

The Relationship between Perceived Preparedness for Computer Use and Other Psychological Constructs Among Kindergarten Teachers With and Without Computer Experience in Greece

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Abstract

This study examined Greek kindergarten teachers' (n=396) perceived preparedness for computer use in the preschool classes and the potential difference between computer-experienced and non-experienced group of teachers. Attention was given to the relationship between perceived preparedness and a number of other psychological constructs that the relevant research literature has revealed as significant factors, namely: internal locus of control, perceived stress, attitudes toward computers, perceived usefulness and ease of use, and computer anxiety. The data analyses confirmed the hypotheses concerning the differences between the two groups of teachers with regard to their sense of preparedness as well as among the variables intercorrelations. In addition, based on regression analyses, different patterns of predicting variables were revealed for each of the two groups.

Keywords: Stress, attitudes, usefulness, ease of use, anxiety.

Introduction

As one moves toward the future, the interaction with computers seems to become a daily routine. Likewise, information and communication technologies (ICT) are nowadays characterized by their variety in forms as well as in their innovative uses throughout the educational levels and contexts all over the world (e.g. Angeli, 2004; Kankaanranta & Kangassalo, 2003; Sheridan & Samuelsson, 2003).

ICT have been embedded within a broader framework of education reforms in the international arena (Pelgrum & Anderson, 1999) that reflect the necessity for computer awareness even from the preschool period. Despite concerns and objections about computers' use in the preschool level (Cordes & Miller, 2000), the majority of the empirical studies have indicated the positive effects of technology on children's developmental outcomes in cognitive, social, and emotional domains (Clements & Sarama, 2003; Haugland, 2000; Haugland & Wright, 1997; Ntoliopoulou, 1999; Tsitouridou & Vryzas, 2001; Wang & Ching, 2003), although these results are linked with developmentally appropriate activities that take place within a reasonable time and context for computer usage conditions.

In Greece, following the international trends and rapid changes with regard to the educational technological innovations, a new national curriculum for primary and pre-primary educational levels was launched recently (Pedagogical Institute, 2003; Dafermou et al. 2006) with particular emphasis on the creative learning environments as well as the introduction and use of computer applications in class. With regard to preschool education in particular, the aim of the ICT integration in kindergarten and elementary school is to familiarize the students with the basic computer functions.

However, despite these changes, the implementation of ICT in the broader Hellenic society still remains at low levels based on national level statistical indicators (Eurobarometer, 2007). Similarly, the introduction of information technology into the country's schools is still in the early stages and the computer has not yet been fully incorporated into the culture of the school (Tsitouridou & Vryzas, 2001).

Teachers are the critical agents for successful computer integration in kindergarten classes (Collis et al., 1996) with particular reference to their knowledge, familiarity, attitudes and confidence towards computers (e.g., Lawton & Gerschner, 1982; Violato et al., 1989; Woodrow, 1992), among a number of additional key factors. In Greece, only a small number of studies concerning pre-primary education teachers' perceptions/views and attitudes for the introduction of computer technology in education have been carried out (Gritsi et al., 2001; Zaranis & Oikonomidis, 2006; Kyridis et al., 2003). In a recent research Tsitouridou and Vryzas (2004) studied the views of early childhood teachers on the prospect of computer use being integrated into education at the kindergarten level. They found that teachers appear to be favorably disposed, to a greater or lesser degree, while some voiced certain reservations. It was also revealed that the views of the teachers are shaped by their knowledge and experience of computers and by the in-service training in computer use that they have received. Although the figures were more positive than almost a decade earlier (Pange, 1997), it nevertheless seems that there is still some resistance of the in-service kindergarten teachers which may be related to a variety of socio-demographic (age, gender, computer knowledge, duration of use, level of training etc.) and psychological factors (motives, interest, attitudes to the computer, self-confidence, self-efficacy expectations, computer anxiety etc.).

Indeed, research studies have revealed that early childhood teachers lack computer competence and interest (Landerholm, 1995). This may reflect societal-based gender differences in which women are less likely to use and enjoy computers than men (Shashaani, 1994; Teague, 2002) and middle-aged adults to demonstrate less positive computer attitudes than young and elderly individuals (Dyck & Smither, 1994; Necessary & Parish, 1996). With regard to the psychological variables, computer attitudes and anxiety seems to play a critical role in the manner and the extent of computer use by early childhood educators and they may be interrelated with a number of other social and psychological constructs (e.g., Levine & Donitsa-Schmidt, 1998). This observation has led to the development of key-theories with regard to the predictors of behavior in relation to ICT, such as the theory of reasoned action (TRA) (Ajzen & Fishbein, 1977, 1980). How ready, however, do the kindergarten teachers feel they are to implement the computer technologies in the preschool class?

