Animation to Develop Mathematical Connections in Students

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Abstract - The main purpose of this paper is to improve mathematical connection in e-learning using animations that will help the students in learning. Animation content is displayed to students. To know the mathematical evaluation abilities in students, pre-test and post-test were administrated before and after teaching and learning process. At last the result was found to be that animation content had significant effect on mathematical connections between students and it has also been helpful to improve mathematical connection than that of normal approach in teaching and learning.

Keywords: e-learning, improving, animation content, mathematical connection abilities.

I. INTRODUCTION

Electronic technology helps students in organizing and analyzing data, it provides all students to calculate in a quick and accurate manner. Computer can be considered as one of the best said example. Dubinsky and Tall stated that computer can be used as a tool to complement advantage mathematical thinking in variety of ways. It is necessary to develop an encourage students in learning and using electronic technology that will help them in their future. This technology will be helpful for both the teachers and students.

In the past history and some places, even today math's is considered to be very annoying, boring and students will be less interested. In this case they will be forced to do learning which will be unpleasant to them. To change this atmosphere, technologies must be used which help teachers in teaching and students in learning. This will be effective for students to recognize themselves in their learning process. Both the teachers and students should be able to utilize the technology in learning and teaching.

In association with the development of Information and Communication Technology (ICT), teachers and students should be able to be equal to and utilize the advance of it. Teachers should be able to exploit or utilize the ICT-based media in the learning process. With the rapid development of ICT, there has been a shift in views on learning in and outside the classroom. After the shift in teaching method there are different views on learning in and outside the classroom.

Development of computer in mathematics is designed with the requirement that is expected to be much helpful to enhance student's mastery of mathematics. Technology devices can be used to help students investigate various mathematical phenomenon's. ICT can also assist students in learning mathematics. All these technologies will help students to go on with different formats that are seen visually and observed. These will help students to easily formulate mathematics.

Dunham and Dick stated that if there is proper use of computer technology, students will be able to learn with more interest and will start learning in more profound ways[1]. Furthermore, Dubinsky and Tall stated that computers can also give much-needed meaning to mathematical concepts that students may feel are 'not of the physical world" but in the mind or in some ideal world [2].

Advantages of using this computer as a medium of learning is that graphs and pictures used as a visual form will be attractive and can be observed which will help students to study easily. By using computer and animation, difficult boring models, techniques, types and equation in mathematics can be easily studied and captured by the students.

Bitter and Hatfield stated that it will be reasonable and efficient that if computer technology will be used to improve quality of learning in mathematics particularly[3].This will help to meet the diversity of student's ability, as well as under the opportunities to obtain better education. To satisfy the children needs, teachers must try to serve all students. In utilizing the advantage of ICT, it needs to consider diversity of student's abilities as well as wider opportunities for society to obtain education. To meet the children necessities with various abilities, teachers should try to serve all children well. To meet these expectations, teacher's role is certainly not easy. Ruseffendi stated that more heterogeneous the students, more difficult to teach. Because of these reasons teachers need to take on extra effort to serve students with more information. Most of the teachers teach mathematics in one particular way, this will not help all students to learn and understand maths but when using animation it will give students to learn with more interest.
One such design model used for learning is " e-learning".
Learning maths online with animation will help students to learn easily. Researchers have done this mostly at college level, as for when considered with Kids in school level, it is still limited. Disadvantage of e-learning must also be known clearly, it will be for the teachers, for they have to answer and serve students at all time.

Both the advantage and disadvantages are limited, but researchers should develop e-learning based on animation content and implement it in teaching mathematics to improve the connection between mathematics and students.

II.RESEARCH QUESTION

The research conducted is designed to answer the following questions:
1. How can we develop e-learning based on animation contents which could improve the student's mathematical abilities?
2. How far is the improvement of student's mathematical

connection after e-learning which is based on animation content is implemented in teaching learning process?

III.AIM OF THE RESEARCH

This research includes two major areas namely developing e-learning based on animation content and studying towards the students achievement especially in mathematical connection abilities.

IV.HYPOTHESIS

Based on the described issues the hypotheses are namely: E-learning based on animation content can improve mathematical connections abilities of students than those with conventional learning.

V.THEORETICAL FOUNDATION

A. E-learning based on animation content
In accordance with the rapid development of Information and Communication Technology (ICT), the need for a concept and a mechanism of learning and teaching (education) based on ICT becomes inevitable. The concept of e-learning has brought influence to the process of transforming a normal method of teaching into digital format. This concept of e-learning is widely accepted by the world community and the educational institutions (school, training places and universities). John Chambers who is the CEO of Cisco Systems company said that for the next era, the application in education will be a "killer application" which is very influential. The Department of Commerce and even the U.S. Department of Education has joined to declare the Vision of 2020 which related to the concept of education based on Information Technology (e-learning).

This section will focus the discussion on the application of e-learning and its development. How the application of e-learning should be developed with a balance between user needs and desires of developers. Explanation will start from the definition of e-learning, why do we need e-learning, e-learning history, some analysis of the failure of e-learning and e-learning development strategy.

The term e-learning contains many different understandings from various perspectives. One among that definition is by Hartley: "E-learning is a type of teaching and learning which enables to deliver teaching materials to students by using internet, intranet or other computer network media. LearnFrame.com in glossary of e-learning terms explained a broader definitions; e-learning is the educational system that uses electronic application to support learning and teaching with Internet media, computer network or standalone computer.

Researchers made this program easy for the purpose of study. Teaching materials also appeared in animations. Thus with the help of animations that is more interactive, students can interact with e-learning systems that will help them do independently and also to work out exercises. E-learning before was only web-based, which will display on text without animations and interactive teaching materials.

