COMPUTER PERCEPTIONS OF SECONDARY SCHOOL TEACHERS AND IMPACTING DEMOGRAPHICS: A TURKISH PERSPECTIVE

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ABSTRACT
Technology use in education is largely influenced by external environmental and personal teacher factors. Adding a Turkish perspective, the purpose of the present study was to explore secondary school teachers' perceptions of computers and influencing demographics characteristics. Cross-sectional survey methodology was employed in three secondary high schools known for their educational and technological eminence. A total of 130 secondary school teachers participated. Teacher perceptions were defined to include computer attitudes, technological affinity, technological aversion, and confidence and comfort. The survey instrument measured these dimensions in four scales. General Linear Model findings illustrated effects of computer experience and training, gender, teaching field and Internet connection availability on perceptions. Ownership of personal computer appeared to be an important predictor of higher level computer experience and training, and consequently, more positive attitudes and higher confidence and comfort. Implications address pre- and in-service teacher development programs. Further research recommendations are made.
Keywords: Computer perceptions, Secondary school teachers, Computer attitudes, Technological aversion, Technological affinity, Demographics, Educational technology, Computing technology, Cross-sectional survey, Pre-service teacher education, In-service teacher development.

INTRODUCTION

Advances in technology have caused vital changes in many domains of societal and individual life. As such, technology has also influenced the way education at all levels was done. As an innovative tool, technology has played a central role in improving teaching and learning in light of educational reforms around the globe. Numerous scholars argue that integrating technology and education can enhance teaching and learning activities in ways that can support student-centered teaching with more active student involvement in the learning process (Alexander, 1999; Beal, 2000; Cajas, 2001; Cope & Ward, 2002; Edelson, 2001; Jarvela, Bonk, Lehtinen, & Lehti, 1999; Jonassen, Hernandez-Serrano, & Choi, 2000; Lancashire, 2000; Scheffler & Logan, 1999).

For educational practices to benefit from technology in an optimum way, a number of factors need to be taken into consideration. Two of these are technological infrastructure and teachers, the implementers of curricula (Erkan, 2003). Similar to Erkan's assertion, Chai and Khine (2006, as cited in Teo, Chai, Hung, & Lee, 2008) argue that teachers' technology use is influenced by factors which can be classified in two broad categories, external environmental factors and the personal teacher characteristics. Also, according to Chou (2003) the two among the several factors of limited or no use of computers and Internet are lack of knowledge and skills as well as insufficient technological equipment. On one hand, in recent years, technology and computers require lesser financial resources, thus spreading at faster rates (Çepni, Taş, & Köse, 2006; Newhouse & Rennie, 2001). On the other hand, teachers have always been the central agents in the utilization of any reform-based innovation. As Arslan (2003) underscores, a school with an adequate technological base may not succeed to provide technology supported education if teachers are not willing to do so and do not carry a positive attitude toward using technology in their teaching.

If the goal is to promote technology enhanced education, it is of primary importance to investigate what teachers perceive of technology and its use in education, what their knowledge and skills are or what skills they need to further develop. Sadık (2006) in his study in Egypt reported that the more positive teachers' attitudes were toward technology the more likely they were to integrate it in classroom. A study carried out with university chemistry professors in the U.S. suggested that pedagogical content knowledge was a stronger predictor of technology use rather than perceptions (Kahveci, Gilmer, & Southerland, 2008). Others found that beliefs about teaching influenced the way Singaporean pre-service teachers used technology in their classrooms (Teo et al., 2008).

Various studies conducted in different countries on teacher attitudes, including Turkey, revealed positive attitudes toward technology and computers (Çağıltay, Çakıroğlu, Çağıltay, & Çakıroğlu, 1998; Hong & Koh, 2002; Ng & Gunstone, 2003). A number of scholars concluded that attitudes were more strongly influenced by prior computer experiences than by gender (Badagliacco, 1990; Levin & Gordon, 1989). Hong and Koh (2002) and Sadık (2006) also established a gender relationship with positive attitudes toward computers in favor of males. Others reported that computers have not been used by teachers for professional purposes as much as for other personal interests (Toprakçı, 2005).

