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Swiss and Turkish Pre-service Science Teachers' Anxiety Levels for Educational Technology

Hulya Aslan Efe[1], Rifat Efe[2]

[1]Dicle University, Ziya Gokalp Education Faculty, Department of Primary Science Education, Diyarbakır, Turkey

[2]Dicle University, Ziya Gokalp Education Faculty, Department of Biology Education, Diyarbakır, Turkey

Correspondence: Hulya Aslan Efe, Dicle University, Ziya Gokalp Education Faculty, Department of Primary Science Education, 21280, Diyarbakır, Turkey.

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Abstract

This study aims to culturally explain pre-service science teachers' instructional technology-related anxiety levels by analyzing the variables of their instructional technology using experiences, frequency of using instructional technologies, access to instructional technologies, instructional technology-related attitude and their instructional technology-related self-efficacy perceptions. The participants were 538 pre-service teachers studying at the Dicle University Ziya Gokalp Education Faculty and 188 pre-service teachers studying at the University of Teacher Education during the 2011-2012 academic year. The findings indicate that the higher the degree of Turkish and Swiss pre-service science teachers' technology experience, the higher instructional technology-related anxiety levels they have. Furthermore, the frequency of Turkish pre-service science teachers' technology use is in reverse ratio to their instructional technology-related anxiety level. However, the frequency of Swiss pre-service science teachers' technology use was found to be in direct ratio to their instructional technology-related anxiety levels.

Keywords: cross-cultural comparison, anxiety, educational technology

1. Introduction

In Turkey, as in the rest of the world, education systems are affected by the technological developments. Technology is an area that comprises various social and economic activities and organizations that require the application of technical knowledge to life practices. Technology can be described as the application of scientific principles and innovations to solve problems in order to make life easier. At the same time, it changes the relationships among subject fields and disciplines and leads to an exponential growth of knowledge (Middlehurst, 1999; Williams & Kingham, 2003). Societies aim to equip individuals with this increasing knowledge through high-quality education systems by utilizing technology (MEB, 2004). As such, in today's world, education and the use of technology in education have become two inseparable concepts (McCannon & Crews, 2000; Komis, Ergazakia & Zogzaa, 2007) because technology is the key for accessing, using, producing, and sharing knowledge (Halis, 2002). With this increasing awareness, technology offers innovative ways to learners to facilitate their learning (Sarıtaş & Üner, 2013). From a constructivist perspective, many researchers agree that learners gain personal knowledge, have opportunities for rich learning experiences and change these experiences through instructional technologies (Buzzard, Crittenden, Crittenden, & McCarty, 2011, Garris, Ahlers & Driskell, 2002). The research findings obtained over the past 20 years offer some evidence that instructional technologies used in classroom environments have a positive contribution to learning (Mumtaz, 2000). Despite positive contributions made by instructional technologies to the classroom environment, the actual use of advanced technology products as teaching tools in the classroom environment is surprisingly rare (Ertmer, 2005). In spite of all the positive research findings, the technology investments at schools and technology-based education programs, adoption of such instructional technologies at schools by teachers is progressing at a disappointingly slow rate (Yıldırım, Koçak & Kirazcı 2001; Seferoğlu, Akbıyık & Bulut, 2008). According to Ertmer (2005), many teachers still use computers for low-level tasks such as searching for information on the Internet, or word-ordering. The studies in Turkey support this conclusion as well. For instance, Demiraslan and Koçak-Usluel (2005) found that, while most teachers can use a computer, they do not conduct any activities to integrate the IT technologies into the process of teaching and learning. Findings from many studies demonstrate that a majority of teachers use computer only for low-level tasks like "Word