Since beliefs are one significant component in the relevant explanatory theories concerning the acceptance and, in a final analysis, the intention to use the “object”, i.e. computer technology in the class (Ajzen & Fishbein, 1977), it is assumed herewith that the perceived sense of preparedness and readiness to be informed could be an additional variable that may be interrelated with other key psychological factors that have been revealed in the up-to-date research literature. Hence, in this study attention was given to the level of perceived preparedness of Greek kindergarten teachers to integrate computers in their work with young children and the potential interrelations with a number of psychological predictors such as locus of control, stress and anxiety, and perceived usefulness and ease of computer use.

The importance of this research attempt is based on the fact that it was carried out (a) in a period that public discussion was taking place about the compulsory one year preschool education (this was a law of the state one year later) and (b) two years after the implementation of the new curriculum. Finally, it is among the few studies that involve a large number of in-service kindergarten teachers from almost all over the country.

Methodology

Instrumentation

For the purposes of this study a number of measures were used:

(a) *Perceived preparedness and readiness to be informed scale*: The measure was devised for this particular study. The answers to this 7-items instrument were recorded on a 5-point rating scale (“1=none at all” to “5=very much”). The factor analysis confirmed the theoretical construct and the analysis of internal consistency was considered adequate (Cronbach $\alpha = .85$). A higher total score reflects higher levels of the representing construct.

(b) *Internal Control Index (ICI)*: The scale was devised by Patricia Duttweiler (1984) and was chosen as a measure of the locus of control construct (a personality trait that influences human behavior across a wide range of situations related to learning and achievement) because it was designed to measure specifically control by oneself (i.e., internal) and not control by others or fate (external). It consists of 28 items which were scored on a 5-point Likert scale from 1=“rarely” to 5= “usually”. Following the scoring directions of the author, a final total score was extracted ranging from 28 to 140 with higher scores reflecting higher internal locus of control. The coefficient of internal reliability Cronbach alpha was at a sufficient level ($\alpha = .76$).

(c) *Perceived Stress Scale (PSS)*: The PSS (Cohen et al., 1983) is a widely used psychological instrument for measuring the perception of stress. It is a measure of the degree to which situations in one’s life are appraised as stressful. The 10 items of the scale are designed to tap into how unpredictable, uncontrollable, and overloaded respondents find their lives as well as respondent’s current levels of experienced stress. The sum of scores (5-point rating scale ranging from 0=never to 4=very often) across all scale items indicates the level of perceived stress. Cronbach alpha was $\alpha = .84$.

(d) *Attitudes Toward Computer Instrument (ATCI)*: It is one of the various scales that have been developed for measuring teachers' attitudes towards computers with particular emphasis on the resistance of individuals to use information systems (Shaft & Sharfman, 1997, 2001). The instrument, which consists of 8 semantic-differential style items using a 7-point scale, is broad-based and applicable to a variety of settings and has been tested and retested through various studies. The instrument was found to be both valid and reliable. Higher total score indicates more positive attitudes towards computers. The coefficient of internal reliability Cronbach alpha was at a sufficient level ($\alpha = .78$).

(e) *Perceived Usefulness (PU)* and *Perceived Ease of Use (PEU)* questionnaires – modified version (Wiedenbeck & Davis, 1997): Davis (1989) developed the scales based on the technology acceptance model (TAM) that focuses on an individual's acceptance of a particular information system. The theoretical model builds upon Ajzen and Fishbein's (1977) theory of reasoned action (TRA). According to this, "an individual's perceived usefulness and perceived ease of use of a particular information system influences their attitude toward using that system, which affects their intention to use the system and, in turn, their actual use of the information system" (Shaft et al., 2004). Each scale consists of 4 items that are scored on a 5-point Likert-type scale (1=strongly disagree to 5=strongly agree). Higher total scores indicate higher perceived computer "usefulness" and "ease of use." Cronbach alpha for perceived usefulness was $\alpha = .88$ and for perceived ease of use was $\alpha = .90$.

(f) *Computer Anxiety Scale-Revised (CAS-R)* (Bandalos & Benson, 1990): The measurement was used as a "generalized" anxiety to computers scale. The 23 items of the scale are based on the well-known synonymous Loyd and Gressard's (1984) instrument. The authors' factor analysis extracted three anxiety components, namely: computer liking, computer confidence, and computer achievement. For this study only the total summative score was employed with higher values to indicate lower generalized anxiety levels, which according to Ropp (1997), represents a positive position towards computers. The instrument was found to be valid and reliable (Bandalos & Benson, 1990; Gos, 1996; Kay, 1992; Rosen & Weil, 1995). Cronbach alpha was extremely high ($\alpha = .95$).