The excess of studies conducted on teacher characteristics including perceptions, beliefs and attitudes indicate the primacy of understanding what drives teachers to integrate technology in their teaching. In contemporary society, issues related with providing sound technology infrastructure in schools have almost faded out as the costs have become more affordable in recent years with policy makers attending to these issues more closely. The teacher factor is yet to be resolved, thus continuing to draw the attention of educational researchers, teacher educators, curriculum developers and stakeholders in promoting educational reform. Various studies conducted in various settings continue to add to the literature on technology integration by rendering perspectives on the complex issue of teacher characteristics, influential in technology use. Uncovering common patterns related with the teacher factor may enable taking joint action or simply, be inspiring and directive for those responsible from transforming education in their own contexts.

RESEARCH PURPOSE AND QUESTIONS

The purpose of the present study was to add a Turkish perspective to the international literature on integrating technology in education through exploring secondary school teachers' perceptions of computers and the relationship of these perceptions with the teachers' various demographic characteristics. This conduct was intended to elucidate what affected teacher use of technology and computers in school contexts where technology infrastructure issues are readily resolved. In this way, a finer focus on the teacher would be possible. For the purposes of this study, teacher perceptions were meant to include computer attitudes as well as technological affinity, technological aversion, and confidence and comfort levels in using computing technology for education. The specific research questions that guided this work were the following:

(1) What are secondary school teachers' perceptions of computers as measured in terms of computer attitudes, technological affinity, technological aversion, and confidence and comfort?
(2) Are there any relationships between computer attitudes, technological affinity, technological aversion, and confidence and comfort?
(3) Are there any relationships between demographic variables such as age, computer experience and training, gender, field of teaching and computer/Internet ownership?
(4) Are there any differences in perceptions based on demographic variables?

METHODOLOGY

Study Design and Context

Survey research methodology was employed to understand secondary school teachers' distribution on demographic variables and their computer perceptions. Cross-sectional survey (Fraenkel and Wallen, 2003) was conducted over four weeks. The research sites were three secondary high schools in a metropolitan area in Turkey. These schools were Anatolian High Schools (AHSs), which are public high schools in Turkey that are among the few school types most successful in terms of student achievement and graduates' entrance to college. Students are selected to AHSs by a central nationwide examination upon completion of middle school, or Grade 8. Teachers are also selected for teaching at AHSs based on criteria of having previous teaching experience of at least three years, a competitive examination and an interview. AHSs are well known for their educational and learning environment eminence. These schools are more likely to have sufficient technology resources than other, non-Anatolian public high schools with AHS teachers having unconstrained access to computers and the Internet during school time.

Instrumentation

The survey instrument comprised of Loyd and Gressard (1984)'s Computer Attitude Scale (CAS) 40-item version, and Hogarty, Lang and Kromrey (2003)'s Technological Aversion, Technological Affinity, and Confidence and Comfort scales consisting of a total of 28 items. Loyd and Gressard's (1984) scale was translated to Turkish by Berberoğlu and Çalıkoğlu (1992), validated, and the reliability tests performed. Further, the researchers found that the four dimensions in the original CAS did not appear to be distinct factors in the Turkish context. The CAS was originally designed to measure computer attitudes in four dimensions: computer anxiety/fear, liking of computers/enjoying working with computers, confidence in ability to use or learn about

computers, and usefulness of computers. Following Berberoğlu and Çalıkoğlu (1992)'s recommendations, the CAS was utilized as a one-dimension scale in the present study.

Hogarty et al. (2003)'s items were translated into Turkish by the authors and validated by back-translation. The instrument was developed to better understand how educators and students used technology in the classroom and the factors important to this utilization. General teacher attitudes were to be measured by two subscales, Technological Affinity and Technological Aversion. The Technological Aversion subscale included items such as "I feel tense when people start talking about computers." Items such as "Computers make my job easier" were included in the Technological Affinity subscale. The Confidence and Comfort subscale was characterized by items regarding confidence and comfort in efficient use of computers for teaching and increasing classroom performance. An example of items for this subscale was "I am comfortable using computers during classroom instruction."

All of the items from the four scales were rated by the study participants using five-point Likert scale, ranging from "definitely agree" to "definitely disagree." Cronbach's Alpha reliability coefficients were computed for the internal consistency of the scales and found to be ranging from .73 to .90 (Table 1), demonstrating acceptable reliability levels.

