instructional media is to serve the learning needs of students / students. Through the use of instructional media, students are able to understand certain materials that seem abstract and not easily visualized independently. Interactive multimedia applications in mathematics learning is one form of innovation (product technology) in education. This will impact on beneficiaries or users of these innovations, namely education stakeholders including students. An acceptance of an innovation become very complex due to the diversity of perceptions, backgrounds, and interests of users of innovation itself.

The results of previous research had an impact quite well that the teaching materials interactive media give the students facility to learn more independently. Currently, some means based on information and

communications technology (Information and Communication Technology / ICT) supporting the teaching learning process has been available. Regarding to the development of information technology so rapidly, teaching materials can be presented with sounds and images dynamically, not boring, as well as solid information. Therefore, the development of ICT-based learning is expected to improve the quality of the learning process in the classroom. UNESCO 2002 states that the use of ICT in teaching has three objectives: 1) to build a "knowledge-based society habits" such as problem solving skills (problem solving), communication skills, ability to find / manage information, transform that information into new knowledge and inform others, 2) to develop the ability to use ICT or "ICT literacy", and 3) to improve the effectiveness and efficiency of the learning process.

The use of interactive media in the learning mathematics in the classroom is expected to attract students' interest and motivation to improve their academic achievement. Learning math using interactive media is one form of realization of the curriculum in Mathematics Education courses and development courses Mathematics Instructional Media. Students are expected to participate actively and learn independently on Mathematical Capita Selecta to develop their critical thinking skills in mathematics.

In learning mathematics, the applications of interactive multimedia can be used in presenting the concepts and high-level skills in mathematics, which is connected between one element and the other which is difficult to teach and learn through books. These applications have advantages in explaining a concept. Therefore, the students are expected to be able to explore and analyze, try and explore the concepts and principles contained in the material, so it is relatively faster to build a structure of students' understanding. This is because of the integration of several components such as sound, text, animation, pictures / graphics, and video functioning to optimize the role of the senses in receiving information into the system memory. Nowadays, in some lectures there are still many lecturers who still use ordinary teaching learning conducted without the help of interactive media, so it can not provide the opportunity for students to explore and develop their creativity. Therefore, the development of interactive instructional media is predicted to facilitate students to develop high-level thinking skills independently, one of them is the critical thinking skills of mathematics. Regarding this problem, the authors are interested in carrying out research entitled "Critical Thinking Skills Math Students through Media Development Interactive Learning"

The purpose of this study is to identify the elusive teaching materials, the characteristics of critical thinking skills of mathematics, and the initial conditions of students. In addition, it is to design interactive teaching materials that contain critical thinking skills to facilitate self-learning mathematics students at Mathematical Capita Selecta Course. The outcomes of this study is media interactive learning software at Mathematical Capita Selecta Course.

## II. SOME RELEVANT STUDIES

Research on Media Education, which has been previously conducted by the research team comprising of Sri Wardani, Ipah Mudzalipah, and Edi Hidayat. The study, entitled "Development of Media-Based Learning Interactive Multimedia to Facilitate Self-Study Students on Course Capita Selecta Mathematics (Research on the Ability Understanding and Troubleshooting Mathematics Student Mathematics Education FKIP Siliwangi University in Tasikmalaya) concluded that the design and development of media-based learning multimedia interactive to facilitate students to learn independently and provide the opportunity to develop the ability of understanding and problem solving mathematic, instructional media based interactive multimedia sufficient quality makes it feasible to use student of mathematics learning courses mathematics capita selekta, and media-based learning interactive multimedia positive effect on the ability of understanding and solving mathematical problems students of mathematics education. Other studies are Kusuma (2008, 2009) states that (1) a computer-based interactive learning can be presented in an interesting, efficient, and effective interaction patterns tutorials, simulations, or games; (2) Development of a model-based learning e-Learning improve high-level mathematical thinking skills; and (3) increasing the capacity of reasoning, communication, connection, problem solving, critical thinking, and creative thinking mathematically through learning computer media better than students in the regular classroom learning; (4) the implementation of the use of computer media can significantly increase positive attitudes and interests of students in learning mathematics

## III. THEORETICAL REVIEW

### A. *Media Pembelajaran Interaktif*

Media in the learning process tends to be interpreted as graphics tools, photographic, or electronically to capture, process, and reconstruct the visual or verbal information (Arsyad, 2007). With the presence of

media in learning, students can learn the material independently and provides an opportunity to discover mathematical concepts and develop their creativity. Media are classified into five groups: (1) human-based media (teachers, instructors, tutors, role playing, group activities, field-trip); (2) print-based media (books, guides, exercise books (workbooks), work tool, and loose pages); (3) visual-based media (books, work tools, charts, graphs, maps, drawings, transparencies, slides); (4) based on audio-visual media (video, film, slide-tape program, television); and (5) computer-based media (computer aided teaching, interactive video, hypertext). In mathematics, interactive media helps students understand the various materials that seem to be abstract independently. Sutopo (2003) in Samsudin, A. (2008), suggests a media presentation could use some kind of text, charts, audio, video, animation, simulation, or photos. If these kinds of components (text, charts, audio, video, animation, simulation, or images) can be combined interactively, it can produce an effective learning.

