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USE OF TECHNOLOGY ASSISTED MATHEMATICS EDUCATION AND ALTERNATIVE MEASUREMENT TOGETHER

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ABSTRACT

The aim of this study is to figure out student ideas about technology supported instructions and alternative measurement and evaluation could be used together. At this research, 20-hours-technology assisted lessons were processed on the sub-field of Mathematics which is Trigonometry. During technologically designed lessons for 10th grade, some software were appropriately used. In addition to this process, alternative assessment methods were used to evaluate students. After completion of the process, every single participant was interviewed about the process. Descriptive analysis method was used to analyze the interviews. In this study, it was obtained that students' participation to lessons, their interests and their achievement perceptions positively changed; furthermore, in the evaluation process, it was also observed that students think that alternative measurement process better reflects their achievement and they prefer alternative measurement methods over traditional measurement methods. In the consideration of whole study, it was concluded that technology supported instructions and alternative measurement and evaluation process could be effectively used.

Keywords: *Technology supported instruction, alternative measurement and evaluation.*

INTRODUCTION

It is accepted that developments in information and communication fields will increase incrementally and knowledge will become the most efficient factor shaping the future of humanity (Şataf; 2010:1). The innovations in information and communication technologies have an effect on education as well as other fields. Elementary school environments and school instruments and should keep up with these developments and changes to answer the needs of the age (Erginbaş 2009:1). Various technologies can be used in current education environments. Technologies that may be used in education can be examined under two main titles as hardware and software. Hardware includes computer, graphical calculators, datashow, interactive boards, calculating instruments, digital cameras, scanners, printers, CDs. Software includes computer programmes designed for using in courses (Oldknow&Taylor,2003:2-65).

Developments in information and communication technologies affected Mathematics courses as well as all other courses. Mathematics has always been a field which is difficult both to learn and to teach, the reason of which is the problem of objectifying the abstract units. Mathematics software used in this context is in a constant change and development process. Programmes like Geometer's Sketchpad, Geogebra, Graphic Analysis and different technological instruments are used purposelessly.

As Harris and Hofer (2009) stated, technology integration is a complex, dynamic and slow process. In this process, given the structure of learning environments, technologies should be considered as efficacious instruments and be successfully integrated to education process.

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Within the frame of technology aided education; changes are inevitable in programme development process defined (p.105) as overall dynamic relationships between target, content, teaching and learning process and assessment by Demirel (2008). Bayrak and Erden (2007) mentioned about the requirement of carrying out education process with modern learning- teaching approaches, which has emerged worldwide recently, and the necessity to change current education programmes in our country. This state may be accepted for mathematics education, which accepts the same philosophy. Within the scope of this change, some alterations were made on mathematics curriculum in 2005 and a necessity of change in assessment step of the curriculum emerged as in other steps. According to MNE (2004), traditional assessment and evaluation aimed at targets should be replaced with alternative assessment and evaluation aimed at process (qtd. in: Arslan, Kaymakçı and Arslan, 2009).

Alternative assessment instruments are the entire instruments apart from traditional assessment instruments including multiple choice tests. Alternative assessment instrument are capable of assessing more correlated and higher level skills when compared with traditional assessment instruments. According to most defenders of alternative assessment instruments, these instruments give more accurate and valid results. One of the most important positive elements of alternative assessment instruments is that they can assess the process as well as results. Different skills can be assessed by different assessment instruments and students can be motivated better (Bahar, Nartgün, Durmuş and Bıçak, 2009:49).

Even though our country adopts structuring system in education system, in application, traditional methods are still used in learning- teaching process and assessment steps. In this teacher based system, teacher is transferring and student is receiving position. Students were made to believe that mathematics is system of unchanging lines, and to feel obliged to memorize this system (Gelibolu, 2009:1-2). The results of recent studies like Taşlıbeyaz (2010), Turgut (2010), Gelibolu (2009), Şataf (2010) etc. indicated the necessity and benefits of technology aided education. Similarly; various publications like Arslan et al. (2009), Mert (2008), Karahan (2007) etc. stressed the necessity to use alternative assessment instruments. However, there is deficiency of studies including technology assisted education and alternative measurement together. This study is important in harmonizing these two processes, considering education process as a whole.
This study aims to present the views of students about the course in which technology aided mathematics education and alternative assessment instruments were used together.

