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## **SCIENTIFIC APPROACH-BASED OF INTERACTIVE LEARNING MEDIA TO IMPROVE MATHEMATICAL THINKING SKILL AND SELF-REGULATED LEARNING**

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### **Abstract**

The aim of this research is to write a learning book and to develop a software of interactive media based on scientific approach to facilitate students in discovering concept, improving their mathematical thinking skill, and self-regulated learning. This is a two-year Research and Development, whereas in the first year is to write textbooks, and develop a interactive media software. The second year is to measure the validity of the entire instrument, the pre-test and post-test mathematical thinking skill, implement the software in a learning process, distribution a self-regulated learning questionnaire, implement the software in a learning process, explore the students' perception towards this software through interviews. The sample of this research is seven grade students of junior high school in Tasikmalaya. Two schools are selected randomly. The developing of this software complies of stages: concept, design, material collecting, assembly, testing, and distribution. The validity test of all instrument used consists of consideration of two experts (a mathematician and learning-media expert); revision based on advices and input from both experts, empirical trial test, revision further if necessary. Based on the results of consideration two experts of instructional media and mathematician, test empirically, and perceptions of students that textbooks, textbook and software interactive learning media based approach to scientific, worthy implemented in the learning of mathematics students at the junior high school.

**Keywords:** interactive learning media, scientific approach, mathematical thinking skill, self-regulated learning

### **1. Introduction**

Mathematics is a subject that is less favored by students, this assumption is developing both regionally and nationally. Though individually, many are successful at math competitions nationally and internationally. This is in accordance with the opinion of Abdi (2004) which states that most students find it very difficult to be able to quickly absorb and understand about mathematics courses, but the difficulty

students understand math taught it be related to how to teach teachers in classes that do not make students feel happy and sympathetic towards mathematics, approaches used by mathematics teachers are generally less variable. For students who have a high level of intelligence, attitude and action as well as how to teach anything is not a problem. However, for students who have an average level of intelligence, and low math will drab causing not pleased to learn mathematics.

Various factors that cause poor performance of students in mathematics, according to Ruseffendi (1991) there are ten factors that could affect the success of student learning is child's intelligence, readiness of children, child talent, willingness to learn, the child's interest, the model presentation of the material, the attitude of the teachers, the atmosphere of teaching , the ability of teachers, and the community. From the ten factors, presentation model of the material, the attitude of the teachers, the atmosphere of teaching, as well as the ability of teachers continue to be quality improvement effort, through changes in the curriculum, improving the quality of teachers through courses-upgrading and continued his studies at a higher level, but from businesses it has not produced any meaningful results. Various efforts have been made by the government to boost student achievement, including the conduct of curriculum change, apply a variety of innovative learning model so that learning becomes more meaningful, students are not only learning to know about but also learning to do, learning to be and learning to learn, as well as learning to liver together. With studying patterns like the above will happen interpersonal communication, cooperative group learning among students. Students can relate the concepts learned with other concepts that are relevant to a comprehensive thinking process as a whole, and learn to solve problems as a learning exercise to familiarize with high cognitive level. If the condition the learning as above, it is expected that the classroom comes alive for students to become happy feelings.

Curriculum enforce government policy in 2013, is one of the government's efforts to improve student achievement. In the implementation of Curriculum 2013, the government issued some sweets among Permendikbud number 103 in 2014, standard learning process for teachers are required to implement the learning process using a Problem Based Learning Model, Discovery or Inquiry Learning and Project Based Learning Model as well as the need to integrate scientific approach to any learning process. Moreover, that the computer must be integrated in the learning process, the teacher acts as a facilitator so that learners can discover and build knowledge. Thus the teacher should facilitate students' learning in the form of computer-based media, one of which is an interactive learning media. Currently available software that facilitates learning but rarely students learn to find the concept.

