MATHEMATICS TEACHER'S VIEWS ABOUT USE OF COMPUTER IN LESSONS AND SUITABILITY OF THEIR WORKPLACE

ABSTRACT

The purpose of this study was to identify mathematics teachers' computer-related knowledge level, their views concerning the use of computers in courses, and whether or not their work environment is appropriate for utilizing computer technology. The samples of the study comprised 51 randomly selected mathematics teachers working in city of Turkey in which the study was performed. During the data collection phase, questionnaire was used. Frequency tables were used for the analysis of collected data. According to the results of the survey, teachers participating in the survey are of the opinion that using computers in mathematics courses will be useful but that they do not benefit sufficiently from computers in their course.

Keywords: Mathematics Teaching, Computer Integration,
            Mathematics Software, Teachers' Views,
            Technology in Teaching Mathematics

MATEMATİK ÖĞRETMENLERİNİN DERSLERİNDE BİLGİSAYAR KULLANMA VE ÇALIŞTIKLARI ORTAMLARIN UYGUNLUĞU İLE İLGİLİ GÖRÜŞLERİ

ÖZET

Bu araştırmanın amacı, matematik öğretmenlerinin bilgisayar teknolojisi kullanımı ile ilgili yeterlilikleri, derslerde bilgisayar kullanımı ve çalıştıkları ortamların bilgisayar teknolojisi kullanımına uygun olup olmadığı ile ilgili görüşlerini ortaya koymaktır. Araştırmanın örneklemini, araştırma yapılan ilde görev yapan ve rastgele seçilen 51 matematik öğretmeni oluşturmuştur. Verilerin toplanması aşamasında, anket kullanılmıştır. Toplanan verilerin analizinde frekans ve yüzde tablolarından yararlanılmıştır. Araştırmanın sonuçlarına göre ankete katılan öğretmenlerin, matematik derslerinde bilgisayar kullanımının faydalı olacağına inandıkları ancak derslerin işlenişinde bilgisayarlardan yeterince faydalanmadıkları görülmektedir.

Anahtar Kelimeler: Matematik Öğretimi, Bilgisayar Kullanımı,
                     Matematik Yazılımları, Öğretmen Görüşleri,
                     Matematik Öğretiminde Teknoloji

1. INTRODUCTION (GİRİŞ)

According to Piaget [37] logical-mathematical knowledge is constructed in minds of the individuals through associations. The materials used in mathematics lessons have a great impact on how students see and appreciate these associations [22 and 36]. While it is widely assumed that material use supports learning, studies conducted in this field do not provide clear and consistent results [3, 9, 15, 24, 25 and 26]. These studies report that the lack of consistent results is a consequence of how the materials are used in the lessons, and that the knowledge, beliefs and experiences of teachers within this field are critical factors. Stein and Bovalino [39] observed that successful teachers in this field focus on how the materials can impact the students and how they think mathematically when they planning the lessons. However, many teachers use these materials in their lessons without examining how they can most effectively support learning [20].

Lately, as a reaction to rapid growth in the use of computer technology, a number of studies in mathematics have been carried out on using computers as instructional tools [2, 3, 6, 9, 23, 35 and 36]. In the present study, computer use was focused on as a tool in mathematics teaching. While computers and the Internet are available in the class, their presence does not guarantee that teachers will use these tools effectively, or that the quality of the education will improve [12]. Computers are merely tools for teaching; they are only as effective as their users. It is essential that available computer technologies are used correctly, in a way that maximizes the potential of the technology. Related studies reveal that teachers may not use computers as efficiently as possible for the following reasons: they do not have adequate training on the computer programs; they have a negative attitude towards computer use in the lessons [13, 19, 27, 30, 31, 33 and 38].

The computer, one of the most efficient information tools of our time, is also an efficient tool in mathematics lessons, as well as other subjects. Today, the question "Should we use a computer in education?" has been replaced by the question "How can we maximize the full capability of the computer?" [42: 128]. There are a number of studies on the use of computers in mathematics teaching that are available in the literature [9, 18, 19, 26 and 32]. These studies support the premise that computer use in the lessons is helpful: "conveying mathematical formulas, relations and procedures to the screen make it possible to see symbolical and graphical transitions which facilitate analytical understanding" reports Baki's study [4]. Using these tools facilitates mathematical solutions and analyses via visual methods among mathematicians. Also supported by the studies is the premise that sessions prepared with computer aided programs as a component will also contribute to constructivist learning, as students can design activities that address their own problems [10 and 17]. Some of the research on the use of computer programs in education reveals various findings, like: "Tools and materials are used in order to support teaching in the learning and teaching process, well-designed teaching tools and materials enrich the process and increase learning" [41: 82]; "students are motivated to learn, make generalizations and construct formulas in terms of using the computer, drawing pictures and solving numerical problems" [11: 184].

