

## ELEMENTARY SCHOOL TEACHERS AND TEACHING WITH TECHNOLOGY

Filiz VAROL

Department of Elementary Education, Firat University, Elazig, Turkey

filizvarol@gmail.com

### ABSTRACT

This study aims to identify the relationship between elementary school teachers' ICT engagement with their attitudes towards technology. To this end, one hundred elementary school students were asked to fill out questionnaires related to their ICT knowledge, usage, and attitude towards technology. The results show that teachers' ICT knowledge and usage is very low. Also, their attitude toward technology is at medium level. Teachers' ICT engagement predicts their attitude towards technology and self-confidence for teaching with technology.

**Keywords:** elementary school teachers; technology; attitudes; self-confidence

### INTRODUCTION

As stated in many other articles, the radical changes in education (i.e., moving to learner-centered constructivist approaches, designing/developing new tools for educational purposes etc.) have affected the roles of teachers. Indeed, such changes require teachers to be more careful about what type of learning objectives to have, which content to cover, which strategies to employ, which technological tools/media to use to enrich instruction, and so on. Among others, effective use of information and communication technologies (ICT) has a critical role on successful student learning.

Despite ICT's advantages and effects on students' learning, studies that recently conducted show that high level of technology use was not yet achieved (Kozma, 2003; Mueller, Wood, Willoughby, Ross, & Specht, 2008; Scrimshaw, 2004; Smeets, 2005; Tondeur, van Braak, & Valcke, 2007). Even, ICT was not considered as a powerful tool to facilitate learning (Cuban, Kirkpatrick, & Peck; 2001; International Society for Technology in Education [ISTE], 2008). In the present study, the goal is to investigate the factors that affect elementary school teachers' ICT integration into their classroom practices.

### Theoretical Background

#### Teachers Knowledge of ICT

Teachers' knowledge is a critical factor that affects their decisions about their classroom practices. In addition to content, pedagogical, and pedagogical content knowledge as Shulman (1986) stated, there is technology attachment to those knowledge types: technological pedagogical content knowledge (Pierson, 2001), pedagogical technology integration content knowledge (Brantley-Dias, Kinuthia, Shoffner, DeCastro & Rigole, 2007), and technological pedagogical content knowledge with emphasis on ICT (Angeli & Valanides, 2009). Those three types of knowledge have common principles: content, pedagogy, and technology.

For effective technology integration, teachers need to have technology knowledge, which became one of the basic skills of teaching. However, such knowledge is not enough for effective teaching with technology. They have to know about various types of hardware as well as software and the ways to integrate them into their instruction. Indeed, according to Cennamo, Ross, and Ertmer (2010), for effective technology integration into classrooms, teachers need knowledge that enables them to:

- Identify which technologies are needed to support specific curricular goals
- Specify how the tools will be used to help students meet and demonstrate those goals
- Enable students to use appropriate technologies in all phases of the learning process including exploration, analysis, and production
- Select and use appropriate technologies to address needs, solve problems, and resolve issues related to their own professional practice and growth (p. 10).

A critical point is that if teachers are required to integrate technology in their teaching practices, in addition to ICT knowledge, they have to have positive beliefs towards technology. In this paper, teacher beliefs are considered as another key variable that affect ICT integration and it is explained below.

#### Teacher Beliefs related to ICT

Teacher beliefs are established by their experiences that they had as pupils and shaped during their teacher education program. Although they are influenced by their professional experiences, their beliefs become stable and resistance to change when they start serving as a teacher (Keys, 2007; Pajares, 1992). Those beliefs affect

teachers’ teaching practices (e.g., Fang, 1996; Kagan, 1992; Kane, Sandretto & Heath, 2002; Pajares, 1992; Prawat, 1992).