Based on the interview with the Chairman MGMP that teachers are still rare use interactive learning media, hence the need for innovation in the learning process. Therefore, efforts are needed to improve the learning process through the use of media-based interactive learning approach scientific. This is because the use of interactive learning media can motivate students to learn. Previous research has had an impact quite well that the media interactive learning ease the burden on students learn independently. In the current circumstances, the lesson should no longer be a tedious thing, as a few decades ago. Thanks to the development of information technology so rapidly, teaching materials can be presented with sounds and images are dynamic, not boring, as well as solid information. Therefore, the development of computer-based learning is expected to improve the quality of the learning process in the classroom.

Implementation of interactive learning media in the learning of mathematics can present the concept and practice of mathematical thinking skills such as critical and creative thinking and independent learning. The advantages of interactive multimedia applications of mathematics in explaining a concept requires students to explore and analyze, try and explore the concepts and principles contained in the material that it faces, so it is relatively faster build students' understanding structure. This is caused

because the integration of components such as voice, text, animation, pictures or graphics, and video functions to optimize the role of the senses in receiving information into the system memory. Regular learning has been done without the help of interactive media do not give students the opportunity to explore and develop their creativity. Therefore, the development of interactive learning media predicted to be able to facilitate students to develop the ability to think mathematically and Self Regulated Learning.

The purpose of this research is to develop textbooks, software media interactive learning, identify and analyze the mathematical thinking skills and self Regulated Learning students. Outcomes of this study is mathematics textbooks and software media interactive learning.

## **2. Theoretical Background**

Some experts give a definition of instructional media, among others Schramm (1977) suggested that learning media is the messenger technology that can be used for learning purposes. Meanwhile, Briggs (1977) argues that learning media is the physical means to convey the content or learning materials such as books, movies, videos and so on. Meanwhile, the National Education Association (1969) revealed that the learning media is a means of communication in the form of print and view, listen, including hardware technology. From three above opinion concluded that the learning media is anything that can deliver the message, it can stimulate the mind, feelings, and the willingness of students so as to encourage the creation of a learning process. Learning media can be either print media or electronic media.

Media classified into five groups: human-based media (teachers, instructors, tutors, role playing, group activities, field-trip); print-based media (books, guides, workbooks, work tool, and loose pages); visual-based media (books, work tools, charts, graphs, maps, drawings, transparencies, slides); based audio-visual media (video, film, slide-tape program, television); and computer-based media (computer aided teaching, interactive video, hypertext). The results of other studies, Kusuma

(2008, 2009) states that the computer-based interactive learning can be presented in an interesting, efficient, and effective interaction patterns tutorials, simulations, or games; Learning model development based e-Learning improve high-level mathematical thinking skills; and improved reasoning skills, communication, connection, problem solving, critical thinking, and creative thinking mathematically through learning computer media better than students in the regular classroom learning; implementation of the use of computer media can significantly increase positive attitudes and interests of students in learning mathematics. In mathematics, interactive media greatly assist students in understanding the various materials that seem abstract independently.

In this research used media presentation in the form of random (non-linear), which is one form of interactive video. This learning media according Seels & Glasgow (Arsyad, 2007) belong to the media type microprocessor based on cutting-edge technology media selection. Media cutting-edge technology itself is divided into a telecom-based media, such as teleconferencing, distance learning, and microprocessor-based media, such as computer-assisted instruction, computer games, intelligent tutoring systems, interactive, hypermedia, and compact (video) discs. Based on these opinions, the preparation of the learning process through interactive media begins with preparing teaching materials following practice questions in the form of interactive animated video. In the learning process, students interact with computers and learn mathematical concepts independently, the teacher acts as a facilitator and motivator.

Scientific approach is an approach to learning according to the curriculum in 2013 include: Observe, ask, reasoning, Trying, Summed known as 5M. Thus, students find the concept begins by presenting the problem, observe first, then asked to given problems, reasoning, then try and draw conclusions. Thinking is an activity that is individualized, but it is not done in isolation, must be mediated by others. 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 it involves critical and creative aspects of the mind, both are used in reasoning and build ideas. Additionally thought to be involved in any mental activities that help to formulate or solve a problem, make a decision or to build understanding, then through thinking we can interpret it.