B. Mathematical Connection
The ability of mathematical connections belongs to the higher-order of thinking ability. The mathematical connection means capacity above given information, with a critical attitude to evaluate something and has a metacognitive awareness and problem-solving ability. Marzano, et all., stated that met cognition is the process by which individuals utilize their cognition in understanding him/herself, thinking processes, and control of thinking processes [6]. Suryadi stated too that metacognitive is important since someone's knowledge about the cognitive processes can guide him/herself in choosing a strategy to improve further cognitive performance. Meanwhile, Ibrahim and Nur gave an explanation of the characteristics of the higher-order thinking, such as: non algorithmic, which means an array of action that is not fully established earlier, tends to complex, often produces a lot of solutions, involves consideration and interpretation, as well as higher mental activity.

Moreover Web and Coxford explained that the higher-order of thinking involves understanding the mathematical ideas in a more depth, by examining the data and exploring the idea of the lines, making conjectures, analogies and generalizations, logical reasoning, problem solving, communicating in mathematics, and relating mathematical ideas with other intellectual activities.

The theory of the higher-order of thinking focuses on the developmental approach or definitional approach. Developmental approach assume that there is a way of thinking from lower forms into higher forms, and students must have the low-level of thinking first before reaching the higher level one. Although the definitional approach assume that all students can engage in the higher-order of thinking, without going through the stages of students' thinking abilities.

The linkage between the higher-order of thinking with mathematics described by Romberg in Chair stated that some aspects of the higher-order of thinking are mathematical problem solving, mathematical communication, mathematical reasoning, and mathematical connections. Mathematical connections or connections in mathematics study the students' understanding of connecting the mathematical ideas that will facilitate the ability to formulate and verify conjectures deductively between topics. The mathematical concept and procedure developed which are newly can be applied to solve the other problems in mathematics and other disciplines.

VI.METHOD

This research is intended to develop e-learning based on animation content for improving student mathematical connection abilities. The method used is Research and Development (R&D). The steps taken in the process of this research leads to a cycle based on the findings of research studies and then develop a product. Product development based on preliminary findings of this research was tested in a situation and then revisions are made from the test results until finally obtained a product.

The product itself is e-learning based on animation content. The procedure of this study uses the techniques of research and development with the following steps: (i) development of models, which are: preliminary study, planning, content design and writing, material development, and field testing and revision of the model.

(ii) Analysis of the e-learning model impact on the student mathematical connection abilities.

To find out the student's mathematical connection abilities an experiment with pretest-posttest control group design was used to the student. One class was given a treatment with e-learning

based on animation content and the other with conventional treatment.
The design of the study is:

O1　X1　O2
O1　　　O2

Note:
O1: Pretest mathematical connection.
O2: Posttest mathematical connection
X1: Mathematics learning with e-learning based on animation content.

Samples were shown to the students in primary school level; samples will be based on ICT Tools. The result of the students before teaching them using animation was observed (i.e.) using conventional teaching and after teaching the students with animation content are compared.

VII.FINDINGS

Development of E-Learning based on Animation Content
According to the procedure of this study in developing e-learning based on animation content is developed.

Preliminary Study
In this phase we analyzed the requirement of development in e-learning based on Animation content. This includes the students need, their likes, and their interest.

Planning
The planning for the development of e-learning based on animations content includes: planning the e-learning menu, animation contents. All of which were adapted to target students who will be given e-learning.

Content design and writing
There are several steps that have been done in this phase include:

a) Applying an effective instructional design.
Time allocations for each learning activity based on content and learning objectives.

Defining and providing the learning support needs of the students, and also for teachers.

Testing and final checking
This phase requires steps as the following:
- Knowing what standards should be aimed for

Establishing means by which to measure or test that standards and usability objective have been achieved. Considering when to measure, and how information from this will feed back into the development process to achieve best outcomes most efficiently.
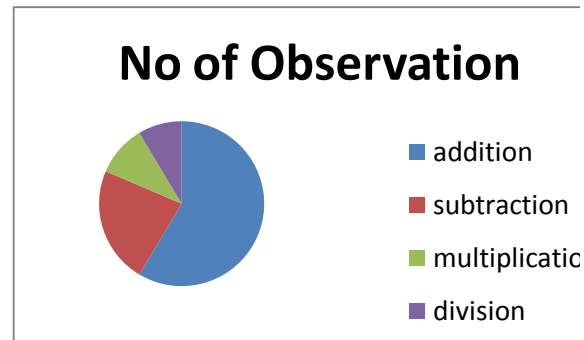

Figure1. Is the observation of kids using the addition subtraction multiplication and division.

Based on the mathematical ability presented in Table1 and Figure1 the results obtained were that the top most mathematical ability was the mathematical connection abilities of students with e-learning. From the result it can be said that e-learning increased student's mathematical abilities than the conventional one and the result also shows that if animation is more interesting and interactive kids are involved in those type of animations than the normal and conventional approach.

VIII.CONCLUSIONS & FUTURE ENHANCEMENTS

From the results of the research and discussion, it can be concluded that: E-Learning based on animation content can be developed according to the development of systems models, which are: preliminary study, planning, field testing and revision of the model.Students with e-learning have a better result in its mathematical connection ability than students with conventional learning. Animation content in future will be developed for even Colleges, Institutions, Universities and etc. This will help them to have more interest in learning, to work out problems.

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Class	Average result of test	
	e-learning	conventional
Pretest	45	66
Posttest	87	76

Table 1. Average result of Pre and Post Test of Mathematical Connection Abilities.