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Procedia - Social and Behavioral Sciences 47 (2012) 507 – 514

Procedia
Social and Behavioral Sciences

CY-ICER2012

The effect of mathematica on primary students' perceptions of properties of three - dimensional geometric objects

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Abstract

This study was applied to the eight grade students of an elementary school owning a computer lab. Geometric attributes of three dimensional geometric objects were re-told to students by using *Mathematica* 7.0 software. Perceptions of students after using this software were detected with written interview. It was detected in computer-aided math instruction performed by using *Mathematica7.0* software that a change in the positive direction occurred in mathematics perceptions of students.

Keywords: Computer aided instructional, computer aided mathematic instruction, mathematica, three dimensional geometric objects.

1. Introduction

Rapid developments experienced in science and technology in our age affect education system as well as other systems and also, changes, which occur as a result of technologies becoming widespread in society, become inevitable. As a result of these changes, society is re-structured, becomes an information society. In this structuring, it is obvious that science without mathematics, technology without science cannot exist (İşman, 2002: cited by, Aktümen and Kaçar, 2008). Therefore, mathematics, science and technology hold a significant place in constructing information societies.

As math instruction holds an important place in terms of futures of countries, math education also teaches to develop thought and horizon of individuals, to make interpretations by using their free will (Aydın, 2003). For this reason, learning mathematics by understanding and applying gains further significance day by day. Examining education policies of various nations, it is seen that the fundamental objective in math instruction is to develop mathematical power. Mathematical power is the ability to effectively use mathematical relationships, logical causation and mathematical techniques (Ryan, 1998: cited by, Işık Albayrak ve İpek, 2005).

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1877-0428 doi:10.1016/j.sbspro.2012.06.689

Instead of learning mathematical concepts, students memorize algorithms used for solution of problems formed by resting on those concepts in learning mathematics, which is generated by human mind in an abstract structure.

It is not sufficient for students to only identify and memorize concepts for them to be able to understand concepts and inter-conceptual relations. Instead, students should study as scientists by providing suitable environments, should structure concepts by discovering and debating their scientific knowledge themselves. Thus, students will acquire conceptual learning ability escaping from memorizing information (Taşkesenligil, Şenocak and Sözbilir, 2008).

Mathematics, which is a system per se, consists of structure and correlations; it is an abstract concept, which contains sequential abstractions and generalization processes that those structure and correlations form. Due to the fact that gaining abstract concepts is difficult, it is known that math is found difficult by students and develops negative behavior. An instruction suitable for structure of math is required to aim at the goal of helping students to understand math-related concepts and operations; to make connections among these concepts and functions (Alakoç, 2003).

"According to Peker (1985), benefits of using new technologies in mathematics education are deemed crucial in terms of developing positive perception and attitude towards math, increasing interest, decreasing anxiety and fear felt against math courses and more importantly, developing effective thinking habits such as analytical and critical thinking" (Alakoç, 2003).

Nowadays, computers are without a doubt one of the indispensible materials of educational activities. Thanks to advancement of computer technology, the use of new and advanced technologies has started to become compulsory in education as well and to appear before us as a system, which plays a positive role in learning of students (Gülcü, 2004).

Students can be ensured to discover many mathematical features in all subjects of mathematics with appropriate software (Aktümen and Kaçar, 2003).

"Cartwright and Hammond (2003) identified the integration of Information Technologies (IT) into learning-teaching process in the form of using it throughout instruction program to fulfill instruction goals and strengthen students' learning" (Usluel and Umay, 2005).

"Liao (2007) detected in the meta-analysis study he conducted that Computer Aided Instruction (CAI) has an impact on student success in the positive direction in comparison with traditional instruction; Senteni (2004) ascertained that CAI increases student motivation towards learning math and enables positive perception and attitude improvements" (cited by, Birgin, Kutluca and Gürbüz, 2008).

When required components for computer aided instruction examined, it is seen that they contain many elements such as software, hardware, teacher training, lab and assistant personnel training. Among these components, the most salient one is regarded as lesson software and even it is claimed that the success of computer aided instruction is directly proportional to the quality of lesson software (Numanoğlu, 1990: 13: cited by, Aktümen and Kaçar, 2003).

According to Jinich (1986), the most crucial factor for students to reach success in mathematics is computer software programs.

The objective of many computer softwares is to ensure students to be able to carry out practical studies facilitating them to understand the subject, to support and develop their critical thinking and problem solving abilities (Özüsağlam, 2007). Of these programs, one of the most used ones is Mathematica software.

Mathematica is one of the most suitable software's for studying these subjects. Graph of any function on a three-dimensional space can be easily drawn by means of *Mathematica* (Baki, 1996) and many relationships, properties, generalization, which cannot be seen, generated in traditional environments, can be easily studied (Güven ve Karakaş, 2007: cited by, Güven ve Karakaş, 2008).

Three-dimensional and colorful objects have significance in terms of students in altering student perceptions, saving time regarding graphs, being affective in establishing function-figure correlation and solving unsolvable questions to render math understandable (Taşlıbeyaz, 2010).