processor", "www", "e-mail" and few use it for instruction purposes such as "Calculation Tables", "Education Software CDs", and "databases" (Akkoyunlu, 2002; Aşkar & Koçak-Usluel, 2003; Demiraslan & Koçak-Usluel, 2005). Technology-enhanced classrooms require teachers who are actively able to use technology. However, the number of teachers who can integrate instructional technologies into their classroom teaching is quite low (Kozma, 2003). This is because by its nature, technology can be intimidating, confusing and disappointing for both teachers and students (King, 2002), and thus there are some factors preventing classroom utilization of instructional technologies by teachers while they acknowledge its benefits (Beak, Jung & Kim, 2008). According to Pelgrum (2001), teachers' failure at using instructional technologies may be caused by their inadequate cognitive, affective and psychomotor skills. Also, in the case of inability to use technology or feeling incompetent about using it turns it into a nuisance rather than a facilitator, which underscores the importance of teachers' instructional technology-related anxiety level. An individual's prejudices against or fears of using instructional technology or thinking about the results of using instructional technology are called technology anxiety (Marcoulides, 1989). Technology Anxiety is related to users' fears or fearful experiences they have acquired during the technology courses they have attended or such fears that arise when they think about using technology (Chua, Chen & Wong, 1999). Differing from other negative stimuli, technology anxiety involves some potential negative emotional fears and reactions like appearing stupid or feeling the urge to vandalize instructional technologies (Kanfer & Heggestad, 1997). Technology anxiety also has a negative impact on individuals' technology use and technology-related task performances (Doyle, Stamouli & Huggard, 2005). As such, it was reported in the relevant literature that technology anxiety negatively affects individuals' technology use and that teachers with technology anxiety hesitate to integrate technology into their educational environments (Ceyhan, 2006). It is known that one of the factors affecting instructional technology-related anxiety level is instructional technology-related attitude (Mc Ilroy, Bunting, Tierney, & Gordon, 2001, Coffin & Mackintyre 2000). Instructional technology-related negative and positive attitudes play a determinant role in anxiety (Blignaut, Mc Donald & Tolmie, 2002). Jawahar and Elango (2001) found that a high computer anxiety led to negative attitudes toward computers. Positive experiences in technology use, on the other hand, leads to highly positive attitudes towards technology (Chau, 2001; Zhao, Tan & Mishra, 2001; Huang & Liaw, 2005; Khine, 2001; Kumar & Kumar, 2003). Attitude toward technology is defined by Smith, Caputi and Rawstorne (2000) as an individual's general assessment of technology or their feeling of sympathy or antipathy for technology. In order for the technology use at schools to reach the desired level, and for it to be used effectively, first and foremost the attitudes of teachers and students toward technology need to be known. Attitude toward technology is one of the most crucial factors determining the use of technology (Altun, 2002). Another factor that plays a role in technology-related anxiety level is perception of technological self-efficacy. Technology-related anxiety and perception of technological self-efficacy are highly related and interactive concepts (Kutluca & Ekici, 2010). Technological self-efficacy is an individual's judgment about his/her own skills in using technology in various areas (Compeau & Higgins, 1995). Studies on the perception of technological self-efficacy show that individuals with high level of technological self-efficacy perception are more motivated to get involved in technological activities and they enjoy such activities (Seferoğlu, 2005). The individuals with high technological self-efficacy are found to more easily overcome any problem that they encounter while using technology (Usluel & Seferoğlu, 2003). As such, the individuals with high degree of technology self-efficacy belief were found to be more eager to participate in activities involving the use of technology, to have a higher expectation from such work, and to more easily cope with the technological problems they come across (Salanova, Grau, Cifre & Llorens, 2000; Hasan, 2003).

1.1 Cross-cultural Perspective

It is notable that intercultural studies usually compare eastern and western cultures. Such studies state that in the collectivist eastern countries like Turkey, groups rather than individuals are more important and humbleness instead of pride is adopted. Western countries like Switzerland are described as individualist. In individualist cultures, values of an individual are of higher importance than group values, and pride comes before humbleness (Bond, 1986; Wang & Leichtman, 2000). This cultural difference has an impact on many studies conducted in social sciences. Rosen and Weil (1995) stress that related to its own culture, each country has a unique computer anxiety model. Harris, Kemmerling and North (2002) found that participants displayed significant differences between computer anxiety levels and personal computer use by cultural variable. Blignaut, Mc Donald and Tolmie (2002) studied university students' computer-related task attitudes, computer anxieties and visual spatial skills. Their findings revealed the African and European students had similar attitudes toward computer use. The students' attitudes indicated a positive change after their computer using experiences. Computer-related anxieties of African students who had taken computer training were significantly higher than those of the European students.