Table 1: Reliability levels of the four scales in the survey.

Scale	Number of Items	α
Computer Attitudes	40	.90
Technological Affinity	10	.77
Technological Aversion	9	.73
Confidence and Comfort	9	.87

In the survey, demographics information was also sought including years of teaching experience, field of teaching, computer experience, computer education (training in using computers), computer/Internet availability, gender and age. Response options for teaching experience and age were provided as year ranges. Field of teaching was asked as an open ended question and then coded separately for science/mathematics, social sciences (i.e., history, geography, philosophy), literacy (including Turkish and foreign language), physical education and arts/music. Computer and Internet connection ownership items required a yes/no response. The item concerning computer experience provided response categories based on experience ranging from none to integrating computers in classroom teaching. The item concerning computer training involved similar categories of computer experience in a formal training context (categories are detailed in Tables 3 and 4).

Survey Participants and Demographics

Convenience sampling (Fraenkel & Wallen, 2003) was used in the selection of participant teachers from three different AHSs, two of which were the schools where the second and third authors worked. The third school was one with which the third author was in close contact. One hundred and thirty teachers participated in the study voluntarily.

As unraveled by demographics statistics, the sample consisted of 76 female (58.5%) and 54 male (41.5%) AHS teachers. Forty five of them (34.6%) were in the science/mathematics field, 26 (or 20%) in the social sciences, 36 (or 27.7%) in literacy, four teachers in physical education and six teachers in arts/music. Mode of age range was found to be 31-35, and 46.2% of the teachers were 35 years old or younger. Only five of the teachers had teaching experience of 2-5 years with the rest having experience more than that (Table 2).

Table 2: AHS teachers' teaching experience.

Teaching Experience	*f*	*P*
2-5 years	5	3.8%
6-10 years	53	40.8
11-15 years	28	21.5
16 years and over	44	33.8
TOTAL	130	100.0%

The majority of the teachers (109, or 83.8%) had their own computer at home and 95 of them (73.1%) had an Internet connection. With regards to computer experience, more than half of the teachers (67, or 52.8%) stated regularly using application software such as word processing and spreadsheets (Table 3). With regards to formal computer training, learning to use application software received the highest percentage with fifty two teachers (or 40%) (Table 4).

Table 3: AHS teachers' computer experience.

Computer Experience	***f***	**Valid *P***
I have never used a computer and I do not plan to use one.	1	.8%
I have never used a computer but I would like to learn.	15	11.8
I use application software such as word processing and spreadsheets.	67	52.8
I use computers for teaching in the classroom occasionally.	19	15.0
I use computers for teaching in the classroom every day.	13	10.2
I use computers for teaching in the classroom every week.	12	9.4
TOTAL	127	100.0%
Missing Data = 3		

Table 4: AHS teachers' training in computer use.

Computer Training	***f***	**Valid *P***
No training.	35	27.1%
Basic computer literacy (on/off operations, how to run programs).	31	24.0
Computer applications (word processing, spreadsheets).	52	40.3
Computer integration (how to use in classroom curriculum).	11	8.5
TOTAL	129	100.0%
Missing Data = 1		

DATA ANALYSES AND FINDINGS

Likert data were scored on a five-point scale. For all of the items in the four scales of the survey, the response "strongly disagree" was scored as 1, while the response "strongly agree" was scored as 5. The range for possible scores was 1-5. An option of "not sure" response was also available which was scored as 3. The range for the midpoint 3 of "not sure" being 2.45-3.44 was assumed to be inclusive of scores of "not sure," thus, a mean score higher than 3.44 meant at least "agree." The scoring was reversed for negative statements. Higher scores on the Computer Attitudes, Technological Affinity and Confidence and Comfort scales meant more positive attitudes, higher affinity for and higher confidence and comfort in using computers, respectively. However, higher scores on the Technological Aversion scale meant higher state of technological dislike.

Prior to analyses on relationships among scale variables, normality checks were performed for each of the scales. According to the Kolmogorov-Smirnov tests performed, all four scales showed normal distribution of data (with *p*'s > .05). Thus, parametric tests could be utilized in further analyses. General Linear Model and subsequent relationship analyses were performed to understand effects of the independent variables and differences in terms of the dependent variables emerging from the perceptions instrument.