Computer aided teaching is a teaching method in which students interact with programmed learning materials by using the computer. Students achieve learning through computer programs, and they can observe what they have learned and assess themselves [34]. According to Baki [4] findings in the literature indicate that there are two

different approaches to computer aided mathematics teaching. The first and the oldest one is to use this technology in order to solve calculations, or create presentations relating to the taught topic using graphics and designs in order to strengthen the standard mathematics lesson. The second one, more difficult, but most efficient approach, is the one that will lead to a dramatic change in mathematics teaching. It is to use the computer as a simulation tool, as a research and experimental tool. Using a computer in this way, the teacher has an opportunity to establish his/her own self knowledge." In addition, it is also possible to see studies focusing on using the computer for information modeling in mathematics teaching [21, 32 and 34].

This method is expected to ease the difficulty of learning and teaching many of these topics via traditional means, particularly mathematics and physics, which include abstract concepts [2]. Başer and Yeşildere [7] found that a majority of teachers participated in their study liked using computers and believe that the computer makes life easier. Baki [5] states that the main objective of computer use in mathematics teaching is to facilitate learning through conveying abstract concepts to the screen with the help of computer programs, and thereby solidifying them. Today there is an abundance of educational software, for use by teachers and students, available in the market, though not always adequate. But there is also a lack of training on the extent to which these programs should be used.

2. RESEARCH SIGNIFICANCE (ÇALIŞMANIN ÖNEMİ)

Today, technology use in education is seen as necessary, and computer use in education has gained greater prominence. Using instructional technologies in mathematics teaching is no longer just an option; it is obligatory. The ability to convey abstract concepts to the screen, solidifying those concepts with the help of computer technologies, facilitates learning [18 and 29]. As aforementioned, teachers have not been effectively using computer as learning and teaching tool [8, 14 and 40]. Therefore, probing teachers' opinions are of importance in order to diagnose the actual problems teachers encounter and this ultimately provide us with finding likely solutions for those problems. Accordingly, it is important to get teachers' comments on their access to computers and use in their working environment. In addition, it is believed that this data will greatly contribute to the current literature.
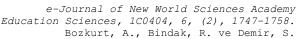
This study results should be interpreted taking into account the teachers' selection of a specific region and lack of sample. In addition, this study performed for mathematics teachers is limited to the field of primary and secondary education.

The further studies are required to find out how to break prejuides of teachers and teach teachers to use instructional technology. Moreover, motivation factors of teachers while using instructional technology should be determined and used in learning-teachning process of teachers.

2.2. Purpose of the Research (Çalışmanın Amacı)

The purpose of this study was to find out the mathematics teachers' views about their level of competency in terms of using computer technologies, whether or not their working environments are conducive to the use of computer technologies, and their opinions about using computers in lessons. In this context, three questions were determined.

- What are teachers' views about their competency level in computer use?

- What are teachers' views about suitability of their workplace for computer use?
- What are teachers' views about opinions of teachers on computer use in their lessons?

3. ANALYTICAL STUDY (ANALİTİK ÇALIŞMA)

This is a descriptive study. It was conducted using a survey model. In descriptive studies, the researcher attempts to determine/identify the fact as it is [16].

3.1. Sample (Örneklem)

In this research, the study group consists of a total of 51 mathematics teachers working in public elementary schools and public high schools. The schools and teachers were randomly chosen from schools in the city center of Gaziantep during 2009-2010 academic year.