1.2 The Present Study

Given the increasing importance of using instructional technologies in education, as the future teachers to provide instructional technologies in their classrooms and to create the appropriate environment and opportunities for their

students, pre-service science teachers' anxiety about using instructional technologies is becoming more and more important. While in the classroom use of instructional technologies in almost all the subjects is viewed as important and its more extensive application is encouraged, there is a higher number of studies conducted on the use of instructional technologies in science subjects due to the better suitability of their course contents for such instruction. The intercultural research focuses mostly on anxiety, attitude and self-efficacy regarding the computer as an instructional technology Marcoulides & Wang, 1990; Brosnan & Lee, 1998; Durnell, Haag & Laithwaite, 2000; Tekinaslan, 2008). In their study carried out with 2456 university students from 10 countries, Rosen and Weil (1995) found cultural difference to have an impact on computer anxiety. Furthermore, their findings indicate that there are many technophobic students in many different countries. Ursavaş, McIlroy and Şahin (2011) studied Turkish and British university students' computer anxiety level and concluded that computer-related anxiety level differs culturally. These studies demonstrate that the concept of anxiety has a unique model for each culture and technology anxiety has a substantial negative effect on technology use. Thus, it is important to determine the factors that affect pre-service science teachers' instructional technology-related anxiety status. Hence, the aim of the present study is to culturally explain the instructional technology-related anxiety based on the variables of technology experience, frequency of technology use, availability of access, perceived instructional technology-related self-efficacy, and instructional technology-related attitude.

2. Methodology of Research

2.1 Participants

Participants from Turkey included 538 (M: 181, F: 357) pre-service science teachers in a science teacher education course at Dicle University, Ziya Gokalp Education Faculty in the 2011-2012 academic year.

The Swiss participants included 188 (M: 37, F: 151) pre-service science teachers in teacher education at St. Gallen Teacher Education University in the 2011-2012 academic year.

2.2 Data Collection Methods

Pre-service science teachers' anxiety towards educational technology was measured through the "State Anxiety Scale" developed by Spielberger (1983). The scale consists of 20-Likert type items. The Kaiser-Meyer-Olkin (KMO) value was .917, and the Bartlett's Test of Sphericity value was 4,635 (DF: 190, $p<0.000$). The single factor accounted for 42,664 % of the variance. The reliability of the questionnaire was measured through Cronbach's alpha, which was .930 for the entire scale.

The data for pre-service science teachers' self-efficacy regarding educational technology were collected through the "Self-Efficacy Perception for Technology Scale", which included 18 Likert-type items developed by Aşkar and Umay (2001). The factor analysis of the scale demonstrated that the KMO value was .791, and the Bartlett's Test of Sphericity value was 8,091 (DF: 153, $p<0.000$). The reliability of the questionnaire was measured through Cronbach's alpha, which was .710 for the entire scale.

The data for attitudes were collected using the "Pre-Service Science Teachers' Attitude towards Educational Technology Scale" developed by Efe (2011). The five-point Likert scale invited pre-service science teachers to respond to the items with "never", "very rare", "sometimes", "often", "always" or "none", "very little", "little", "high", or "very high", according to the nature of the item. The scale included four dimensions that consisted of 48 Likert-type items. The four dimensions on the scale were *pre-service teachers' technology background, pre-service teachers' intention to use educational technology in their teaching, pre-service teachers' intention to provide opportunities for their students to use technology in the classroom,* and *the value of educational technology for learning science.* The factor analysis of the scale for the present study revealed that the Kaiser-Meyer-Olkin (KMO) value was .895, and the Bartlett's Test of Sphericity value was 2,963 (DF: 3655, $p<0.000$).) The four factors of the scale accounted for 25.26%, 11.1%, 5.76%, and 4.84% of the variance of the data, for a total of 46.96%. The reliability of the questionnaire was measured through Cronbach's alpha, which was .915 for the entire scale. Cronbach's alphas were .902, .863, .837, and .874 for the first, second, third, and fourth variables, respectively.

2.3 Data Analyze

After the data collection, multiple linear regression analysis was used to find out to what degree the variables of technology experience, frequency of technology use, availability of access, instructional technology-related self-efficacy, and instructional technology-related attitude predict instructional technology-related anxiety. Before this analysis, the hypotheses of the multiple linear regression analysis were tested. The normality and linearity hypotheses of the multiple linear regression analysis were found to be satisfied. The tolerance, VIF and Durbin-Watson values were within acceptable range.