All these scales, together with a socio-demographic and computer experience relevant questions part, consisted of a battery of instruments in a questionnaire form that was sent to kindergarten teachers by mail and was collected analogously.

Participants

The study was based on the answers of 396 female kindergarten teachers from 26 prefectures of the Greek territory that were participating in a larger scale empirical study. Their mean age was 40.1 years ($sd = 7.8$). With regard to their first degree, 64.5% of them were graduates of the older form of kindergarten teachers academies (a two-year graduate circle with two additional years of higher education during their service), and 35.5% were university department graduates.

Hypotheses

With regard to the psychological construct of interest in this study (i.e., perceived sense of preparedness) a statistically significant difference was expected between kindergarten teachers that have had even minimum experience of computer use in comparison to those with no experience at all. Also, based on research literature as well as in relevant explanatory theoretical schemes, a series of strong inter-correlations between “perceived preparedness” and a number of selected psychological aspects were expected both in a bi-variant mode and in a regression analysis scheme/model. The final regression models were expected to be different for the two groups of teachers according to their level of knowledge of computer use.

Results

One important finding was the fact that 100 kindergarten teachers reported that they had never used a computer and 21% of them reported that it seems to be “difficult” to learn to use computers. From those who had computer use experience, even at a minimum level, the mean age of first-time computer use was 33.3 years. 61% had computers at home. The level of computer knowledge/competence was assessed through a composite score from the answers on a 5-point scale (“0 = no experience” to “4 = very good experience”) for 9 types of applications (theoretical range 0-36). The mean score was 9.4 (sd = 7.7), which is considered rather low and reflect rather “amateur” users.

With regard to the perceived preparedness and readiness to be informed measure, the mean score was 20.2 (range: 2-35, sd= 6.04) and statistically significant differences were found between the two groups of kindergarten teachers based on their computer experience. The computer experienced group of kindergarten teachers perceived themselves to be significantly more prepared than the no-experienced group (22.02 vs. 14.96, $t = 11.7$, $p < .001$), confirming the relevant hypothesis. With regard to the psychological constructs selected for this study, the descriptive indicators are presented in Table 1.

Table 1. Means and standard deviations of the psychological constructs related to computer use from kindergarten teachers

Measures	range	Mean	SD
Internal Control Index (ICI)	53-136	102.2	12.46
Perceived Stress Scale (PSS)	0-36	15.6	6.19
Attitudes Toward Computer Instrument (ATCI)	3-56	38.6	9.69
Perceived Usefulness (PU)	3-25	17.5	4.62
Perceived Ease of Use (PEU)	2-20	14.2	3.46
Computer Anxiety Scale-Revised (CAS-R)	4-115	75.4	20.04

In the present study it seems that participants were rather action-oriented considering the relatively high scores on the ICI measure. The scores of the teachers in the perceived stress scale presented a normal distribution, similar to the computer anxiety measurement (CAS-R). The ATCI total scores reflected a rather positive orientation towards computers. The same favorable position towards computers was revealed in the perceived usefulness and ease to use scale.

As expected, significant correlations were found between perceived preparedness scores and the selected psychological variables pertaining to the use of ITC in preschool classes. In all but one case of the bivariate correlations, the coefficient was statistically significant. The low correlation coefficient between PU and PEU reflect that the two constructs are independent of each other. All these intercorrelations are presented in Table 2.

Table 2. Correlation matrix between perceived preparedness and selected psychological constructs

	Perceived preparedness	ICI	PSS	ATCI	PU	PEU
Internal Control Index (ICI)	.22**					
Perceived Stress Scale (PSS)	-.17**	-.27**				
Attitudes Toward Computer Instrument (ATCI)	.40**	.28**	-.15**			
Perceived Usefulness (PU)	.48**	.20**	-.02	.40**		
Perceived Ease of Use (PEU)	.59**	.24**	-.19**	.48**	.52**	
Computer Anxiety Scale-Revised (CAS-R)	.66**	.26**	-.18**	.52*	.54**	.75**

** $p < .001$

In a final step, two multiple regression analyses with the stepwise method were performed, one for each group of teachers with regard to their computer experience (experienced, non-experienced). In these analyses, the perceived preparedness score was the dependent variable and the independent variables were the six psychological variables that were selected for this particular study and had been shown to be significantly related with the dependent variable when compared individually (see Table 2). These separate analyses were performed in order to explore possible differences between the two groups in the final regression patterns.