Relationships between Demographic Variables

The teachers who owned a personal computer were significantly more likely to have computer experience at higher levels ($\chi^2(6) = 16.370$, $p = .012$, $\varphi = .36$) (Table 5). Also, there was a significant relationship between computer ownership and computer training received. Computer owners appeared to have had more training on utilizing computers in education ($\chi^2(3) = 9.729$, $p = .021$, $\varphi = .28$) (Table 6). From these results, the extent to which the teachers had computer experience and received training seemed to depend on their computer ownership.

Table 5: The relationship between computer ownership and computer experience of the AHS teachers.

Computer Experience	**Own a computer?**		**TOTAL**
	No	*Yes*	
I have never used a computer and I do not plan to use one.	0	1	1
I have never used a computer but I would like to learn.	7	8	15
I use application software such as word processing and spreadsheets.	11	56	67
I use computers for teaching in the classroom occasionally.	0	13	13
I use computers for teaching in the classroom every day.	0	12	12
I use computers for teaching in the classroom every week.	2	17	19
TOTAL	20	107	127
Missing Data = 3			

Table 6: The relationship between computer ownership and computer training of the AHS teachers.

Computer Training	**Own a computer?**		**TOTAL**
	No	*Yes*	
No training.	4	31	35
Basic computer literacy (on/off operations, how to run programs).	10	21	31
Computer applications (word processing, spreadsheets).	6	46	52
Computer integration (how to use in classroom curriculum).	0	11	11
TOTAL	20	109	129
Missing Data = 1			

Computer experience and computer training also differed significantly in terms of the teachers' age. The teachers between ages 31-40 were more likely to use computers in their classrooms ($\chi^2(30) = 101.350$, $p < .005$, $\varphi = .89$). Teachers 41 and over mostly used application software and wanted to learn more about computers (Table 7). As shown in Table 8, as age increased the number of teachers having received training on using computer applications and integrating computers in their teaching, decreased ($\chi^2(15) = 27.768$, $p = .023$, $\varphi = .46$).

Table 7: AHS teachers' computer experience by age.

Computer Experience	**Age**						**TOTAL**
	18-25	**26-30**	**31-35**	**36-40**	**41-45**	**46 and over**	
I have never used a computer and I do not plan to use one.	0	0	0	0	1	0	1
I have never used a computer but I would like to learn.	0	1	3	1	2	8	15
I use application software such as word processing and spreadsheets.	1	14	19	12	13	8	67
I use computers for teaching in the classroom occasionally.	0	4	4	4	0	1	13
I use computers for teaching in the classroom every day.	0	1	2	7	1	1	12
I use computers for teaching in the classroom every week.	0	2	6	5	3	3	19
TOTAL	1	22	34	29	20	21	127
Missing Data = 3							

Table 8: AHS teachers' training in computer use by age.

Computer Training	**Age**						**TOTAL**
	18-25	**26-30**	**31-35**	**36-40**	**41-45**	**46 and over**	
No training.	0	4	7	14	4	6	35
Basic computer literacy (on/off operations, how to run programs).	2	2	7	7	6	7	31
Computer applications (word processing, spreadsheets).	0	11	19	7	9	6	52
Computer integration (how to use in classroom curriculum).	0	5	2	1	1	2	11
TOTAL	2	22	35	29	20	21	129
Missing Data = 1							

Teachers' Perceptions: Computer Attitudes, Technological Affinity, Technological Aversion, Confidence and Comfort

AHS teachers' overall attitudes toward computers and technology were found to be positive ($M = 3.69$, $SD = .43$), with 73.8% of the teachers having attitude scores above the "not sure" range (Table 9). On average, the teachers scored highest on the Technological Affinity scale ($M = 3.90$, $SD = .55$). On the Technological Aversion scale, only one teacher had a score above the "not sure" range, which meant that almost all of the

teachers did not agree with items expressing computer and technology dislike. The mean score for the Confidence and Comfort scale was found to be in the "not sure" range and less than half of the teachers agreed or strongly agreed that they were confident and comfortable in using computers. The higher standard deviation score for this scale implied higher perception variability in terms of confidence and comfort.