3. Findings

The regression analysis results regarding how the variables of Turkish pre-service science teachers' technology experience, frequency of technology use, availability of access, instructional technology-related self-efficacy perception, instructional technology-related background, attitude toward having students use instructional technologies in the future, attitude toward using instructional technologies in classroom in the future, and contribution of instructional technologies to learning science predict instructional technology-related anxiety are presented in Table 1.

Table 1. Multiple Regression Analysis Results Regarding the Prediction of Turkish Pre-service Science Teachers' Anxiety towards Educational Technology

Dependent Variable	Predictors	B	Std. Error	β	t	p	Zero order	Partial
Anxiety Towards Educational Technology	Constant	1.749	.217		8.052	.000		
	Technology experience	.152	.030	.229	5.036	.000	.396	.214
	Technology usage frequency	-.004	.016	-.012	-.264	.792	-.274	-.011
	Availability of technology access	-.049	.027	-.088	-1.791	.074	-.342	-.078
	Self-Efficacy towards educational technology	-.037	.040	-.035	-.921	.357	-.108	-.040
	Technology background	.199	.026	.312	7.646	.000	.444	.315
	Attitudes to provide opportunities for their students to use technology in the classroom	.058	.028	.107	2.057	.040	.184	.089
	Attitudes to use educational technology in their teaching	.022	.028	.038	.777	.438	.200	.034
	The value of educational technology for learning science.	.007	.031	.009	.211	.833	.012	.009
	R=.542 R^2 = .294 F=27.478 p= .000							

When the bivariate and partial correlations between the predictor variables and dependent variables were analyzed, a positive and average level (r=.40) correlation was found between Turkish pre-service science teachers' instructional technology-related anxiety levels and their technology experience, but when the other variables were controlled, the correlation between these two variables was calculated as r=.21. However, there was a negative and low level (r=-.27) correlation between the frequency of technology use and instructional technology-related anxiety. However, when the other variables were controlled, this correlation was determined to be r=-.01. Similarly, a negative and low level (r=-.34) bivariate correlation was found between Turkish pre-service science teachers' technology access opportunity scores and their instructional technology-related anxiety levels. A low level negative correlation (r=-.10) was found between Turkish pre-service science teachers' instructional technology-related self-efficacy perceptions and their instructional technology-related anxiety levels. When the bivariate and partial correlations between the instructional technology background available to Turkish pre-service science teachers and their instructional technology-related anxiety levels were analyzed, a positive correlation with average significance (r=.44) was found between technological background and instructional technology-related anxiety; however, when other variables were controlled, the correlation between both variables was calculated to be (r=.31). Of the instructional technology-related attitude sub dimensions, the correlation between attitude toward having students use instructional technologies in the future and instructional technology-related anxiety was found to be positive at low level (r=.18). Further, a positive low-level ((r=.20) correlation was found between attitude toward future classroom use of instructional technologies and instructional technology-related anxiety levels. In a similar vein, a low-level (r=.01) positive correlation was identified between the attitude toward contribution of instructional technologies to learning science and instructional technology-related anxiety. Technology experience, frequency of technology use, availability of access, instructional technology-related self-efficacy perception, instructional technology-related attitude variables yield a moderately significant correlation with Turkish pre-service science teachers' instructional technology-related anxiety scores (R=.54, R^2=.29, p<.01). These eight variables together explain 29% of the total variance in the instructional technology-related anxiety level. According to the standardized regression coefficients (β), predictor variables' order of relative significance regarding instructional technology-related anxiety is: technological background, technology experience, attitude toward having students use instructional technologies in the future, availability of access to technology, attitude toward future classroom use of instructional technologies, instructional technology-related self-efficacy perception, frequency of technology use, and attitude toward the contribution of instructional technologies to learning science. The t–test results regarding regression coefficients' significance reveal that, technology experience, technological background and attitude toward having students use instructional technologies in the future variables are significant predictors of instructional technology-related anxiety levels.

As for the Swiss pre-service teachers, the regression analysis results regarding the predictivity of instructional technology-related anxiety according to the variables of technology experience, frequency of technology use, availability of access, instructional technology-related self-efficacy perception, instructional technology-related background, attitude toward having students use instructional technologies in the future, attitude toward future classroom use of instructional technologies, and attitude toward the contribution of instructional technologies to learning science are presented in Table 2.

