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EDITORS

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Assist. Prof. Dr. S. Ahmet KIRAY

Res. Asst. Selahattin ALAN

KONYA

NECMETTİN ERBAKAN UNIVERSITY

AHMET KELEŞOĞLU FACULTY OF EDUCATION

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PREFACE

Greetings!

We are congregating scientists, researchers and students who keep on involving their studies on education all over the world via International Conference on Education in Mathematics, Science and Technology which took place on May 16 - 18, 2014, at Necmettin Erbakan University in Konya, Turkey. We are honored to organize this event at Necmettin Erbakan University. By this opportunity, all the participants were able to develop scientific knowledge and scientific exchange through this well organized conference. In addition, they were able to spend a few restful days on the rich historical and cultural ambiance of Konya.

About 400 people from 30 different countries participated in the conference. A total of 359 academic works were presented at this event. We would like to acknowledge by expressing our deepest gratitude to keynote speakers, Prof. Dr. Paul ERNEST from University of Exeter-UK, Prof. Dr. William F. MCCOMAS from University of Arkansas-USA, Prof. Dr. Mack SHELLEY from Iowa State University-USA, Assoc. Prof. Dr. Jacqueline T. MCDONNOUGH from Virginia Commonwealth University-USA, and Prof. Dr. Lynne SCHRUM from West Virginia University-USA, for accepting our invitation to present a keynote speech in our conference. We thank to the panelists, Prof. Dr. Giray BERBEROGLU from Middle East Technical University-Turkey and Assoc. Prof. Dr. Gultekin CAKMAKCI from Hacettepe University-Turkey, for their valuable presentations. We also would like to thank to the members of the organization committee who contribute with their intense efforts for this conference and our sponsors, Private Genclik Schools, Private Basak College,Yargi Academy, Egitim Publication, and TUBITAK for their support.

The Organization Committee

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FACTORS AFFECTING THE FREQUENCY OF ICT USAGE IN PRIMARY SCHOOLS TEACHING

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ABSTRACT: Intensive and rapid development of ICT lead to popularization and necessity of its use, and changes in all spheres including education as a process.

A research was conducted in order to ensure valid and reliable assessment of the extent and nature of ICT knowledge and skills of teachers in primary schools, to identify the factors that affect the frequency of use of ICT in teaching and to identify strategies for enhancing development effectiveness future.

The research surveyed 214 teachers from 10 primary schools in the Southeast region of Macedonia. Technique Modeling of Structural Equations was used to determine the relative strength of the factors affecting the frequency of use of ICT in teaching. The results show that the highest percentage of 58.4 % of the teachers often use ICT in teaching, 33.6 % rarely use ICT, 7 % of respondents use ICT at all times, and only 0.9 % do not use ICT for teaching purposes. ICT competencies of teachers, number of training, years of computer use, possession of personal computer and having Internet at home proved as influential factors for ICT usage frequency in teaching.

The survey results were analyzed using SPSS 19, Excel and Amos Graphics 18.

Keywords: ICT knowledge and skills, ICT in teaching, modeling with structural equations.

1. INTRODUCTION

Information and communication technologies (ICT) play a proven critical role in enhancing the quality of education. They are particularly important in helping teachers and students to perform more effectively. To make the best use of ICT, teachers must be equipped with adequate ICT competencies. In the process of integrating ICT into education, both teacher's ICT competencies and how they perceive the role of ICT in their teaching/learning processes play key roles. Analysis, design, development, implementation, evaluation, and management of ICT in education require diversified competencies and knowledge (Kozma 2002, pp.1-6).

ICTs have become within a very short time, one of the basic building blocks of modern society. Many countries now regard understanding ICT and mastering the basic skills and concepts of ICT as part of the core of education, alongside reading, writing and numeracy (Daniels, 2002).

Today, improved communication technology has made time and space less complex. It could be observed that this modern age is the age of information explosion in which an average individual wants to explore the information system. Thus, the ability for timely acquisition, utilization, communication and retrieval of relevant

and accurate information has become an important attribute for better teaching-learning process (Adebayo, 2008).

The new technologies have the potential to support education across curriculum and provide opportunities for effective communication between teacher and students in ways that have not been possible before. ICT in education has the potential to be influential in bringing about changes in ways of teaching (Dawes, 2001).