Table 9: AHS teachers' computer perceptions.

					Respondents with *M* > 3.44	
Scale	**Minimum**	**Maximum**	***M***	***SD***	***n***	**%**
Computer Attitudes	2.35	4.60	3.69	.43	96	73.8
Technological Affinity	2.50	4.90	3.90	.55	108	83.1
Technological Aversion	1.00	3.56	2.09	.53	1	.8
Confidence and Comfort	1.11	5.00	3.41	.73	51	39.2

Relationships between Computer Attitudes, Technological Affinity, Technological Aversion, and Confidence and Comfort

Unsurprisingly, bivariate correlation analysis based on the Pearson product-moment coefficient demonstrated that positive Computer Attitudes corresponded to higher Technological Affinity, higher Confidence and Comfort, and lower Technological Aversion scores (Table 10). Significant positive correlations were also found between Technological Affinity and Confidence and Comfort. Technological Aversion was found to significantly negatively correlate with these two scales.

Table 10: Pearson product-moment correlations among perceptions scales.

	Computer Attitudes	**Technological Aversion**	**Technological Affinity**	**Confidence and Comfort**
Computer Attitudes	1.000			
Technological Aversion	-.637(**)	1.000		
Technological Affinity	.616(**)	-.552(**)	1.000	
Confidence and Comfort	.619(**)	-.462(**)	.577(**)	1.000

** Correlation is significant at the 0.01 level (2-tailed).

Differences in Computer Attitudes, Technological Affinity, Technological Aversion, and Confidence and Comfort based on Demographics

General Linear Model analysis of data was performed to explore any significant effects of demographic characteristics on the perceptions scores. In the model, nominal independent variables were considered as fixed factors while ordinal independent variables were considered as covariates. Multivariate tests revealed significant effects of computer experience ($F(4, 82) = 3.10$, $p = .020$), computer training ($F(4, 82) = 3.91$, $p = .006$), gender ($F(4, 82) = 2.61$, $p = .049$), and field of teaching ($F(4, 82) = 1.69$, $p = .049$) on one or more of the dependent variables. Further, to understand the direction of the relationships or the differences between the means of the demographic variable categories in terms of computer perceptions, correlational and mean differences analyzes were performed.

Crosstabulation analysis for the relationship between computer experience and the four dependent variables revealed significant relationships between computer experience and Computer Attitudes ($\chi^2(360) = 420.687$, $p = .015$, $\eta = .46$), and between computer experience and Confidence and Comfort ($\chi^2(168) = 210.910$, $p = .038$, $\eta = .38$). More teachers who had computer applications experience or have used computers in their teaching had higher Computer Attitudes scores. The teachers who used computers in their teaching scored higher on the Confidence and Comfort scale compared to the teachers who did not. As compared with others, more teachers with computer applications experience scored in the "not sure" range for Confidence and Comfort signifying that in some way, being informed was paired with being cautious.

Computer training was found to be related to three dependent variables. Tukey's HSD post hoc tests revealed that the teachers who had training in using computer applications as well as in computer integration in teaching had significantly more positive Computer Attitudes than those who had basic computer literacy, $p = .009$ (for both). Also, the teachers with computer training in using computer applications had significantly higher Affinity scores than those who did not receive any training, $p = .009$. In terms of Confidence and Comfort, the teachers with training in using computer applications scored significantly higher than those with basic computer literacy, $p = .015$.

Gender had an effect on computer attitudes and confidence and comfort. According to the independent samples t-tests conducted, male teachers had significantly higher mean scores on Computer Attitudes ($t(128) = -2.122$, $p = .036$) and Confidence and Comfort ($t(128) = -2.969$, $p = .004$) than female teachers (Table 11). The female teachers' mean score on Computer Attitudes was 3.62 while that of the male teachers was 3.79. Given that both of these means were above the cut point of the "not sure" range (3.44), on average, both genders agreed with positive Computer Attitudes with male teachers appearing to be located at the more positive end of the range. The teachers' mean scores for Confidence and Comfort were 3.25 and 3.63 for females and males, respectively. According to these results, on average, female teachers appeared to be unsure of their Confidence and Comfort in using computers while male teachers agreed that they were confident and comfortable.