3.2. Data Collection Techniques (Veri toplama teknikleri)

To collect data, the questionnaire, based on Almirini [1], Çakıroğlu, Güven and Akkan [13] and Wu at al. [40] articles published, was administered to the teachers in the present study. Draft questionnaire were checked by three instructors in mathematics education and one instructor in computer and instruction technology education for validity. This questionnaire consists of Likert type-questions grouped into three topics related to research questions: Determining the level of competency of the mathematics teachers in terms of using computer technologies; whether or not their working environments are conducive to the use of computer technologies; and their opinions about computer use in the lessons. Cronbach's Alpha test was used to calculate the reliability of the part of questionnaire about teachers' opinions. The result was 0.753 and it was in acceptable level. Answers given to two open-ended questions in the questionnaire were analyzed and the results of analysis were used to provide justification.

4. FINDINGS (BULGULAR)

This section presents the findings on the sub problems of the study.

4.1. Teachers' Views About Their Competency Level in Computer Use (Öğretmenlerin Bilgisayar Kullanım Yeterlikleri ile ilgili Düşünceleri)

- **Question 1.** Please mark the sentence that best describes your skill level.

Table 1. Evaluation results of question 1
(Tablo 1. Soru 1'in sonuçlarının değerlendirilmesi)

	f	%
I have no experience with computer technologies	5	9,8
I try to use computer technologies, but I still need help for regular basic skills	27	52,9
I show a general competency level in many computer applications	12	23,5
I have a higher skill level in using computer technology	7	13,7
Total	51	100

Answers indicate that most of the teachers surveyed believe that their skill levels are inadequate in the use of computer technology

and they believe that they need to raise their basic skill levels. The 19 teachers (37,2%) believed that they have sufficient knowledge to use computer technology.

- **Question 2.** How much in-service training have you received on using computer programs in mathematics teaching to the present time?

Table 2. Evaluation results of question 2
(Tablo 2. Soru 2'nin sonuçlarının değerlendirilmesi)

	f	%
Never	37	72,5
One month or less	7	13,7
Less than one semester	3	5,9
One semester	3	5,9
More than one semester	1	2
Total	51	100

The answers indicate that a majority of the teachers surveyed had not received any in-service training on computer technologies in mathematics teaching. Since computer technologies are so fast moving, it is necessary to provide quality in-service training at regular intervals to keep teachers informed.

4.2. Teachers' Views About Suitability of Their Workplace for Computer Use (Öğretmenlerin Çalıştıkları Ortamların Bilgisayar Kullanımına Uygunluğu ile ilgili Görüşleri)

- **Question 1.** How would you rank your opportunities for using the computer in mathematics lessons in the school where you currently work?

Table 3. Evaluation results of question 1
(Tablo 3. Soru 1'in sonuçlarının değerlendirilmesi)

	f	%
Extremely low	28	54,9
Little	16	31,4
Acceptable	2	3,9
Well	2	3,9
Very well	2	3,9
Excellent	1	2
Total	51	100

Answers indicate that the teachers surveyed for this study do not have enough opportunities to use computer technologies in the mathematics lessons at their schools. The percentage of teachers who believe they have average or better opportunity is just 13.7%.

- **Question 2.** How frequently do you use computer technology in your lesson activities?

Table 4. Evaluation results of question 2
(Tablo 4. Soru 2'nin sonuçlarının değerlendirilmesi)

	F	%
Never	27	52,9
Rarely	16	31,4
Sometimes	6	11,8
Often	2	3,9
Total	51	100

Interestingly, more than half of the teachers participating in the study have never used computer technologies for lesson activities.

- **Question 3.** How often do you use the following technologies in mathematics lessons?

Table 5. Evaluation results of question 3
(Tablo 5. Soru 3'in sonuçlarının değerlendirilmesi)

	Never		Low/middle		Sufficiently	
	f	%	f	%	f	%
Overhead	44	86,3	7	13,7	0	0,0
Presentation software (PowerPoint)	28	54,1	21	41	2	3,9
Spreadsheets (Excel)	33	64,7	13	25,5	5	9,8
Flash animation	39	86,7	5	11,1	1	2,2
Projectors	30	76,9	7	18	2	5,1
Mathematical software	39	88,6	4	9,1	1	2,3
Smart boards	48	96,0	2	4,0	0	0,0
Calculator	27	61,4	11	25,0	6	13,6

A majority of the teachers participated in this study have never used computer technologies in their lessons. PowerPoint and calculator were used more frequently when compared to the use of other technologies. The level of calculator (13.6%) and spreadsheets (9.8%) use were sufficient.