The field of education has been affected by ICTs, which have undoubtedly affected teaching, learning, and research (Yusuf, 2005). A great deal of research has proven the benefits to the quality of education (Al-Ansari, 2006). ICTs have the potential to innovate, accelerate, enrich, and deepen skills, to motivate and engage students, to help relate school experience to work practices, create economic viability for tomorrow's workers, as well as strengthening teaching and helping schools change (Davis and Tearle, 1999; Lemke and Coughlin, 1998; cited by Yusuf, 2005). As Jhurree (2005) states, much has been said and reported about the impact of technology, especially computers, in education The field of education has been affected by ICTs, which have undoubtedly affected teaching, learning and research (Yusuf, 2005) .ICTs have the potential to accelerate, enrich, and deepen skills, to motivate and engage students, to help relate school experience to work practices, create economic viability for tomorrow's workers, as well as strengthening teaching and helping schools change (Davis and Tearle, 1999; Lemke and Coughlin, 1998; cited by Yusuf, 2005).

Teachers contribute toward the base of the education innovation, therefore ICT competencies of teachers in primary schools should be seen as an invaluable prerequisite to facilitate teaching and learning in this modern era of information and technology. [9]

ICT is not only a means of realizing the educational goals but important factor in a complete restructuring of the educational system, introducing new interactive and participatory models of education, new educational pedagogy, continuous and lifelong learning.

Macedonian context of computerization and digitization of education intensively developed after 2002 when the country received the first Chinese donation, which allowed a certaindegree of popularization of ICT in the education. Starting in 2003 through the e-school project teacher training the use of ICT were conducted in two phases. With changes in education that occurred with the intensive introduction in education, resulted in a need to develop national educational policies and strategies that will contribute to the social and educational development. In 2005 was created the draft program for the development of ICT in education (2005-2015) which covered the process of computerization and digitization of education.

Macedonia entered the world of ICT innovation with the introduction of the program "Computer for Every Child" initiative and investment by the Government of the Republic of Macedonia to modernize Macedonian education. This project provides a computer for each child, software solutions and tools for each subject, advanced ICT skills among teachers and students, a national system of testing students and the interactive online teaching.

In the academic year 2009/2010, primary schools were equipped with portable Classmate PCs for every student from first to third grade. In 2010 teacher trainings were conducted for Edubuntu operating system, the programs for integration of mathematics and sciences, ToolKid program and SSTC of using “thin clients”. Furthermore, despite the software electronic grades were introduced. Also attached is training for class teachers for the program and Green G Compris suite-junior. [5,6,8]

Starting from the academic year 2013/14, all teachers were required to integrate at least 30% of ICT in the curriculum.

2. METHODOLOGY

In the survey every teacher had to report their ICT knowledge and skills, the ways in which they use ICT in teaching, ICT trainingthey have attended, frequency of ICT use in teaching and to evaluate motivational attitudes of the ICT use in teaching, and the attitudes of the school towards ICT. The main parts of the survey are shown in Table 1.

This research is done in order to ensure a valid and reliable assessment of the extent and nature of ICT knowledge and skills of teachers in primary schools, and to identify factors that affect the frequency ICT usage in teaching.

The survey was conducted in the academic year 2012/13, in 10 primary schools in the Southeast region of the Republic of Macedonia in the municipalities of Strumica, Vasilevo, Bosilevo and Novo Selo. The survey was

conducted on 214 teachers, a representative sample in given that 610 is the total number of teachers in those municipalities.

Table 1. Structure Of The ICT Survey In Teaching For Teachers In Primary Schools.

part	Title of section	Information	Number of issues
I	General information	environment, age, experience, sex, teacher	5
II	Using the computer for personal needs	personal computer, type of computer, Internet at home, years of experience with computer	4
III	Personal and professional development	training classes at school, additional training, self-improvement	3
IV	Using computers at school	implementation of ICT programs, type of computer, hardware, use of computer	6
V	Motivation for using ICT in teaching	motivational view with scale assessment	21
VI	ICT knowledge and skills	navigation in the operating system, email, Internet, text editor, multimedia presentations, spreadsheet calculations, blogs, databases	8
VII	ICT in school	assessment scale for the application of ICT in school	3
		Total Questions	33

3. RESULTS AND DISCUSSION

The survey results were analyzed using SPSS 19 programs, Excel and Amos Graphics 18. The tables below present the demographic characteristics of the surveyed teachers.