Table 11: AHS teachers' gender differences in Computer Attitudes and Confidence and Comfort.

	Gender	***n***	***M***	***SD***	***SEM***
Computer Attitudes	female	76	3.6247	.45	.05
	male	54	3.7860	.39	.05
Confidence and Comfort	female	76	3.2500	.69	.08
	male	54	3.6263	.74	.10

The teachers also showed significant differences in their perceptions based on their teaching fields. Although weak, crosstabulation analyses revealed significant relationships between teaching field and Technological Aversion ($\chi^2(92) = 124.155$, $p = .014$, $\eta = .13$), and between teaching field and Confidence and Comfort ($\chi^2(120) = 148.605$, $p = .039$, $\eta = .16$). These relationships were further examined within the categories of Internet connection ownership. Resulting from this analysis, the relationships between teaching field and computer perceptions appeared to be significant only for those teachers who had Internet connection (Table 12) and insignificant for those who did not. Among the respondents with Internet connection, the social sciences teachers scored lower in Computers Attitudes (usually below the "not sure" range) contrary to the teachers in the other fields. The arts/music teachers scored also lower in Technological Affinity. Also, the physical education and arts/music teachers scored slightly higher in Technological Aversion (corresponding to the "not sure range") and lower in Confidence and Comfort as compared with the rest.

Table 12: Teaching field and computer perceptions relationships for AHS teachers with Internet connection.

	χ^2	**df**	***p***	**η**
Computer Attitudes	293.293	220	.001	.26
Technological Aversion	124.862	84	.003	.24
Technological Affinity	112.698	84	.020	.12
Confidence and Comfort	166.691	108	< .005	.27

DISCUSSION

Findings of this study underline computer ownership as an important predictor of higher level computer experience and training. Computer owners were more experienced in computer use and more likely to have attended a computer training program. In addition, the teachers with higher level computer experience in teaching with technology had more positive attitudes and higher confidence and comfort. Based on these results, ownership of personal computer emerged as a key factor in improving both computer expertise and attitudes towards computers of secondary teachers. In the context of AHSs where sufficient technological infrastructure was available and the teachers had access to computers during school time, these findings highlighted the importance of personal computer ownership. Teachers at school might be busy with lesson planning or other duties which might limit their interactions with the school computers. Clearly, teachers owning computers would have more opportunities of tinkering as compared with teachers with access to computers only at school.

This study revealed that teachers with no or basic computer literacy training significantly differed from their counterparts in terms of Computer Attitudes, Affinity and Confidence and Comfort. As in other studies, training emerged as an important factor that affected teacher perceptions (Badagliacco, 1990; Levin and Gordon, 1989). Teachers having received formal computer training can be more positive about computers and more confident about their knowledge. On the other hand, teachers with no training and with knowledge acquired primarily by trial and error cannot be certain to the same degree. Thus, teachers with formal training are more likely to have higher levels of confidence and comfort in computer use.

In Turkey, it is most likely that teachers in their 40s and over had their earliest computer training in college. Informal conversations with the teachers revealed that a number of them learned basic computer programming languages in theory at college with little or no opportunities to practice, similar to the teachers in Cypriot

primary schools, who also do not have a sufficient technology training at college (Vrasidas & McIsaac, 2001). On the other hand, most likely younger teachers encounter application software such as word processing earlier than college and utilize these in preparing homework. This generation difference as well as the recent widespread availability of desktop or portable laptop computers might have led to the younger teachers' adopting computers more readily.

In general, the AHS teachers had positive computer attitudes. Their scoring the highest in Technological Affinity implied not only that they were positive about computers but also that they felt sympathy. Scoring low in Technological Aversion was consistent with the high scorings on attitudes and affinity, indicating a valid measurement. However, despite their positive attitudes most of the teachers were unsure if they were confident and comfortable in using computers for teaching. In other words, teachers carried positive attitudes towards computers, felt affinity for computers and were not averse to computers. Though, they did not seem to be sure about their confidence and comfort. Several reasons may account for this. First of all, to be confident and comfortable in computer use, previous experience is essential. Furthermore, mastering certain computer skills – in this case, computer supported teaching—would be a major factor in having confidence in computer use. Personal rather than pedagogical uses of computers might have been impediments to needed confidence and comfort. Finally, computer integration in teaching may be viewed by senior teachers as challenging their traditional authoritative role in the classroom as their students would likely be more knowledgeable about computers. Thus, they may find it uncomfortable to give up their teacher-centered methods where the teacher is the only authority and primary source of knowledge.