4.3. Teachers' Views About Their use of Computers in Teaching (Öğretmenlerin Öğretimde Bilgisayar Kullanımı ile ilgili Görüşleri)

- **Question 1.** How important is using computer technologies in mathematics lessons?

Table 6. Evaluation results of question 1
(Tablo 6. Soru 1'in sonuçlarının değerlendirilmesi)

	Primary school		High school	
	f	%	f	%
Never	1	3,57	1	4,35
Could have done without	2	7,14	5	21,74
Important	18	64,29	6	26,08
Very important	7	25,00	11	47,82
Total	28	100	23	100

The answers to this question indicate that most teachers believe using computer technologies in mathematics lessons is important. There were teachers whose answers indicated that they do not believe it is important or relevant; they tended to be mostly high school teachers and those who also believe that their level of competency (in terms of computer-aided mathematics teaching) is low.

- **Question 2.** What do you think about the use of computer technologies in mathematics lessons?

The questions below were used to determine the teachers' thoughts on the effects of computer on learning-teaching process.

Table 7. Evaluation results of question 2
(Tablo 7. Soru 2'nin sonuçlarının değerlendirilmesi)

	Strongly disagree		Disagree		Undecided		Agree		Strongly agree	
	f	%	f	%	f	%	f	%	f	%
1.Their use increases academic success	3	5,9	4	7,8	9	17,7	25	49,0	10	19,6
2.Their use enables students to learn main concepts and ideas	2	3,9	6	11,8	7	13,7	25	49,0	11	21,5
3.Their use makes class management difficult	8	15,7	27	52,9	8	15,7	7	13,7	1	2,0
4.Their use develops the writing and presentation skills of teachers	2	3,9	5	9,8	5	9,8	23	45,1	16	31,4
5.Their use takes up too much of the teacher's time in lesson preparation	6	11,8	17	33,3	9	17,7	10	19,6	9	17,7
6.Their use enables teacher to feel himself/herself more competent	3	5,9	9	17,7	9	17,7	19	37,2	11	21,6
7.Teachers will have greater success if they are educated in using the software	0	0,0	9	17,6	5	9,8	23	45,1	14	27,5
8.Their use is not appropriate for constructivist education	12	23,5	19	37,3	9	17,7	10	19,6	1	2,0
9.Their use increases career development	1	2,0	4	7,8	6	11,8	28	54,9	12	23,5
10.Their use alleviates the pressure on me as a teacher	5	9,8	21	41,2	8	15,7	11	21,6	6	11,8
11.Their use limits my choice of teaching materials	12	23,5	24	47,1	5	9,8	7	13,7	3	5,9
12.Their use requires training in using the software, requiring more time	0	0,0	10	19,6	11	21,6	22	43,1	8	16,0
13.Their use is efficient when comprehensive computer resources are available	1	2,0	3	5,9	4	7,8	30	58,8	13	25,5
14.Using the computer saves time in the lessons	3	5,9	5	9,8	7	13,7	24	47,1	12	23,5
15.Their use requires more time for planning the learning activities	1	2,0	13	25,5	8	15,7	19	37,3	10	19,6
16.Their use encourages the neglect of traditional learning resources. (library, etc…)	8	15,7	21	41,2	6	11,8	12	23,5	4	7,8
17.Computer use increases active participation of students in the lessons	3	5,9	4	7,8	12	23,5	19	37,3	13	25,5
18.Their use is important in the sense that it decreases the burden on the teacher in the classroom	3	5,9	15	29,4	7	13,7	19	37,3	7	13,7

Teachers believe that using these technologies increases academic success(68.6%), enables students to learn main concepts and ideas(71.5%), develops the written and presentation skills of the teachers, aids in career development, computer saves time in the lessons (70.6%), and increases active participation of students in the lessons(62.8%). The answers indicate that teachers in this study believe that the benefits of using computer technologies in mathematics lessons outweigh any disadvantages.

Answers also indicate that teachers believe that computer use in the lessons allows more diversity in choice of materials saves time (70.6%) and does not necessarily encourage the disuse of traditional learning resources (56.9%). Teachers state that training and education to gain the requisite hardware and software skills is necessary (59.1%), along with comprehensive computer resources (84.3%), in order to achieve these positive results.