Table 2. Multiple Regression Analysis Results Regarding the Prediction of Swiss Pre-service Science Teachers' Anxiety Towards Educational Technology

Dependent Variable	Predictors	B	Std. Error	β	t	p	Zero order	Partial
Anxiety Towards Educational Technology	Constant	.973	.509		1.913	.057		
	Technology experience	.121	.056	.160	2.169	.031	.285	.160
	Technology usage frequency	.054	.033	.133	1.628	.105	.347	.121
	Availability of technology access	.006	.043	.010	.128	.898	.249	.010
	Self-Efficacy towards educational technology	.170	.085	.123	1.993	.048	.115	.147
	Technology background	.190	.069	.180	2.767	.006	.293	.203
	Intention to provide opportunities for their students to use technology in the classroom	-.050	.052	-.078	-.973	.332	-.067	-.073
	Intention to use educational technology in their teaching	.198	.065	.242	3.051	.003	.215	.222
	The value of educational technology for learning science.	-.222	.047	-.315	-4.681	.000	-.366	-.330
	R=.577 R^2 = .333							
	F=11.188 p= .000							

The analysis of the bivariate and partial correlations between the predictor variables and dependent variable indicated that there was a low-level positive correlation (r=.28) between instructional technology-related anxiety level and technology experience, but when other variables were controlled, the correlation between the two variables was calculated as r=.16. Similarly, the correlation between frequency of technology use and instructional technology-related anxiety level is positive and low (r=.35). However, when other variables were controlled, this correlation was found to be r=.12. A positive and low-level bivariate correlation (r=-.25) was calculated between Swiss science pre-service teachers' availability of technology access scores and their instructional technology-related anxiety levels. When the bivariate correlation between Swiss pre-service science teachers' instructional technology-related self-efficacy perceptions and their instructional technology-related anxiety levels was analyzed, a low-level positive correlation (r=.11) was found. On the other hand, when the bivariate and partial correlations between Swiss pre-service science teachers' instructional technology-related backgrounds and instructional technology-related anxieties were analyzed, a positive correlation with low-level significance (r=.29) was found, however, when other variables were controlled, the correlation between the two variables was calculated as r=.20. On the other hand, the correlation between attitude toward having students use instructional technologies in the future and instructional technology-related anxiety was found to be negative and low (r=-.07). A positive low level (r=.21) correlation was found between attitude toward the future classroom use of instructional technologies and instructional technology-related anxiety. Also, a negative and low level (r=-.36) correlation was identified between attitude toward the contribution of instructional technologies to learning science and instructional technology-related anxiety. The variables of technology experience, frequency of technology use, availability of access, instructional technology-related self-efficacy and instructional technology-related attitude yield a moderately significant correlation with pre-service science teachers' instructional technology-related anxiety scores (R=.58, R^2=.33, p<.01). These aforementioned eight variables together explain 33% of the total variance in instructional technology-related anxiety.

According to the standardized regression coefficients (β), predictor variables' relative order of significance regarding instructional technology-related anxiety is as follows: attitude toward the contribution of instructional technologies to learning science, attitude toward using instructional technologies in the future, instructional technology-related background, technology experience, frequency of technology use, instructional technology-related self-efficacy perception, attitude toward having students use instructional technologies in the future and availability of technology access. The analysis of the t-test results regarding the significance of regression coefficients reveal that, the variables of technology experience, instructional technology-related self-efficacy perception, instructional technology-related technological background, attitude toward the future classroom use of instructional technologies, and attitude toward the contribution of instructional technologies to learning science are significant predictors of instructional technology-related anxiety.