METHOD

The study is a qualitative research and case study method was used in the study. Case study method enables a more profound examination on exceptions without any need of generalization or proving (Yıldırım and Şimşek, 2008:279-292). The study group of the research consisted of entire students (11 students) of Science Class-A of 10^{th} grade of a high school in Gaziantep province. The study lasted for 20 course hours in second semester of 2009- 2010 School Year.

This study has some constraints because only one learning domain and only one teacher's practices were used in. But; this study's results are important because they are based on in-class observations and video records.

The outputs aimed to be obtained at the end of the research are the acquisitions containing the first 22 hour course of trigonometry sub-learning in "Elementary School (9^{th}, 10^{th}, 11^{th} and 12^{th} grades) Mathematics Course Curriculum (MNE, 2005)" of MNE. However in this research, regulations were made in content, process and assessment steps pursuant to technology aided education. Activities in textbook were sometimes used exactly within the context of content and learning teaching process, sometimes these activities suited to technology aided education through some partial regulations and sometimes new activities were designed. Computer, datashow, interactive board, web connection,

computer programmes (Geometer's Sketchpad, Geogebra, Graphical Analysis, Microsoft Office, Paint, NetOpSchool) technologies were used in giving lectures. In assessment step, alternative assessment instruments were used instead of traditional assessment instruments. During study, computerized diagnostic tree, structured grid, word association test, concept map, project, problem solving exercises, technological assessment instruments were used within the scope of alternative assessment instruments.

Data collection tool of the study was the interviews with the students conducted at the end of the process. Interviews were made separately with each student after the course period was completed. The outline of the questions directed to students is as follows:

- What is the difference of the mathematics course taught normally in class with the mathematic course aided with technology and alternative assessment in the context of your interest and participation in the course, your feelings about the course, comprehension level, your success level and capacity to memorize of what you learnt?

- Which assessment type do you think would demonstrate your success, only single exam at the end of 20 hour course or alternative assessment instruments applied throughout process?

In the first question, the opinions and perceptions of students about class environment where technology aided education and alternative assessment were jointly used was presented, and in the second question eagerness of students to be subjected to alternative assessment was aimed be demonstrated.

The interviews were videotaped. Afterwards video tapes were written out. Written data were evaluated with descriptive analysis and coded. The codes were reciprocally controlled by researchers and concurrent validity in codes was determined 85%. The codes belonging to the part of the interviews about class environment where technology aided education and alternative assessment were jointly used were divided into four main topic as positive interest for the course, participation, effect to learning and success perception. The topic of "positive interest for the course" covers the sentences regarding the interests and senses of students for the course. In this topic, positive interest, exciting and entertaining codes were included. "Participation" topic covers sentences regarding participation and being active in class and attending to course in general. In this topic, participation, activeness and interest codes were used. The topic of "effect to learning" covers the sentences regarding the effects of technology aided education to the learning process of students. In this topic, enduring, better understanding, learning assistant, better solving questions, efficient, focusing and skill developer codes were used. "Success perception" topic covers sentences regarding how students perceived their successes in technology aided environment. The codes belonging to the part of interviews regarding alternative assessment instruments were divided into three main topics as reflecting success, preference and causing to be preference. The topic of "reflecting success" covers the sentences regarding whether traditional assessment instruments or alternative assessment instruments reflects the successes of students. "Preference" topic covers the sentences regarding whether students prefers traditional assessment instruments or alternative assessment instruments to evaluate their success. The topic of "causing to be preference" covers sentences regarding the reasons of students' preference of assessment method.

Codes and tables regarding each student's opinions were created.

The first topic was determined to be "Positive interest for course". This topic included sentences and codes regarding interests and senses of students about course. This topic was mentioned 24 times by 10 students under the codes as positive interest, exciting, entertaining and different. Students demonstrated their interest for the course with sentences like "*I look forward to the day of the course"*.

The second topic was determined as "Participation". This topic included sentences and codes regarding participation in the class, being active during the course and attending to the course in general. This topic was mentioned 12 times by 9 students under the codes as participation, activeness and eagerness. Students demonstrated their participation with sentences like "*The course was lectured so well and I wanted to take all courses*".