Findings also unravelled that having an Internet connection seemed to benefit more the teachers in the science/mathematics and literacy fields in terms of computer utilization as they scored higher in the perceptions scales in comparison with the teachers in physical education and arts/music. Because of the more practical nature of the physical education and arts/music fields these teachers might have not felt the need to utilize computers as much as the teachers in the other fields. Thus, the Internet and computers might not have been used for more than personal purposes by the physical education and arts/music teachers.

CONCLUSIONS AND IMPLICATIONS

For the particular context, ownership of personal computer appeared to be an important factor in computer experience and training and thus, in computer perceptions. Attending to these results, administrators and policy makers may plan for funding opportunities for teachers who do not have personal computers to become computer owners. For instance in the past, the Ministry of National Education in Turkey made efforts to make every teacher a computer owner by providing teachers more affordable payment options. Similarly in Israel, an essential aspect of a new model for computer integration in primary school teaching was to establish a broad computer infrastructure and provide every teacher a laptop computer (Tubin & Chen, 2002). Taken together, these and similar efforts point to the centrality of computer ownership for teachers in developing positive computer perceptions through training and experience.

Investigation of teachers' perceptions of computers is rather important in the process of shifting to student-centered education supported with computers and technology. Although the findings of the current study are not statistically generalizable, a number of factors such as computer ownership, gender and age emerged as shared patterns with international research findings. These factors were found to be also influential in the Turkish teachers' computer perceptions. Results of the current study may be used to inform policy makers, curriculum developers, teacher educators, and all stakeholders involved in the design of effective teacher preparation and in-service professional development programs. Possible recommendations for practice are summarized as follows:

- Professional development and training programs with a focus on educational computing are strongly needed for in-service teachers, as was also suggested by a number of scholars nearly a decade ago (Bybee & Loucks-Horsley, 2000; Vrasidas & McIsaac, 2001). Training programs need to be designed in different levels covering basic computer literacy skills through skills for using computers in the classroom. In agreement with Liu and Szabo (2009)'s findings with US in-service teachers, these initiatives should be well-planned and systematic.
- Teachers may be provided institutional incentives to complete the educational technology professional development programs at all levels. These incentives may include laptops, release time and services such as paid technology summer institutes (Liu & Szabo, 2009).
- Teachers over a certain age need to be encouraged in more distinctive ways to be involved in in-service computer training. Similarly, female teachers may need more attention and opportunities for computer applications practice.

- Pre-service teacher preparation programs should be designed to include teacher education on computer and technology integration in teaching. For this, as Borko, Whitcomb, and Liston (2009) argue, the major part of the work lays on the shoulders of teacher educators who are to transform teacher education via utilizing digital technologies themselves. Specific courses on teaching with technology may be developed. These courses should be informative in practice. Moreover, in these courses the teaching of a specific subject (i.e., science) with constructivist uses of technology, should be modeled (Vrasidas & McIsaac, 2001).
- Secondary curricula in all disciplines should be of encouraging nature for teachers to use computers and technology in classrooms. Also, workshops and demonstrations of technology utilization across the curriculum should be provided.
- Pre- and in-service teachers could be assisted on how to use the Internet for teaching purposes and professional development.

In specific, further research may explore on a more qualitative basis the way computer ownership affects teacher perceptions in a positive way. Relatedly, experimental studies may be conducted to understand any perception differences for computer owner teachers. Perception variability based on demographic variables such as age and gender may be investigated in advance. Teacher practices could be evaluated by using more in-depth instrumentation than self-reporting with the aim to reveal any relationships between perceptions and actual classroom implementations. Reasons behind recent technological extensive availability impacting young and senior teacher perceptions in a different way might be an additional research focus. Also, confidence and comfort issues in using computers for education require closer attention of researchers as they appear not necessarily to be tightly related with positive attitudes. Finally, perceptions of teachers specialized in subject areas such as physical education and arts/music may be an additional research area to uphold the utilization of educational technologies across pre-college curricula.

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