Table 2. The location of the school.

Location

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Rural	105	49,1	49,1	49,1
	Urban	109	50,9	50,9	100,0
	Total	214	100,0	100,0	

Table 2 Shows That Almost Equal Number Of Teachers Are From Urban And Rural Areas.

Table 3. Age Structure Of The Surveyed Teachers.

Age

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	<=25	5	2,3	2,3	2,3
	>=56	24	11,2	11,2	13,6
	26-35	59	27,6	27,6	41,1

	36-45	55	25,7	25,7	66,8
	46-55	71	33,2	33,2	100,0
	Total	214	100,0	100,0	

Table 4. Work experience as a teacher.

Experience

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	<=5	46	21,5	21,5	21,5
	>=26	51	23,8	23,8	45,3
	11-15	29	13,6	13,6	58,9
	16-20	22	10,3	10,3	69,2
	21-25	19	8,9	8,9	78,0
	6-10	47	22,0	22,0	100,0
	Total	214	100,0	100,0	

Table 5. Gender of surveyed teachers.

Gender

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Female	177	82,7	82,7	82,7
	Male	37	17,3	17,3	100,0
	Total	214	100,0	100,0	

Table 6. Teachers from primary education.

Teacher

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Primary education teacher	85	39,7	39,7	39,7
	Subject teacher	129	60,3	60,3	100,0
	Total	214	100,0	100,0	

Figure 1 is a graphical representation of a given application of ICT in teaching. The question: Do you use ICT in teaching, teachers had to answer whether they do it all the time, rarely, never, or don't know what it is. The largest percentage of 58.4% reported that they use ICT often, 33.6% rarely use ICT, 7% of the respondents use ICT at all times, and only 0.9% do not use ICT for teaching purposes.

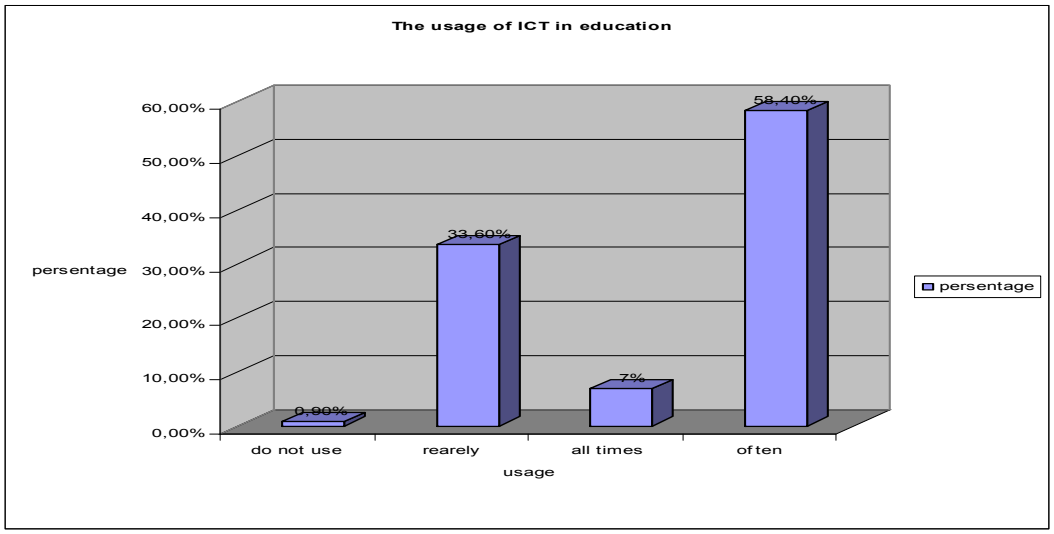

Figure 1. The usage of ICT in education.

The survey asked teachers who use ICT in teaching to also assess the frequency, i.e. if they apply it daily, weekly, monthly, or a few times a year. Figure 2 shows the frequency of ICT usage. The largest percentage of 49.10 % applied ICT weekly, 20.60 % applied ICT monthly, 17.80 % a few times a year, and the smallest percentage of 11,70 % use ICT every day. The frequency of ICT usage in teaching depends on the nature of the subject that the teacher teaches and the requirements for the application of ICT in the teacher's curriculum.