5. DISCUSSION (TARTIŞMA)

The purpose of this study was to find out the mathematics teachers' views about their level of competency in terms of using computer technologies, whether or not their working environments are conducive to the use of computer technologies, and their opinions about using computers in lessons.

The purpose of the study was to determine the teachers views about their level of competency in terms of using computer technologies, their working environments are conducive to the use of computer technologies, and the effects of computers using in lessons. In this context, the findings will be discussed in this section within the framework of the literature.

37.2% of the teachers stated that their computer skills are adequate and good level. In addition, the teachers believe that using these technologies increases academic success, enables students to learn main concepts and ideas, develops the written and presentation skills of the teachers, aids in career development, and increases active participation of students in the lessons. Answers also indicate that teachers believe that computer use in the lessons allows more diversity in choice of materials saves time and does not necessarily encourage the disuse of traditional learning resources. Teachers state that training and education to gain the requisite hardware and software skills is necessary, along with comprehensive computer resources, in order to achieve these positive results.

In contrast, 84.3% of the teachers stated that they have never or rarely used computers technology in their lessons. In generally, the teachers believed that computers technologies contribute to education. However, they had the lack of knowledge or concerns of using computers technologies. 72% of teachers who had not taken in-service training supported this issue.

In this context two factors may contribute to this scenario: First, they do not a chance to use computer technologies in the mathematics lessons in their current schools; second, teachers' skills are not up to the level of competency required for computer aided mathematics teaching.

Each technology listed in the table5 has a different function in mathematics teaching. overhead projectors, presentation software, smart boards and projectors are considered technologies that are more time-efficient and effective at keeping students focused, by making the lesson visual. Flash animation, mathematical software, spreadsheets and the calculator are also technologies that can aid in learning by conveying abstract concepts to the screen and solidifying them. Although the teachers believed that computers technologies are useful and beneficial for education, these technologies are used less in educations, besides the reasons mentioned above, internal barriers like the teachers' attitude to computers technologies and lack of confidence [27] can be shown the reasons. In the reason of the technologies used less in education, the presence of the technology are of secondary importance.

An answer to one of the open-ended questions from one of these teachers above is illuminating:

"*During mathematics teaching, the operations should be explained line by line. It is very difficult for a student to understand a ready-made operation. Otherwise, books would be enough for learning.*"

6. CONCLUSION AND RECOMMENDATIONS (SONUÇ VE ÖNERİLER)

The present study examined the competency levels of mathematics teachers for integrating computer technologies into their lessons; their general opinions about computer use in the lessons and the conduciveness of their working environments for computer use. Within this scope, some suggestions include:

Consideration of the answers from the teachers surveyed - particularly to the open-ended questions-lead to an understanding that teachers attribute general meanings to computer use, i.e. solving more problems and saving time. But computer technologies should also be seen as efficient calculators or presentation tools as well as a tool that facilitates learning by conveying abstract concepts to the screen and solidifying them. In addition, not every subject should be taught using computer technologies; teachers must have room in the lessons for non-computer tools. A diversity of materials increases the engagement and motivation levels of the students.

Computer-aided materials should be developed and offered to teachers in order to integrate computer technologies efficiently into mathematics teaching and for students to have an opportunity to construct his/her knowledge actively in the lessons. Studies have been conducted on this topic in recent years. Algebra and geometry software, for instance, are prepared through manipulative and web quest activities [23, 28 and 35]. As discussed in the previous section, if necessary, teachers should be given preparatory training courses provided by experts in each field. Curricula of prospective teachers should be reconstructed within this frame. This is because detailed route charts, experts and teachers who will function as a compass are necessary for computer technology to be used efficiently and productively. The task of clarifying the questions "How will the teachers who want to use computer-aided mathematics teaching prepare their lessons? When and how will they use the computer?" falls on educators and the institutions training the teachers. Explaining each method step-by-step to participating teachers through examples is beneficial for clarifying these questions [4].

Finally, almost every teacher participating in the study said that they do not have enough opportunities to use computer technologies in their mathematics lessons in their current schools. It seems evident that schools need to create an environment conducive for the integration of computer-aided materials in the lessons.

NOTICE (NOT)

The essence of this study presented by title "Mathematics Teacher's Competency of Effective Use of Computer and Suitability of Their Workplace at IETC 2010.

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