4. Discussion

It was also found that as the Turkish and Swiss pre-service science teachers' technology experiences increase, so do their instructional technology-related anxiety levels. Some studies in the literature support the findings of the present study (Bozionelus, 2004, Fagan, Neill & Wooldridge, 2004, Gardner, Discenza & Dukes, 1993). However, Mahar, Henderson and Deane (1997) found a positively significant correlation between computer anxiety and computer experience. This can be said to stem from the constantly changing and advancing nature of technology. According to Chua, Chen and Wong (1999) technology activities temporarily reduce the computer-related anxiety level. Safford and Worthington (1999) state that as the skill level increases so does anxiety. Brosnan and Lee (1998) analyzed the relationship between computer anxiety and computer attitude of British and Chinese students. They found that the British participants had significantly higher computer experience than the Chinese. Furthermore, Chinese participants were found to have lower computer anxiety than the British participants. In their study focusing on computer-related anxiety levels of university students from different cultural backgrounds, Rosen and Weil (1995) found that Israel and Singapore were the countries where university students had low computer experience and low technology-related anxieties, the United States and Australia had students with high computer experiences and low technology-related anxieties, Japan had students with high computer experiences and high technology-related anxieties, while Saudi Arabia, Thailand, Kenya, Egypt, Greece and Italy had the students with low computer-related experiences and high technology-related anxieties. According to the results of the present study, as Turkish pre-service science teachers' frequency of technology use rises, their instructional technology-related anxiety level drops. However, as Swiss pre-service science teachers' frequency of technology use increases, their instructional technology-related anxiety levels do as well. While Brosnan and Lee's (1998) intercultural study found a negative relationship between British students' computer using frequency and their computer anxiety levels, it found a positive relationship between Chinese students' computer using frequency and their computer anxiety levels. Namlu and Ceyhan (2002) also concluded that a rise in computer using frequency lowers computer-related anxiety. Wilfong (2006) found a strong negative correlation between university students' computer anxiety and frequency of computer use. Bozionelos (2004) found a strong inverse correlation between computer anxiety and frequency of computer use. Our results show that, as Turkish pre-service science teachers' technology access increases, their instructional technology-related anxiety level drops. However, Swiss pre-service science teachers' availability of technology access parallels their instructional technology-related anxiety levels. Some studies in the literature report that students who have their own personal computers have low computer anxiety (Korobili, Togia & Malliari, 2010, Arıkan, 2002, Colley et al., 1994). Tekinarslan (2008) concluded that German students had significantly lower computer anxiety than Turkish students and suggested that this was due to the fact that every German student had their own personal computer. Similarly, Ersoy and Kabakçı (2010) found that pre-service teachers' computer anxiety levels differ significantly depending on computer ownership, favoring computer owners. According to the results of the present study, for Turkish pre-service science teachers, higher perceptions of instructional technology-related self-efficacy means lower instructional technology-related anxiety levels. However, as Swiss pre-service science teachers' instructional technology-related self-efficacy perceptions increase, so do their instructional technology-related anxiety levels. While the relevant literature has some studies that report a negative correlation between technology anxiety and perception of technological self-efficacy (Pamuk & Peker, 2009), some other studies report a positive correlation between these two variables (Saade & Kira, 2009). An inverse relationship between German students' computer self-efficacy perceptions and their computer anxiety levels was also cited in the literature (Beckers & Schmind, 2001). Wilfong (2006) suggested that so as to reduce users' anxiety levels, computer self-efficacy perceptions need to improve. However, Sam, Othman and Nordin (2005) point to the positive correlation between computer anxiety and computer self-efficacy perception. Tuncer (2012) identified a positive correlation between computer anxiety and computer self-efficacy perception as well. Li and Kirkup (2007) found that British students enjoy using computers more than Chinese students, but, Chinese students have less self-confidence than the British students in advanced computer skills. Another finding from the current study is that the richer Turkish and Swiss pre-service science teachers' instructional technology-related backgrounds are, the higher their instructional technology-related anxiety levels become. Also, there is a parallel rise in instructional technology-related anxiety levels as Turkish pre-service science teachers' attitude toward having students use instructional technologies in the future gets more positive. However, the more positive Swiss pre-service science teachers' attitude toward having students use instructional technologies in the future are, the lower their instructional technology-related anxiety levels are. The more positive Turkish and Swiss pre-service science teachers' attitude toward future classroom use of instructional technologies are, the higher their instructional technology-related anxiety levels. The more positive Turkish pre-service science teachers' attitude toward the contribution of instructional technologies to learning, the higher their instructional technology-related anxiety levels become, while the more positive Swiss pre-service science teachers' attitude is toward the contribution of instructional technologies to learning, the lower are their instructional technology-related anxiety levels. In their study where they analyzed the relationship between computer anxiety and computer attitude from an