ICT in educational field has attention of researchers from around the world. Governments support ICT integration due to its many advantages (e.g., Brewer, 2003; Ferrer, 2002; Osborne & Hennessy, 2001; Selinger, 2004). However, as stated above, effective ICT integration into classroom practices is yet achieved. One reason of such failure may be related to teachers’ beliefs towards ICT. Beliefs have the power to shape one’s world by guiding their behavior since beliefs are “mental constructions of experience – often condensed and integrated into schemata or concepts” (Sigel, 1985, p.352). With this respect, many researchers argued that teachers’ technology-related beliefs affect their ICT use in teaching (Angers & Machtmes, 2005; Bozionelos, 2001; Hermans, Tondeur, van Braak & Valcke, 2008; Windschitl & Sahl, 2002; Wozney, Venkatesh & Abrami, 2006). Indeed, teachers who hold more traditional beliefs are expected to implement low-level of ICT in their classroom practices, and teachers with more constructivist beliefs enrich their instruction with ICT at high level (Becker, 2001; Hermans, Tondeur, van Braak & Valcke, 2008; Judson, 2006; Niederhauser & Stoddart, 2001). Self-confidence is also considered as beliefs towards the ability to use computers and it was found to be significantly and positively related to the other computer-related beliefs (Gardner, Dukes & Discenza, 1993; Woodrow, 1994).

**PURPOSE OF THE STUDY**

In order for innovations to take place in education, teachers need to be considered as crucial players as Fullan (2001) stated. In this respect, teachers’ general attitudes towards ICTs and their willingness to integrate them into their instruction seem to be crucial as well. Thus, this study aims to investigate four critical questions:

1. At what level teachers’ knowledge of ICTs is and which ICTs they prefer to use for educational purposes?
2. What are the teachers’ attitudes towards computers and internet?
3. What is the level of teachers’ perceived self-confidence towards learning with technology?
4. What are the relationship between the dependent variables given above with the following grouping variables: grade level they were teaching, school they graduated from, teaching experience, gender, computer courses taken, daily computer use, and having a personal computer.

**METHOD**

**Sample**

In order to achieve the goal of the study, in total 157 elementary school teachers were approached randomly selected from eastern part of Turkey by the researcher in 2012-2013 school year; from this, 125 agreed to fill out the questionnaire. Reasons for not participating were due to the teachers’ work load (n = 15) and some personal reasons (n = 17). The questionnaires were distributed to the teachers who agreed to participate. Among 125 teachers, only 108 filled out the questionnaire. The rest did not return the forms. Also, eight questionnaires were not filled partially so that they were not included in the analysis, which left 100 questionnaires. The demographic data are summarized in Table 1.

Table 1. Participants’ Demographic Information

	Male		Female	
	N	%	N	%
<b>Grade they are teaching</b>				
1st Grade	15		14	
2nd Grade	14		8	
3rd Grade	15		11	
4th Grade	11		12	
<b>Teaching experience</b>				
1-10 years	19		22	
11 years and above	36		23	
<b>School they graduated</b>				
Teacher Education Program	41		33	
Others	14		12	
<b>Computer related course taken</b>				
Yes	42		36	
No	13		9	
Time spent on computers(daily)	1.74hr/day		1.56hr/day	

**Research Instrument**

The data was collected through two questionnaires. The first questionnaire was originally developed by Papanastasiou & Angeli (2008) and translated into Turkish by Tezci (2009). The first part of the questionnaire aims to collect demographic information of participants. The remaining aims to measure teachers’ knowledge of ICT (ICT-K), teachers’ use of ICT for educational purposes (ICT-U), computer attitude scale (CAS), and perceived self-confidence for teaching with technology scale (SCT). The Cronbach Alpha values for ICT-K, ICT-U, CAS, and SCT were 0.826, 0.881, 0.92, and 0.92 respectively (Tezci, 2009). For the current study they were found as 0.88, 0.82, 0.81, and 0.85, respectively.

The other questionnaire, Internet Attitude Scale (IAS) was developed by Tezci (2009) and measures internet attitudes of teachers. It consists of three factors including the opportunities of Internet, the change in education, and the effects of daily life. The reliability value of them were 0.93, 0.94, and 0.94, respectively. Cronbach Alpha values for each factor were calculated for consistency and they were found as 0.79, 0.74, and 0.83, respectively. While the ICT-K, ICT-U, CAS, IAS were five-point Likert type scales, SCT was 4-point Likert type scale. The scale ranges from strongly disagree to strongly agree.