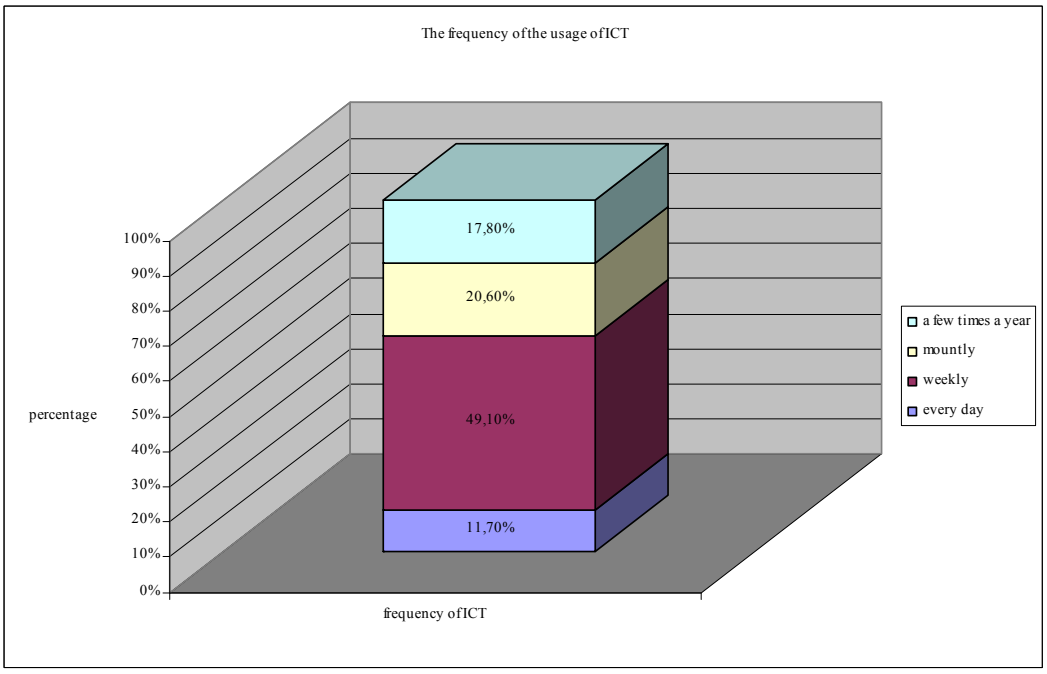

Figure 2. The frequency of the usage of ICT.

According to the frequency of ICT usage, the teachers can be classified into three categories: low, medium and high. The low category, 34.1% of the surveyed teachers, includes teachers who rarely or never use ICT and if they do use it, it is a few times a year or month. The medium category, involved the highest percentage of respondents 52.3%, includes teachers who often use ICT in teaching. The high category, involved the lowest percentage of 13.5 % respondents, includes teachers who use ICT at all times, or every day.

By analyzing all demographic factors such as gender, environment, age, seniority, years of experience, and the kind of teacher we cannot single out any demographic factor that shows statistically significant correlation with the frequency of ICT usage in teaching.

The technique of structural equation modeling was used again to analyze the relationship between the frequency of ICT usage and the other factors.

