Integrating Technology in Inquiry Based Learning

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Abstract—There are two important things to be of interest in accordance with the vision of NCTM in mathematics education, i.e. knowing mathematics in the 21st century and the need to continue enhancing the role of mathematics education to answer the challenges of a changing world. One of the competencies associated with the great challenges of the 21st century is benefiting from the support and tools (including IT), such as: know the existence and nature of the various tools for mathematical activity. In the era of technological advances such as the current graphics software support is very abundant and can be used as an attempt to improve the learning outcomes of mathematics learners. In addition, the student of Mathematics Education as a pre services teacher should receive the widest provision in the control or utilize the skills of computer software, in order to answer the demands in the job market. This paper describes the integration of technology in the inquiry based learning at the college level. Thus, the integration of technology in inquiry based learning in mathematics is expected to generate a deeper understanding and flexible in accordance with the development of education that can’t be separated from the development of technology.

Keywords: technology, inquiry based learning

I. INTRODUCTION

The progress and development of technology was integrated into many life area’s, including economics, health, transportation, education and the others. The use of technology in various fields of course adapted to each field. In the education, technology comes in many forms. Computer as a part of technology can act as a instructional media to facilitate the learning process as well as separately instill the concept to students.

NCTM’s vision shows the importance of two things in mathematics education, there are to know mathematics in the 21st century and the need to continue to improve mathematics education to answer the challenges of a changing world. One of the competencies associated with the great challenges of the 21st century is benefiting from the support and tools (including IT), such as: know the existence and nature of the various tools for mathematical activity [1]. In the era of technological advances such as the current graphics software support is very abundant and can be used as an attempt to improve the learning outcomes of mathematics learners. In addition, students of Mathematics Education Programs as a pre services teacher should receive the widest provision in the control or utilize the skills of computer software, in order to meet the demands in the job market. Learning Differential Calculus accompanied by "Mathematica" produce satisfying achievement for students indicated 88% of students receive a minimum value in the category B- or thoroughly studied and the increased independence of student learning (Listyani, Dhoruri, and Setyaningrum, 2006).

Other standards that must also be met by a math teacher is the knowledge of technology. A prospective teacher should be able to take advantage of technology as an important part in the learning of mathematics. An indicator of the standard of knowledge about the technology are: 1) using mathematical knowledge for selecting and using appropriate technology, but not limited to worksheets, dynamic graphics tools, computer algebra system, statistical tools, dynamic graphing calculators, data collection tool and software presentation.
Inquiry mathematics is a learning model that encourages students to organize their own activities while learning math statement. In the inquiry mathematics, students take responsibility for directing the lesson with the teacher guiding the activities undertaken mathematics students in the classroom.

The involvement of students in inquiry mathematics starts from asking a question, make a conjecture, plan and monitor the activities of their mathematics, explored the idea in collaboration with friends, to identify when they will " requires new knowledge, ask the teacher about the mathematics they learned, explaining the reason answer and prove the results of their answers. While activity in the inquiry mathematics teachers are utilizing the curiosity of students, linking concepts and procedures, motivate students, to build an open inquiry, combining different forms of reasoning, develop initiative, independence and leadership students. According [2] guided inquiry learning methods lead to active participation in the learning process. This learning method improve students' ability to analyze, synthesize, evaluate and relate the concepts contained in the various disciplines of learning and everyday life, thus causing material studied more relevant for students.

II. DISCUSSION

Based on the above introduction, the discussion in this paper will focus on the integration of technology in learning inquiry.

A. Inquiry Based Learning

Inquiry is a term that is used both in education and in everyday life to describe how to find the knowledge or information by asking questions. Inquiry mathematics present clear similarities with scientific investigation [3]. As scientific inquiry, inquiry mathematics began from a question or a problem, and the answer is sought through observation and exploration; conduct experiments; make the connection; recognize the corresponding mathematical techniques when needed.

In the Primas Report, inquiry described as a deliberate process ranging from diagnosing problems, critiquing, experiments, and distinguishing alternatives, planning investigations, researching allegations, searching for information, constructing models, debating with peers, and forming coherent argument. Use of Inquiry Based Learning is good for mathematics and science education.

In inquiry learning, educator role as provocateur, means teachers (educators) served to motivate the students to develop initiative, independence and leadership as well as arouse the curiosity of students. Curiosity beginning students to conduct an investigation is one of the great challenges in Inquiry-based learning. In this process, educators play an important role. Teachers contribute and expand ideas, how to question and how to investigate a person's ideas or theories. Teachers should find creative ways to introduce students to ideas and subject matter that interests them and offer the potential inquiry or provide an opportunity for students to engage in the ongoing Inquiry. When individuals and small groups of students took a different approach to certain questions thoroughly in the classroom, the teachers develop classroom culture where there are ideas that emerged from each student. By hearing the views of others, students have a better understanding of their own ideas and approaches to questions and issues.