intercultural perspective, Brosnan and Lee (1998) found a significantly inverted correlation between British students' computer-related anxiety levels and their computer attitudes. However, a positive correlation was found between Chinese students' computer anxiety levels and their computer attitudes. Agbatogun (2010) found a positive correlation between Nigerian teachers' attitude toward instructional technology and their computer anxieties. Çataklı (2007) found that there was a negatively significant relationship between high school students' attitude and anxiety levels. Aiming to find out the computer anxiety levels and computer-related attitudes of students studying at Thessaloniki University Instructional Technologies Institute and Information Systems department, Korobili, Togia and Malliari (2010) found a strong negative relationship between computer anxiety and computer attitude. This present study found that Turkish pre-service science teachers' technology experiences, technological backgrounds, and attitudes toward having their students use instructional technologies in the future are significant predictors of their instructional technology-related anxiety levels. Swiss pre-service science teachers' technology experiences, instructional technology-related self-efficacy perceptions, instructional technology-related technological backgrounds, attitude toward the future classroom use of instructional technologies, and attitude toward the contribution of instructional technologies to learning science are significant predictors of instructional technology-related anxiety. The variables of technology experience, frequency of technology use, availability of access, instructional technology-related self-efficacy, and the instructional technology-related background, intention of having students use instructional technologies in the future, intention of future classroom use of them and contribution of instructional technologies to science learning as the instructional technology-related attitude sub dimensions together yield a moderately significant correlation with Turkish and Swiss pre-service science teachers' instructional technology-related anxiety scores. Furthermore, all together these eight variables explain 29% of the total variance in the Turkish pre-service science teachers' instructional technology-related anxiety level, and explain 33% of the total variance in the Swiss pre-service science teachers' instructional technology-related anxiety level. Many studies in the literature underline that individuals' technology-related anxiety is affected by cultural differences, attitudes toward technology and self-efficacy perceptions (Ayersman & Reed, 1995; Ertmer et al., 1994; Pamuk & Peker, 2009, Agbatogun, 2010). Jawahar and Elango (2001) state that high anxiety about using technology leads to negative attitudes. Technology-related negative and positive attitudes have a crucial role in shaping technology anxiety (Blignaut, Mc Donald & Tolmie, 2002). Instructional technology-related positive attitudes, high instructional technology-related self-efficacy perceptions and low anxiety levels are important facilitative factors in learning instructional technology skills in the process of integrating instructional technologies into higher education (Sam, Othman & Nordin, 2005). Sproull, Zubrow and Kiesler (1986) found that some university students experience loss of control and get frustrated in the face of technology. Similarly, DeLoughry (1993) found that a third of the 14 million university students in the USA suffer from 'techno-phobia'. It is important for teacher candidates to view themselves as self-efficacious to overcome their instructional technology-related anxieties because pre-service teachers' instructional technology-related anxieties negatively affect their technology use and performance (Webster and Martocchio 1992).

5. Conclusion and Suggestions

This current study reveals that as Turkish and Swiss pre-service science teachers' technology experiences increase, so do their instructional technology-related anxiety levels. The more frequent Turkish pre-service science teachers' technology use is, the lower is their level of instructional technology-related anxiety. On the other hand, it was also found that higher rates of Swiss pre-service science teachers' frequency of technology use correspond to higher instructional technology-related anxiety levels. As Turkish pre-service science teachers' access to technology improves, their instructional technology-related anxiety drops. However, as the Swiss pre-service science teachers' access to technology gets better, their instructional technology-related anxiety levels also go up. The more positive Turkish pre-service science teachers' instructional technology-related self-efficacy perceptions are, the lower are their instructional technology-related anxiety levels. On the other hand, the higher Swiss pre-service science teachers' instructional technology-related self-efficacy perceptions are, the higher their instructional technology-related anxiety levels. Another finding from the current study is that Turkish and Swiss pre-service science teachers with richer instructional technology backgrounds have lower instructional technology-related anxiety levels. The more positive Turkish pre-service science teachers' attitude toward having students use instructional technologies in the future is, the higher their instructional technology-related anxiety levels are. However, the more positive Swiss pre-service science teachers' attitude toward having students use instructional technologies in the future is, the lower their instructional technology-related anxiety levels drop. Furthermore, the more positive Turkish and Swiss pre-service science teachers' attitude toward the future classroom use of instructional technologies, the higher their instructional technology-related anxiety levels become. The more positive Turkish pre-service science teachers' attitude toward the contribution of instructional technologies to learning science, the higher their instructional technology-related anxiety levels become, whereas the more positive Swiss pre-service science teachers' attitude toward the contribution of instructional technologies to learning science is, the lower their instructional technology-related anxiety levels become.

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