According to Fisher (1995), experts distinguish two types of thinking that is creative thinking exploratory and analytical reasoning or logic or critical. According Sumarmo (2006) generally think mathematically can be defined as conducting or mathematical processes (doing the math) or a mathematical task (mathematical task). Judging from the depth or complexity of mathematical activity involved, mathematical thinking can be classified into two types: low-level mathematical thinking (low-order mathematical thinking) and high-level mathematical thinking (high-order mathematical thinking). Critical and creative thinking of mathematics, both of which are types of thinking are included in the high-level mathematical thinking. In addition, according Sumarmo (2004) Self-Regulated Learning is a process of self-monitoring design and careful review of the cognitive and affective processes in completing an academic task. According to Zimmerman (Darr and Fisher, 2004) Self-Regulated Learning includes three main phases are repeated, namely: forethought, performance control, and self-reflection. Schunk and Zimmerman (Sumarmo, 2004) there are three main phases in the cycle of Self-Regulated Learning, namely: designing learning, monitor learning progress for implementing the design, and evaluate the results of the complete study.

### **3. Method**

The method in this research is a developmental research, conducted with junior high school students in the city of Tasikmalaya, taken 7th grade students of SMPN 1 and SMPN 3 Tasikmalaya. The study is planned for 2 years, the first year of making textbooks and developing interactive learning software media. Textbooks cover material: Triangle Quadrilateral, Linear Equations and Inequalities One Variable,

Arithmetic, Social Transformation, Opportunities and Statistik. The second years to make about mathematical thinking skills tests, questionnaires Self-Regulated Learning, and the validity test empirically, but had previously requested an assessment of two the mathematician and interactive learning media. Then pretest mathematical thinking skills, implementation of interactive learning Software media in learning, mathematical thinking skills test, questionnaire distribution Self Regulated Learning, and was last conducted interviews with student representatives. The development of interactive learning media includes the following phases: concept, design, material collecting, assembly, testing, and distribution. Mathematicians assess the material aspect, text, image, order, and clarity, while interactive media experts assess the aspects of text, image, audio, animation, and interactivity.

#### **4. Result and Discussion**

Outcomes of this research is the development of textbooks and interactive learning media software. Textbooks prepared covering material Triangle Quadrilateral, Linear Equations and Inequalities One Variable, Arithmetic, Social Transformation, Probability and Statistics. Software media interactive learning using Scientific approach include: Observe, ask, reasoning, Trying, concluded (5M). After teaching materials and software-based interactive learning media Scientific approach has been compiled, to see the reliability of such instruments held due diligence about the face validity and content validity enlist the help of two people mathematician and interactive media. Face validity views of the editorial aspect, appearance, color matching, and readability, content validity, from the aspect of material conformity with the syllabus. To test the validity of content and face validity textbooks evaluated the suitability of teaching materials to the syllabus, materials, text, image, order, and clarity by a mathematician. As for the test content validity and face validity media interactive learning is evaluated on the material, text, image, order, and clarity by an interactive learning media.

Some input from mathematician to textbooks include: the text should be clearly do not give rise to confusion, picture adjusted to the material covered, and order delivery of content to be reexamined. Based on the advice of a mathematician, later revised textbooks. Some suggestions from the expert media interactive learning include: the menu should be clear, and there are hints, text should be concise clear, the color should be interesting, the logic should be obvious. Based on the advice of expert media interactive learning, interactive learning media software then revised. Scientific approach based teaching materials that have been framed Software developed into an interactive learning media using Adobe Flash. Based on the evaluation of two mathematicians and media, it was concluded that the textbooks and software media interactive learning feasible to implement in the process of learning mathematics in junior high school students next year.

## **5. Conclusion and Remark**

Based on the results of consideration of two mathematician and interactive learning media: mathematics textbooks and software-based interactive learning media declared eligible scientific approach implemented in the process of learning mathematics in the next year. Suggestions put forward in this study, should teachers design their own teaching materials and media interactive learning in order to motivate students to learn tailored to the characteristics of students, presentation materials, as well as skills to be achieved.



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