**RESULTS**

**Analysis Strategy**

Prior to the main analyses, the correlations among five variables (teachers’ ICT knowledge (ICT-K), ICT usage (ICT-U), attitude towards computers (CAS), attitude towards internet (IAS), self-confidence level (SCT)) were examined to determine whether the variables should be tested individually or used as a composite variable. These correlations are presented in Table 2. Although variables are significantly and positively correlated with each other, the correlation between ICT-K and ICT-U is very high. In order to avoid confounding due to the inter-correlations, these two variables were not tested individually. A composite variable was created by first calculating the z-scores for each case for both scales and then calculating the mean score. This variable was used as independent variable in the analyses.

Table 2. Correlations among five variables

	ICT-U	CAS	IAS	SCT
ICT-K	.747**	.336**	.370**	.607**
ICT-U		.211*	.291**	.580**
CAS			.489**	.414**
IAS				.276**

\* p < .05, \*\* p < .01

In addition, there are other variables that were used as independent variables: school they graduated from, teaching experience, gender, computer courses taken, daily computer use, and having a personal computer. In order to test the hypotheses, regression analysis was conducted. In the following section, first, descriptive analyses results are given. Then, regression analysis results are provided.

**Descriptive Analyses**

Table 3 displays the means and standard deviations of teachers’ ICT-K, ICT-U, CAS, IAS, and SCT scores. Across 100 elementary school teachers, the mean score of their ICT knowledge on a 5-point scale is 2.15 (SD = 0.610) and their ICT usage level on a 5-point scale is 2.09 (SD = 0.531). When examined in depth, teachers seem to be more knowledgeable about the common software applications including internet, emails, word processing, painting, presentation software, and use of spreadsheets (M = 3.13, SD = 0.871). On the other hands, they have limited or no knowledge of specialized software applications including databases, concept mapping, software publishing, animations, multimedia authoring software, programming languages, modeling software, and microworlds and simulations (M = 1.51, SD = 0.651).

Table 3. Descriptive analysis results

Source	N	Mean	SD
ICT knowledge	100	2.15	0.610
ICT usage	100	2.09	0.531
Attitudes towards computers	100	3.75	0.518
Self-confidence level	100	2.65	0.589
Attitudes towards internet	96	3.64	0.402
Factor 1: Opportunities of Internet	96	3.59	0.467
Factor 2: Change in education	96	3.57	0.490
Factor 3: Effects of daily life	96	3.80	0.506

Also, according to the results, it seems that teachers’ ICT usage for teaching is low ( $M = 2.09$ ,  $SD = .53$ ). The results also show that teachers use internet, e-mail, text processing programs, painting, presentation programs, spreadsheets and educational CDs for teaching ( $M = 2.86$ ,  $SD = .706$ ) more than the other ones including concept mapping, web page designing / publishing, computer programming, and simulation programs ( $M = 1.41$ ,  $SD = .551$ ).

In addition, descriptive analysis results show that teachers’ attitudes towards computers and internet were above the mean ( $M = 3.75$ ,  $SD = .518$  and  $M = 3.64$ ,  $SD = .402$ , respectively). Teachers’ perceived self-confidence level towards learning with technology is at medium level ( $M = 2.65$ ,  $SD = .589$ ). When SCT items were checked individually, it was found that teachers feel the most confident while searching information via internet ( $M = 3.00$ ,  $SD = .700$ ) and the least confident in helping friends/students to design a website ( $M = 1.79$ ,  $SD = .812$ ).

**Effects of ICT Engagement**

For analysis purposes, linear regression analyses were performed to identify whether teachers’ ICT engagement (ICT-KU) predict their attitudes towards computers and internet and their self-confidence level. To this end, gender, school they graduated from, teaching experience, computer courses taken, daily computer use, and having a personal computer were controlled as independent variables. For each analysis, CAS, IAS, SCT variables were used separately as dependent variable. The significant results at p value of .05 are given in Table 4. Above and beyond gender, school they graduated from, teaching experience, computer courses taken, daily computer use, and having a personal computer, teachers’ engagement with ICT has positive effects on teachers attitudes towards computers and internet and their self-confidence towards teaching with technology.