According [4], Learning inquiry provides the opportunity for children to develop the knowledge, skills, and habits of thought that lead to a deeper understanding of their world and human experience. The process of inquiry focused on developing an interesting question, which is formulated by the teacher and the child, motivating and guiding questions into topics, issues, and issues related to the content and outcome of the curriculum.

Inquiry learning is more than a simple learning method. Learning inquiry is a philosophical approach to learning and teaching, based on research and constructivist methods, involving children in the investigation that led to the disciplinary and transdisciplinary understanding. Learning inquiry built on curiosity and wonder inherent in children, backgrounds, interests, and experiences. The process provides an opportunity for children to be active participants in a collaborative quest to acquire meaning and understanding. Children who engage in inquiry activities as follows: 1) building a knowledge and a deep understanding, not just passively receiving knowledge, 2) directly involved in the discovery of new
knowledge, 3) find ideas that contradict that transform knowledge and previous experience into a deeper understanding, 4) transferring new knowledge and skills to the new situation, 5) is responsible for on going learning and mastery of content and skills curriculum.

Inquiry learning motivate children to explore topics in a meaningful context. The investigation process is not in the steps rigid, but flexible and recursive. Experienced teacher inquirers will move back and forth through the process cycle as new questions arise and the children become more comfortable with the process.

Questions of good questions formulated in a broad and has many possibilities. They encourage children to explore, gather information, plan, analyze, interpret, synthesize, solve problems, take risks, make allegations, concluded, documenting, reflecting learning, and develop new questions for further investigation [4]. As educators, teachers are faced with the challenge and sensitivity in engaging students in learning so that they develop the skills and knowledge they need for daily life.

According [5], the method of inquiry can be done through expository, groups and individuals. In the method of inquiry, the final results are found students is something new for him and also not known by the teacher. In this method, in addition to sebgai guides and counselors, teachers also become resources necessary data. Students still have gathering additional information, make a hypothesis and test it. Examples of topics for inquiry in schools is to determine the density of traffic at the intersection, determine the wasted water from the faucet plumbing damaged, determines much water a river stream.

One of the goals of teaching with inquiry is for students to know and be able to transferring knowledge into other situations. This method consists of four stages, namely: 1) teachers stimulate students with questions, problems, games and puzzles, 2) In response to the stimuli it receives, the students determine the procedures seek and collect information or data that is needed to solve the question, statement and problems, 3) Students appreciate the knowledge gained by the new inquiry conducted, and 4) Students analyze methods of inquiry and procedures found to be a general method that can impose on other situations.

Learning inquiry is one based on the constructivist learning. Mathematics merely as a tool for thinking, the main focus of learning mathematics is to empower students to think construct mathematical knowledge discovered by experts earlier [5]. According [5], mathematics learning approach is the way in which the teachers in the implementation of learning to the concepts presented can be adapted by the students. There are two types of approaches in the learning of mathematics, which is an approach that is methodology and approach are material. While this method of learning is a way of presenting the material is still common, for example, a teacher presents the material with a dominant submission verbally and once in a while there is a question and answer. Each teacher can do a lecture as it was in accordance with their respective fields.

According to Justice et al (2002), inquiry learning process is a cycle in which the students are involved in a topic, develop a question to be explored, determine what information is necessary, collect data, synthesize inventions, discoveries and evaluate the immediate success communicate the inquiry process, students are trained to choose a self evaluation and self reflexion, which is a product of the process of inquiry and permitting success at each stage.

B. Using Technology in Inquiry Based Learning

The rapid development of computer technology and communication brings also bring development and change in people's lives. It is not least also affect the role of technology in the development of education. In the education sector of education, the computer is a multi-functional tool that can be used in teaching and learning. Furthermore, the computer helps in distinguishing the role of students and teachers, apply the same standards of learning [6]. Software can also equate education and encourage student understanding and meaningful learning for all students in a constructivist approach. Teacher-centered learning spontaneously become student-centered when the atmosphere multiple intelligence implemented in educational activities through the use of computers [7].

As in other areas of life, the use of computers in mathematics learning is growing by leaps and bounds. However, the characteristics of users and many other variables that describe various types of use
of technology in learning mathematics. At first, teachers and educational researchers think that kompuetr is a support tool in learning as well as priyektor screen, slide or television. Computer applications used initially only used to present the electronic pages with colorful pictures and simple calculations compared to computer role in guiding students to construct their own knowledge [6]. If the computer is only used traditionally, for example for a simple calculation, then it will give a bad impact on the results to be achieved in learning. Traditional computer usage, for example, according to Nocliffe [8], when the computer is used as a calculator in learning algebra, where students can only see the results with a simple calculation. The results show that students lose their ability in algebra calculations when they only use the computer as a simple calculation tool.