This study uses presentation media in the form of random (non-linear), as one form of interactive video (interactive video). This learning media according to Seels & Glasgow (Arsyad, 2007) belongs to the type microprocessor based on cutting-edge technology media selection. Cutting-edge technology itself is divided into (1) a media-based telecommunications, such as teleconference, distance learning, and (2) a media-based microprocessor, such as computer-assisted instruction, computer games, the tutor intelligent system, interactive, hypermedia, and compact (video) disc. Preparation of the learning process through interactive media begins to prepare the material that will be taught to the following practice questions that contain critical and creative thinking skills in the form of interactive animated video. In the learning process, students learn to interact with the computer and mathematical concepts independently. Lecturers act as a resource and motivator. Another thing that needs to be done for learning through interactive media does not mean just learning entirely by computer, but it must remain the guidance of the lecturers so that the effectiveness of the use of interactive media is maintained. While interactive media can serve as instructors and facilitate self-learning students regarding to the procedures to be performed

#### *B. Kemampuan Berpikir Kritis Matematik*

Learning mathematics can not be separated from the process of thinking. Thinking involves two major aspects of critical and creative. Both thinking use reasoning to build a variety of ideas. According to Fisher (1995) thinking happens in every human mental activity that serves to formulate or solve problems, make decisions, or gain understanding. Judging from the dimensions, Marzano et al. (1989) argues that thinking includes five dimensions of metacognition, critical and creative thinking, thinking, thinking ability of the core, and the relationship between thinking with particular knowledge. In line with these opinions, Fisher (1995) suggested, thinking involves critical and creative aspects of the mind, and both are used in reasoning and build ideas. In addition, thinking is involved in any mental activities that help to formulate or solve a problem, make a decision or to build understanding, and then through thinking, it can interpret something.

Ennis (1981) defines critical thinking is a thinking process with the aim of making sensible decisions about what is believed to be or to do. More Ennis (1981) suggests there are six basic elements of critical thinking that is Focus (focus), Reasons (grounds), Inference (concluded), Situation (situation), Clarity (clarity), and Overview (holistic view). According to Baron and Sternberg (1987) there are five keys in critical thinking that is practical, reflective, reasonable, beliefs, and actions. The five keys to be combined into a definition for critical thinking, so what is meant by critical thinking is a reflective mind that is focused on deciding what is believed to be or do. In addition, the notion of critical thinking is something reasonable, reflective thinking that is focused on what is believed to be the decision, done, or done (Marzano et al., 1989).

#### IV. RESEARCH METHOD

The population in this study is all students of Mathematics Education FKIP Siliwangi University who join the course Math Capita Selecta. The sampling technique used is cluster random sampling. The method used in this research is development research. Procedures in developing interactive learning media include: analysing of the needs of students in the upper division courses, designing the teaching material in writing, asking the expert judgment of teaching materials, revising based on the input of experts, designing interactive learning media, asking for expert judgment interactive media, revised, limited testing, analysing of the trial results, revising, and earning media interactive learning mathematical prepared empirically tested and implemented in the learning of mathematics

## V. RESEARCH FINDINGS AND DISCUSSION

The analysis of the initial conditions of students in mathematics education courses are students who have a grade point average (GPA) average of 3.07. The age of students who will be the population is between 19-21 years. At this age, students have to know the device and use computers or the Internet for information on the results of faculty trustee is not a single person who does not have a social networking account. Interactive mathematics learning media form of teaching materials Course Mathematical Capita Selecta covering materials: operating the algebra, determining factors tribes algebra, completing the operation fractional algebraic form and function, declaring eligible tested empirically to students outside of the sample in the learning process Course capita Selecta and received a positive response from the students. They are motivated and enjoy learning math through interactive learning media. This is according to the research conducted Sudirman, Hermawati entitled Development of Interactive Multimedia Subjects Mathematics at the high school level Class X in Bandarlampung. Another study is Kusuma (2008, 2009) states that (1) a computer-based interactive learning can be presented in an interesting, efficient, and effective interaction patterns tutorials, simulations, or games; (2) Development of a model-based learning e-Learning improve high-level mathematical thinking skills; and (3) increasing the capacity of reasoning, communication, connection, problem solving, critical thinking, and creative thinking mathematically through learning computer media better than students in the regular classroom learning; (4) the implementation of the use of computer media can significantly increase positive attitudes and interests of students in learning mathematics. Based on the results of experts considered that the question of mathematics critical thinking skills, a decent used as an instrument to measure the ability after going through several revisions.

## VI. CONCLUSION

The results showed that the previous ability of the student critical thinking in mathematics at Capita Selecta Mathematical Subjects that are in low classification, though individually some students are at very high and high qualification. The test results critical thinking skills mathematical conducted on 110 students obtained a mean score of 11.66 out of a maximum of 24. This was her ideal because students are not familiar with the form of critical thinking skills about mathematics even though no notification before critical thinking skills tests were held mathematic students, including qualifications less, classically weak on every indicator of the critical thinking skills of mathematics. The difficulties faced by the students are clarity, reason, dan overview. Students' clarity is the weakest indicator, meaning that students can not change habits in resolving the matter. Usually students to solve problems with a short way without clearly outlined, whereas the indicator clarity students are required to solve problems as clearly as possible and step sequences and complete. While the results of critical thinking skills of mathematics with the largest average obtained is the indicator Inference and situation.

Interactive learning mathematics media are tested empirically feasible to students outside of the sample, which will be implemented in the learning process Math Capita Selecta Course. Media are fit to use based on the analysis of experts and limited testing. Similarly, critical thinking skills mathematical instruments to be eligible to be continued to test empirically based on consideration of the experts and the limited trial.

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