Table 4. Regression analysis results

Source	Coefficient $\beta$	SE	p-value
Attitudes towards computers	0.161	0.29	0.009*
Self-confidence level	0.399	.056	0.000*
Attitudes towards internet	0.147	.049	0.003*
Factor 1: Opportunities of Internet	0.141	.056	0.014*
Factor 2: Change in education	0.128	.062	0.040*
Factor 3: Effects of daily life	0.185	0.063	0.004*

**CONCLUSION AND RECOMMENDATIONS**

The main goal of the study was to investigate teachers’ general attitudes towards technology and the relationship between teachers’ ICT engagement and their beliefs. This and similar studies are very critical because of the change in the definition of *good teaching* – that is “teaching that facilitates student learning by leveraging relevant ICT resources as meaningful pedagogical tools” (Ertmer & Ottenbreit-Leftwich, 2010, p.277). Such change in definition leads other changes in teachers’ beliefs, knowledge, and skills related to ICT. Based on the results of this study, it was found that teachers have limited knowledge of ICTs that teachers had and their low level of ICT usage in teaching. The results are similar to the other studies who examined teachers’ ICT knowledge and usage (Kozma, 2003; Tezci, 2009; Tondeur, van Braak & Valcke, 2007). Specifically, as a part of his study, Kozma (2003) investigated technologies teachers use in their classrooms. According to the results, teachers use internet (71%), e-mails (68%), software packages to create presentations (80%), and multimedia software (52%). The results of the current study were similar: teachers reported that they mainly use internet, text processing programs, e-mailing, educational CDs for teaching, and other types of software to create presentations. Although teachers use those types of ICT for educational purposes, we do not know that they are used to support, for instance, student-centered instruction or they are used for just drill and practice exercises, simulations, problem-solving activities, basic skill reinforcer, motivator, and so on. This is actually related to the teachers’ adherence to traditional transmission approaches or constructivist approaches. In further investigations, the focus of research should be extended to the relationship between teachers’ beliefs and the technology integration and this relationship’s contribution to the power of learning environment.

Rozell and Gardner (1999) and van Braak and his colleagues (2004) found that the more opportunities teachers are provided to deal with computers, the more ICT knowledge they have and the more positive attitude towards ICT. As a conclusion, with the definition change in mind, the cultures – colleges where people attend teacher education programs and places they serve as teachers – must embrace and encourage this change.

Recent research about teachers’ ICT use in classroom practices show that computer experience (Bradley & Russell, 1997; Rozell & Gardner, 1999; Tezci, 2009), gender (Hermans, Tondeur, van Braak & Valcke, 2008; Russell & Bradley, 1997; Jimoyiannis & Komis, 2007; Shapka & Ferrari, 2003; Tezci, 2009, 2010; van Braak,

Tondeur & Valcke, 2004), and age/teaching experience (Bradley & Russell, 1997; Jimoyiannis & Komis, 2007; Tezci, 2009). However, for this study, such results were not found in this study. This might be due to the limited number of teachers who participated into this study. Thus, further research is needed to investigate the existence of differences due to teaching experience, gender and computer experience and the reasons of it.

A limitation of the current study is that the data used was self-reported by participating teachers, who may have been subject to providing socially desirable responses. Other data collection methods such as classroom observations when teachers engage with technology may yield more precise data about teachers' knowledge and attitudes towards technology. Such data collection methods are much more expensive and time consuming than asking teachers to report their implementation. Self-report is a common method in many research studies; more information on the relationship between self-reports and actually practices is needed as well as further work on how teachers report. Perhaps more nuanced measures would yield more reliable results and decrease the chance of social desirability affecting the reports.