In the era of today's educational progress, many teachers and lecturers who incorporate technology into the classroom. In better teaching of mathematics, the use of technology in the classroom to make high-level math activities can be more easily accessible to students. In this case, the technology can strengthen students' learning process, by presenting the content of numerical, graphical, and symbolic without spending time to calculate complex computing problems manually. Technology can also help to encourage students acquire skills and abilities to make connections between concepts so finding solusinyai and proven process pengerjaannnya [9]. This technology can also help students to make connections between mathematics with real contexts outside of mathematics to make the learning process more realistic in the context of [9].

According to Okur, et al [6], one of the significant challenges in mathematics teaching and learning is how to teach students about abstract concepts. In this case, technology in mathematics learning software can be used more broadly to instill abstract concepts in mathematics. With the software mathematical some materials that are difficult to explain, it can be more easily delivered to students. In addition, according [10] the technology can also be used for troubleshooting, eg in advanced calculus courses, students often have difficulty in determining a region integral to the integral lipat three. With the use of software Maple in learning, the student's difficulties can be overcome, so that students can more easily determine sketches, regional integration and function integration.

The use of technology in learning mathematics in general aims to assist students in learning, such as helping students understand the concept, invented the concept, oenguatan concept, and as a means to train thinking in problem solving. There are several role of the use of computer technology in learning, is as follows [10]:

1. Technology as a tutorial for students, which means that the technology used for materitertentu menyampaikan or explain to the students and the material is presented in a computer.
2. Technology as drill and practice, which means that the technology can be used untukmenguji level of knowledge or understanding of the students after learning of the material.
3. Technology as simulations in learning, which means that the technology can be used to demonstrate or demonstrate an idea or concept.
4. Technology as a tool or media in learning because it has the nature of trial and error to solve a problem.
5. Technology can be used in problem solving.

According to Justice et al (2002), inquiry learning process is a cycle in which the students are involved in a topic, develop a question to be explored, determine what information is necessary, collect data, synthesize inventions, discoveries and evaluate the immediate success communicate the inquiry process, students are trained to choose a self evaluation and self reflexion, which is a product of the process of inquiry and permitting success at each stage.

The use of technology in the inquiry can be done when students explore the necessary information, collecting data and synthesize its findings or evaluating the results obtained and communicate it to classmates. In addition, when there is a mathematical problem that is presented to the students, then the students can also use the technology for solving the problem. For example, in advanced calculus courses, students usually have difficulty in determining the regional integration of the triple integral. The role of technology in this case, for example in the form of Maple Software which is one of the software in
mathematics, which is to sketch the graph, so that students easily determine the area of integration and determine the shape of the function to be integrated. By using inquiry learning that utilizes the aid of computers, the students are trained to capture information from maple software in the form of a chart to determine the area of integration. At the stage of communicating the results, students can display the answer that has been gained by using software (eg, displaying graphs and calculation results) or you may also use powerpoint. Thus, the integration of technology in inquiry based learning in mathematics is expected to generate a deeper understanding and flexible in accordance with the development of education that can’t be separated from the development of technology.

III. CONCLUSION

There are several conclusions that can be drawn from the above description, is as follows:

1. One of the significant challenges in mathematics teaching and learning is how to teach students about abstract concepts. In this case, technology in mathematics learning software can be used more broadly to install abstract concepts in mathematics. With the software mathematical some materials that are difficult to explain, it can be more easily delivered to students.

2. There are several roles of the use of computer technology in learning: Technology as a tutorial for students, Technology as drill and practice, Technology as simulations in learning, Technology as a tool or media in learning because it has the nature of trial and error to solve a problem and Technology can be used in problem solving.

3. inquiry learning process is a cycle in which the students are involved in a topic, develop a question to be explored, determine what information is necessary, collect data, synthesize inventions, discoveries and evaluate the immediate success communicate the inquiry process, students are trained to choose a self evaluation and self reflection, which is a product of the process of inquiry and permitting success at each stage

4. The use of technology in the inquiry can be done when students explore the necessary information, collecting data and synthesize its findings or evaluating the results obtained and communicate it to classmates. In addition, when there is a mathematical problem that is presented to the students, then the students can also use the technology for problem solving.

5. the integration of technology in inquiry based learning in mathematics is expected to generate a deeper understanding and flexible in accordance with the development of education that can’t be separated from the development of technology.

REFERENCES