The third topic was determined as "Effect to learning". This topic included sentences and codes regarding the effect of technology aided education to the learning of students. This topic was mentioned 22 times by 11 students under the codes as better understanding, faster understanding, learning assistant, better solving questions, efficient, focusing and skill developer. Students demonstrated the effect of technology aided education to their learning with sentences like "*At first I was nervous that the notes on computer would not be enduring as previously we had been writing them on our notebooks. Bu after taking notes on computer, I open them and say to myself that mmm… I remember this one, and this one, too. So I think that this is more enduring and permanent."*

Table 1. Analysis results of 1.2.3.4. students' interviews

	Student 1	***Student 2***	***Student 3***	***Student 4***
Class Environment Where Technology Aided Mathematics Education and Alternative Assessment Instruments Were Jointly Used				
Positive Interest for Course	**Positive interest** (We studied.) (I felt before the course that this course would be good)	**Positive interest** (I became more interested) (It became more interesting for me for example mathematics.) (I wish all other courses was like this)	**Entertaining** (It becomes more entertaining.) (I enjoyed more) (It is more pleasing in my opinion.)	**Positive interest** (My interest increased.) **Different** (It was very different**.)**
Participation	**Participation** (The participation in computer courses was good) **Wish** (I attended on my own wish.)	**Participation** (The course was going well and I wanted to attend all courses.) **Wish** (I wished to attend all courses.)		
Effect to Learning	**Better Understanding** (I began to solve problems after becoming to use computer and smart board. I became to better understand questions.)	**Enduring** (At first I was nervous that the notes on computer would not be enduring as previously we had been writing them on our notebooks. Bu after taking notes on computer, I open them and say to myself that mmm… I remember this one, and this one, too. So I think that this is more enduring and permanent.)	**Enduring** (As they are on computer, they are permanent.) **Efficient** (It is more efficient as we see all details.)	**Enduring** (They are more permanent.) **Focusing** (I try to be more careful in all subjects.) **Skill Developer** (It developed my skill)

		Better solving question (I can solve questions better.)		
Success Perception	**Success Perception** (This study increased my success 90%.)	**Success Perception** (My success increased to 100% from 50%)	**Success Perception** (My success increased to 95% from 70%)	**Success Perception** (My success increased to 100% from 10%)
Alternative assessment and evaluation				
Reflecting Success	**Doubtful**	**Alternative assessment and evaluation reflects my success better.**	**Alternative assessment and evaluation reflects my success better.**	**Alternative assessment and evaluation reflects my success better.**
Preference	**Doubtful**	**Alternative assessment and evaluation**	**Alternative assessment and evaluation**	**Alternative assessment and evaluation**
Preference Reason	(I would like to be graded by the average of my studies in class- I can be successful in single exam)	(I don't think the problem is the exam, you become **excited** as you take only one exam and your success in dependent on it.)	(I may fail in some part of written exam, for example **there might be a situation in that time**, psychologically maybe) (It was **difficult** to have one week after 20 hour course, **in total**. However, it is more **practical** to have an exam from a topic you are continuously lectured.)	

Table 2. Analysis results of 5.6.7.8. students' interviews

	Student 5	***Student 6***	***Student 7***	***Student 8***
Class Environment Where Technology Aided Mathematics Education and Alternative Assessment Instruments Were Jointly Used				
Positive Interest for Course		**Positive Interest** (I willingly attend the course, I began to do homework) **Exciting** (I attend the course excitingly.)	**Positive Interest** (I feel very good)	**Positive Interest** (It attracted my interest.) (It helped me love this course.)
Participation	**Wish** (I want to take this course on computer)	**Participation** (I participate in the course. I began to do homework, I began to solve questions you gave)	**Activeness** (I am more active)	**Participation** (I try to participate more.)
Effect to Learning	**Enduring** (Graphics, procedures are enduring.) **Better understanding** (I understood lessons better) **Faster Understanding** (I understood faster.)	**Enduring** (They can be remembered easily.)	**Enduring** (We lecture our course on computer and it is enduring.) (I understand very well.) **Better understanding** (I clearly understood.) (I understood better.)	**Learning assistant** (It helped me understand better.)
Success Perception	**Success Perception** (My success increased to 100% from below 50%)	**Success Perception** (My success increased to 50-75% from 10-15%)	**Success Perception** (My success increased to 100% from 50%)	**Success Perception** (My success increased to 100% from 50%)
Alternative assessment and evaluation				
Reflecting Success	**Alternative assessment and evaluation reflects my success better.**	**Alternative assessment and evaluation reflects my success better.**	**Alternative assessment and evaluation reflects my success better.**	**Alternative assessment and evaluation reflects my success better.**
Preference	**Alternative assessment and evaluation**	**Alternative assessment and evaluation**	**Alternative assessment and evaluation**	**Alternative assessment and evaluation**
Preference Reason		(I became **more successful** in alternative assessment.)	(We spare **more time** to alternative assessment.)	