## REFERENCES

- Angeli, C., & Valanides, N. (2009). Epistemological and methodological issues for the conceptualization, development, and assessment of ICT-TPCK: Advances in technology and pedagogical content knowledge (TPCK). *Computers and Education*, 52, 154–168. doi:10.1016/j.compedu.2008.07.006
- Angers, J., & Machtmes, K. (2005). An ethnographic-case study of beliefs, context factors, and practices of teachers integrating technology. *The Qualitative Report*, 10, 771–794.
- Becker, H. J. (2001). *How are teachers using computers in instruction?* Paper presented at the Annual Meeting of the American Educational Researchers Association, Seattle, USA. <http://crito.gsm.uci.edu/tlc>
- Bozionelos, N. (2001). Computer anxiety: Relationship with computer experience and prevalence. *Computers in Human Behavior*, 17, 213–224.
- Bradley, G. & Russell, G. (1997). Teachers' computer anxiety: implications for professional development. *Education and Information Technologies*, 2, 1-14.
- Brantley-Dias, L., Kinuthia, W., Shoffner, M. B., DeCastro, C., & Rigole, N. (2007). Developing pedagogical technology integration content knowledge in preservice teachers: A case study approach. *Journal of Research on Computing in Teacher Education*, 23, 143–149.
- Brewer, C. (2003) Computers in the classroom: how information technology can improve conservation education. *Conservation Biology*, 17(3), 657-660.
- Cennamo, K. S., Ross, J. D., & Ertmer, P. A. (2010). *Technology integration for meaningful classroom use: A standards-based approach*. Belmont, CA: Wadsworth, Cengage Learning.
- Cuban, L., Kirkpatrick, H., & Peck, C. (2001). High access and low use of technologies in high school classrooms: Explaining an apparent paradox. *American Educational Research Journal*, 38, 813–834.
- Ertmer, P.A. & Ottenbreit-Leftwich, A. T. (2010). Teacher technology change: how knowledge, confidence, beliefs, and culture intersect. *Journal of Research on Technology in Education*, 42(3), 255-284.
- Fang, Z. H. (1996). A review of research on teacher beliefs and practices. *Educational Research*, 38(1), 47–65.
- Ferrer, L.M. (2002). Computer integration in science and mathematics teaching. H.S. Dhindsa, I.P.A. Cheong, C.P. Tendencia, M.A. Clements (Eds.), *Realities in science, mathematics and technical education*, Universiti Brunei Darussalam, Gadong (2002), pp. 87–93.
- Fullan, M. (2001). *The new meaning of educational change*. London: RoutledgeFalmer.
- Gardner, D. G., Dukes, R. L., & Discenza, R. (1993). Computer use, self-confidence, and attitudes: A causal analysis. *Computers in Human Behavior*, 9, 427–440.
- Hermans, R., Tondeur, J., van Braak, J. & Valcke, M. (2008). The impact of primary school teachers' educational beliefs on the classroom use of computer. *Computers & Education*, 51, 1499-1509.
- Hu, P. J.-H., Clark, T. H. K., & Ma, W. W. (2003). Examining technology acceptance by school teachers: A longitudinal study. *Information & Management*, 41, 227–241.
- International Society for Technology in Education. (2008). *National educational technology standards for teachers* (2nd ed.). Eugene, OR: Author
- Jimoyiannis, A. & Komis, V. (2007): Examining teachers' beliefs about ICT in education: implications of a teacher preparation programme, *Teacher Development: An International Journal of Teachers' Professional Development*, 11(2), 149-173.
- Judson, E. (2006). How teachers integrate technology and their beliefs about learning: Is there a connection? *Journal of Technology and Teacher Education*, 14, 581–597.
- Kagan, D. M. (1992). Implications of research on teacher belief. *Educational Psychologist*, 27(1), 65–90.
- Kane, R., Sandretto, S., & Heath, C. (2002). Telling half the story: A critical review of research on the teaching beliefs and practices of university academics. *Review of Educational Research*, 72(2), 177–228.
- Keys, P. M. (2007). A knowledge filter model for observing and facilitating change in teachers' beliefs. *Journal of Educational Change*, 8(1), 41–60.