As shown in Table 3a, the multiple regression analysis indicates that in the computer experienced group of teachers, perceived preparedness score was predicted by the computer anxiety and perceived stress scale. The predictors remaining in the model accounted for 39.7% of the variability observed in the dependent variable. On the hand, in the no computer use experience group of teachers (N = 100), higher perceived preparedness was associated with

higher values of perceived usefulness and ease of computer use measurements. The variables in the final model explained 29.6% of the variance of the dependent variable (Table 3b).

Table 3. Multiple regression analyses for the predictors of perceived preparedness for computer use in kindergarten class

a. Computer use experience group of kindergarten teachers

<i>Predicting variables</i>	<i>B</i>	<i>Beta</i>	<i>T</i>	<i>t sig.</i>
Computer Anxiety Scale-Revised (CAS-R)	.20	.61	12.54	< .001
Perceived Stress Scale (PSS)	-.08	-.10	-2.08	.038

Adjusted R²= .397, $F_{(2,263)}= 87.48, p<.001$

b. No computer use experience group of kindergarten teachers

<i>Predicting variables</i>	<i>B</i>	<i>Beta</i>	<i>T</i>	<i>t sig.</i>
Perceived Usefulness (PU)	.58	.40	3.92	< .001
Perceived Ease of Use (PEU)	.25	.26	2.57	.012

Adjusted R²= .296, $F_{(2,85)}= 18.88, p<.001$

Discussion

Based on a hypothesis that “perceived preparedness” on the teachers’ part for computer use in the preschool classroom may contribute positively for an effective integration in the classroom, we attempted to explore the level of their perception in this domain and its relation with a number of psychologically relevant variables.

First of all, it was revealed that in the prospective of ICT integration in the preschool classes following the new curriculum, there is still a significant proportion of kindergarten teachers that have no experience with computer use either in general or for educational purposes in particular. This is considered an important finding, although similar figures were found in other studies carried out in the Greek context (Gritsi et al., 2000; Tsitouridou & Vryzas, 2004).

With regard to the “perceived preparedness,” the participants seem to be close to the middle point of the relevant scale that was devised for this particular study. However, although this seems to represent a normal distribution pattern for the sample of participants as a total, when we look at the two groups of teachers, a significant difference between those who are ignorant of computer use and those who have at least a minimum level of computer use experience is revealed. More specifically, the non-experienced group of teachers perceived themselves as unprepared/non-ready for this development. This is partly in agreement with other studies that have concluded that the degree of teachers’ knowledge of computers has a positive influence on their attitudes towards the technology (Lillard, 1985). In another Greek study (Tsitouridou & Vryzas, 2004), a similar group of teachers in terms of their computer experience regarded the introduction of computers into early childhood education as a matter of secondary importance and expressed serious reservations about the prospect of computers being integrated into the kindergarten classroom. A potential impact of such sense of unpreparedness on the part of the teachers may lead to the reasonable assumption that these teachers will not be in a position or will “resist” a successful integration of computers in their program (see also Hignite & Echternacht, 1992; Woodrow, 1992).

As expected, teachers’ perceptions of their preparedness to use computers in a preschool class were associated with other psychological parameters, namely internal locus of control, perceived stress, attitudes toward computers, perceived usefulness and ease of use, and computer anxiety. These variables, however, produce different regression solutions for each of the two groups of teachers in the study according to their computer experience. For the teachers with computer use experience, anxiety and stress constructs have joint effects on the way teachers perceive their level of preparedness. In other words, lower levels of generalized anxiety towards computers and lower perceived stress are related with higher scores of perceived preparedness for computer integration in the preschool program by the kindergarten teachers. For the non-experienced group, the level of perceived preparedness is predicted by two other variables, i.e. usefulness and ease of use, which may reflect logically-driven rather than emotionally-driven variables. This finding is partly contrary to another Greek study (Tsitouridou & Vryzas, 2004) where it was found that “those early childhood teachers that appeared enthusiastic at the prospect of integrating computers into the kindergarten classroom invoke the pedagogical usefulness and social benefits of ICT for the children and the vocational development of the teachers” (p. 39).

The evidence provided from this study confirm those of earlier empirical attempts undertaken both in Greece and elsewhere and –additionally- highlights some more aspects of the interrelationships among the psychological variables that are involved on the part of the teaching staff for a successful integration of computer and ICT in the preschool programs in Greece.

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