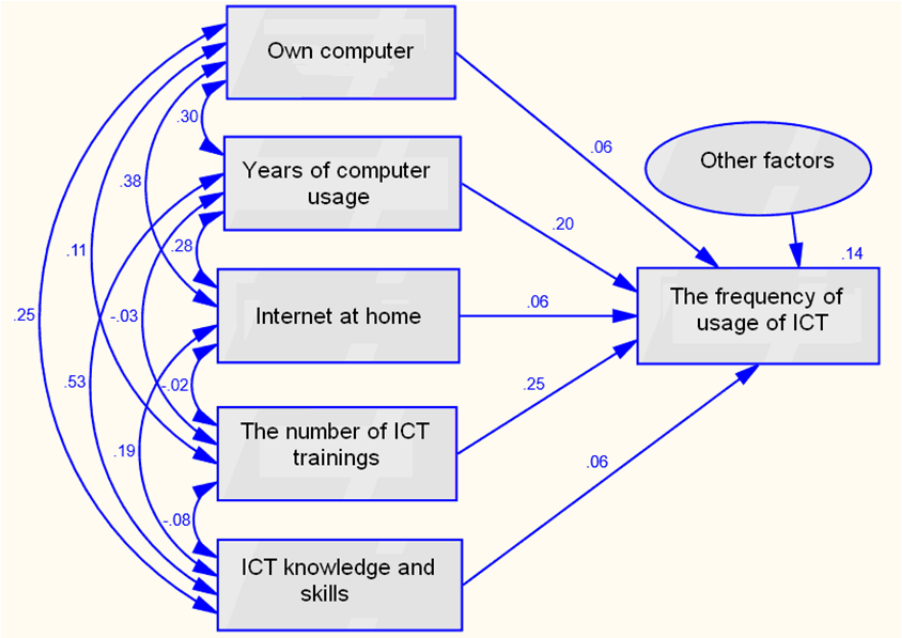

Figure 3. The relative strenght of influence on the factors on the frequency of usage of ICT.

From Figure 3 we can conclude that the number of ICT trainings is a factor with the strongest influence on the frequency of ICT usage - measured 0.25, then comes years of computer usage - measured 0.20, and the remaining three factors: own computer, have Internet at home, and have ICT knowledge and skills - measured 0.06. The impact of other factors on ICT knowledge and skills is 0.14.

When we add the results of all five factors that influence the frequency usage of ICT, we obtain value 0.63 (0 to 1). This means that all these factors are 63% of the variance in frequency of ICT usage, suggesting that these factors describe the impact on frequency of ICT usage well.

Table 7. The regressional weight of the factors for the frequency if the usage of ICT.

Regression Weights: (Group number 1 – Default model)

			Estimate	S.E.	C.R.	P	Label
The frequency of ICT usage	<-	Own computer	.266	.325	.818	.414	
The frequency of ICT usage	<-	Years of computer usage	.289	.110	2.636	.008	
The frequency of ICT usage	<-	Internet at home	.373	.464	.804	.421	
The frequency of ICT usage	<-	Number of ICT training	.238	.060	3.964	***	
The frequency of ICT usage	<-	ICT knowledge and skills	.002	.003	.758	.449	

Table 7 is a textual display of the results using AMOS Graphics. As we can see only the factor *Number of ICT training* has a significant positive effect on the frequency of ICT usage, with value of $p < 0.001$. Years of computer usage have a positive significant effect on the frequency of ICT usage, with value of $p < 0.05$. The rest of the factors have a positive insignificant effect on the frequency of ICT usage, with a value of p greater than 0.05.

Table 8. Overview of the model in SPSS.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,380[a]	,144	,124	1,376

a. Predictors: (Constant), ICT knowledge and skills, Number of ICT training, Internet at home, Own computer, Years of computer usage

Table 8 gives us a summary of the model in SPSS, where we can see that the value of R Square is 0.144, indicating a good model.

Table 9. ANOVA table for the cumulative effect on SPSS.

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	66,457	5	13,291	7,018	,000[a]
	Residual	393,917	208	1,894		
	Total	460,374	213			

a. Predictors: (Constant), ICT knowledge and skills, Number of ICT training, Internet at home, Own computer, Years of computer usage

b. Dependent Variable: The frequency of usage of ICT

As we can see from the ANOVA table, the cumulative effect is significant.

Table 10. Table of coefficients in SPSS.

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1,060	,479		2,213	,028
	Own computer	,266	,329	,058	,808	,420
	Years of computer usage	,289	,111	,204	2,605	,010
	Internet at home	,373	,470	,056	,795	,428
	Number of ICT training	,238	,061	,255	3,917	,000
	ICT knowledge and skills	,002	,003	,057	,749	,455

a. Dependent Variable: The frequency of usage of ICT

From Table 10 we see that the the Beta coefficients of all predictors are positive, but only Number of ICT training and years of computer use are significant, the rest of the factors are insignificant.

4. CONCLUSION

Since the ultimate goal is to achieve higher frequency of the ICT usage in teaching, then according to the factors that contribute to it, are moving a step forward.

- o Increased ICT competencies of teachers positively influence the increase of frequency ICT usage in teaching.
- o Certainly the experience of working with computer positively affects the increase of ICT competencies of teachers, and thus the frequency of ICT usage in teaching.
- o Increased number of training courses and similar improvements increase the frequency of ICT usage in teaching.
- o The use of Internet at home does not limit a teacher to work in preparation for teaching and contributes to increase of the frequency of ICT usage in teaching.
- o Having computer certainly has a positive influence on the frequency of ICT usage in teaching.

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