- Kozma, R. B. (2003). Technology and classroom practices: An international study. *Journal of Research on Technology in Education*, 36, 1–14.
- Mueller, J., Wood, E., Willoughby, T., Ross, C., & Specht, J. (2008). Identifying discriminating variables between teachers who fully integrate computers and teachers with limited integration. *Computers and Education*, 51, 1523–1537.
- Niederhauser, D. S., & Stoddart, T. (2001). Teachers' instructional perspectives and use of educational software. *Teaching and Teacher Education*, 17(1), 15–31.
- Osborne, J., & Hennessy, S. (2001). *Literature review in science education and the role of ICT: Promise, problems and future directions: A report for NESTA Futurelab*. Available from <http://www.nestafuturelab.org/research/reviews/se01.htm>.
- Pajares, M. (1992). Teachers' beliefs and educational research: cleaning up a messy construct. *Review of Educational Research*, 62(3), 307–332.
- Papanastasiou, E. C., & Angeli, C. (2008). Evaluating the use of ICT in education: Psychometric properties of the survey of factors affecting teachers teaching with technology (SFA-T3). *Educational Technology & Society*, 11(1), 69–86.
- Pierson, M. E. (2001). Technology integration practice as a function of pedagogical expertise. *Journal of Research on Computing in Education*, 33, 413–429.
- Prawat, R. S. (1992). Teachers beliefs about teaching and learning. A constructivist perspective. *American Journal of Education*, 100(3), 354–395.
- Rozell, E. J., & Gardner, W. L. (1999). Computer-related success and failure: A longitudinal field study of the factors influencing computer-related performance. *Computers in Human Behavior*, 15(1), 1–10.
- Russell, G. & Bradley, G. (1997). Teachers' computer anxiety: Implications for professional development. *Education and Information Technologies*, 2, 17–30.
- Scrimshaw, P. (2004). *Enabling teachers to make successful use of ICT*. Retrieved from <http://becta.org.uk>.
- Selinger, M. (2004). Developing and using content in technology enhanced learning environments. I.P.A. Cheong, H.S. Dhindsa, I.J. Kyeleve, O. Chukwu (Eds.), *Globalisation trends in science, mathematics and technical education*, Universiti Brunei Darussalam, Gadong (2004), pp. 24–37.
- Shapka, J. D., & Ferrari, M. (2003). Computer-related attitudes and actions of teacher candidates. *Computers in Human Behavior*, 19(3), 319–334.
- Shulman, L. S. (1986). Those who understand: Knowledge growth in teaching. *Educational Researcher*, 15(2), 4–14.
- Sigel, I. E. (1985). A conceptual analysis of beliefs. In I. E. Sigel (Ed.), *Parental belief systems: The psychological consequences for children* (pp. 345–371). Hillsdale, NJ: Erlbaum.
- Smeets, E. (2005). Does ICT contribute to powerful learning environments in primary education? *Computers & Education*, 44, 343–355.
- Tezci, E. (2009). *Teachers' effect on ICT use in education: the Turkey sample*. Paper presented at the World Conference on Educational Sciences. Available at <http://www.sciencedirect.com/science/article/pii/S1877042809002316>.
- Tezci, E. (2010). Sınıf öğretmenlerinin eğitimde BIT kullanımına ilişkin özgüven düzeyleri. *E-Journal of New World Sciences Academy*, 5(3), 981–992.
- Tondeur, J., van Braak, J., & Valcke, M. (2007). Towards a typology of computer use in primary education. *Journal of Computer Assisted Learning*, 23, 197–206.
- van Braak, J., Tondeur, J., & Valcke, M. (2004). Explaining different types of computer use among primary school teachers. *European Journal of Psychology of Education*, 19(4), 407–422.
- Windschitl, M., & Sahl, K. (2002). Tracing teachers' use of technology in a laptop computer school: The interplay of teacher beliefs, social dynamics, and institutional culture. *American Educational Research Journal*, 39, 165–205.
- Woodrow, J. E. J. (1994). The development of computer-related attitudes of secondary students. *Journal of Educational Computing Research*, 11, 307–338.
- Wozney, L., Venkatesh, V. & Abrami, P.C. (2006). Implementing computer technologies; teachers' perceptions and practices. *Journal of Technology and Teacher Education*, 14(1), 173–207.