Table 3. Analysis results of 9.10.11students' interviews

	Student 9	***Student 10***	***Student 11***
Class Environment Where Technology Aided Mathematics Education and Alternative Assessment Instruments Were Jointly Used			
Positive Interest for Course	**Positive Interest** (I looked forward to the day of the course.) (I became happy.) (I became happy as the course was mathematics.)	**Positive Interest** (There are a lot of differences.)	**Positive Interest** **(**This was a little different.) (I loved this course.) (I was affected much because for the first time we lectured the course on smart board.)
Participation	**Participation** (My participation level changed) (We came to class earlier.)	**Wish** (I was very eager.)	**Participation** (My participation is better in computer classes.)
Effect to Learning	**Enduring** (It stays in my mind longer.)	**Enduring** (It is very enduring.) (It stays here longer.) (It becomes more enduring.)	**Enduring** (The questions I solved is still in my mind.)
Success Perception	**Success Perception** (My success increased to 100% from 50%)	**Success Perception** (My success increased to 100% from 50%)	**Success Perception** (My success increased to 90% from 50%)
Alternative assessment and evaluation			
Reflecting Success	**Alternative assessment and evaluation reflects my success better.**	**Alternative assessment and evaluation reflects my success better.**	**Alternative assessment and evaluation reflects my success better.**
Preference	**Alternative assessment and evaluation**	**Alternative assessment and evaluation**	**Alternative assessment and evaluation**
Preference Reason	(I believe I will be **more successful** in this.)	(It is **better** than the studies here.)	(This type is better. I would be preferred **to be graded by only single exam**.) (We study and we remember. **We cannot remember in written exam**.)

The seventh topic was determined as "Preference reason". This topic covers the codes regarding the reasons why students preferred assessment and evaluation method. In this topic, 8 students stated their opinions 10 times. Three students stated that they preferred alternative assessment as they thought they were more successful according to its results. One student preferred it as he did not wanted to be graded from one single exam, one student as the state of the student affected the results in single exam, one student as he could not remember the answers during written exam, and another student as he became excited when his success was dependent on one single exam. While one student mentioned about the difficultness of single exam and practicality of alternative assessment, another student stressed that they had more time alternative assessment. One student also demonstrated his doubtfulness with his two opposite opinion by stating that he would prefer single exam but he would prefer to be graded by alternative assessment methods.

RESULTS AND DISCUSSION

Many of the studies showed that use of technology significantly enhances students' achievement and attitude (Gelibolu, 2009; Phonguttha, Tayraukham and Nuangchalerm, 2009). In addition, studies showed that use of alternative measurement tools demonstrate students' achievement more correctly (Mert, 2008; Stears and Gopal, 2010).

The literature of the field has some problems in using technology and alternative assessment instruments in learning- teaching processes (Hughes, 2005; Janisch, Liu and Akrofi, 2007). The use of both factors was expected with the change of education (MNE, 2005). Various studies demonstrated some negativeness like time inadequacy in using two factors jointly (Janisch, Liu and Akrofi, 2007; Taşlıbeyaz, 2010). Both variables can be used efficiently with a good planning in education processes. Also, positive opinions of learners about this issue may be a proof of joint usability of technology and alternative assessment instruments.

The results of the study are as follows:

- An increase in the interests of students for course, their participation and their success perception for the course was observed,
- Technology aided education affected learning positively,
- Better and faster learning was observed in technology aided environment and what was learnt was more enduring,
- Students thought that alternative assessment instruments reflected their success better,
- Students preferred alternative assessment instruments instead of traditional ones in grading their success,
- What lied beneath the reasons why students preferred alternative assessment instead of traditional one was that alternative assessment was more practical, stress- free; it enabled separate evaluation not from the whole; it gave more time; had not a negative structure that made them forget what they knew,
- Technology aided education and alternative assessment and evaluation can jointly be used in mathematics education.

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