

Early Childhood Teachers' Attitudes towards Computer and Information Technology: The Case of Greece

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The purpose of this research was to investigate the attitudes of early childhood teachers towards computers and Information Technology (IT). The study examined whether or not attitudes are differentiated by a series of factors, such as: years of previous service, the use of a computer at home (with Internet access), inservice training, and experience of teachers with computers, as well as their views about the introduction of computers into early childhood education. The subjects of the survey were 107 inservice female early childhood teachers, taking part in a two-year programme of inservice training at the Department of Early Childhood Education of the Aristotle University of Thessaloniki, Greece. The results show that early childhood educators have limited access and positive but temperate attitudes to the world of computers. Teachers' attitudes appear to be influenced significantly by computer use at home, experience with computers and inservice training.

The new technologies have so far not achieved any dramatic penetration of Greek society, but their rate of penetration is now gathering pace. According to figures published in the *Eurobarometer* in 1999, only 5% of Greek households had a computer, while in 2000 15% of households had Internet access.

The dissemination of the new technologies in the Greek educational system is likewise limited in scale. Information science is taught as a subject in its own right in Greek secondary schools, but the introduction of computers

into primary schools is still in its very early stages. Moreover, there is no broad and systematic training of teachers in the new technologies.

It should be pointed out, however, that, in the context of the initiative e-Europe, curricula are undergoing reform and the introduction of computers to all schools is now being planned, as well as the provision of Internet access. Finally, plans are under way for a broad programme of training for teachers at all levels.

The introduction of Information and Communication Technology (ICT) to Greek schools is based on the assumption that computers have a significant role to play in the teaching process and that their use can lead to the advancement of education. The rapid infusion of technology means that from a young age the child can learn about—and from—the new technologies in his everyday life (Clements & Nastazi, 1993). Children are attracted by computers, feel at ease with them, and are knowledgeable about them (Turkle, 1984). Today's children are the computer generation (Papert, 1996). Technology can play an important role in the teaching and learning of young children (Haugland & Wright, 1997). Computers offer new opportunities for learning and the acquisition of new skills. Nevertheless, reservations are expressed about possible adverse effects, such as an addiction to computer games (Durkin, 1995) and the loss of those skills associated with the use of traditional technologies (Downes, 1999).

The use of ICT in teaching is a challenge to early childhood teachers (Myhre, 1998). In every case the incorporation of computers into early childhood teaching has to be properly adapted to the age of the children and take full account of their interests and developmental needs. The educational computer software used must meet a series of criteria, which ensure that it plays an appropriate role in the children's development (Haugland, 1992).

The important thing is that the early childhood teacher should be suitably prepared to integrate the new technologies into the kindergarten environment in such a way that they will respond to the developmental needs of the young child. Whether or not the computer will enrich the young children's learning environment depends on the knowledge, skills, and attitudes of their teachers (Haugland & Wright, 1997).

Teachers are the primary agents of educational innovation. They are one of the key factors in adopting, integrating, and using information technology in the school (Nash & Moroz, 1997). The teachers' attitudes are closely interconnected with the effective use of ICT in the classroom, since they influence the children's experience of computers in the school environment (Simonson, 1995).

The teachers' attitudes lie behind the patterns of behaviour manifested towards the use of computers. So the important issue is to identify

and understand the attitudes of the teachers so the education and training programmes can tackle these attitudes before they have a chance to become problematic.

If the teachers are to encourage the children to make creative use of computers, they themselves must have a positive attitude. Therefore, those factors associated with the attitudes of the teachers and the question of how education can influence and improve those attitudes, have now quite clearly become issues of critical importance (Yildirim, 2000).

The purpose of the research was to investigate the attitudes of early childhood teachers towards computers and information technology (IT). Within this overall perspective we have examined whether attitudes are differentiated by a series of factors, such as: (a) years of previous service, (b) the use of a computer at home—with Internet access, (c) inservice training, and (d) the experience of teachers with computers, as well as their beliefs about the introduction of computers into early childhood education.

REVIEW OF THE LITERATURE

Research focused on teachers' attitudes to computers and the factors which affected those attitudes (Savenye, 1993). Teachers' attitudes play an important role in the effective use of technology. They affect the teachers' level of confidence in computers (Delcourt & Kinzie, 1993), as well as their personal use and adoption of computers for use in class (Hignite & Echternacht, 1992).

If teachers view computers unfavourably or with suspicion, the educational use of computers will be limited. To gain the support of the teaching staff, which Winner (1983) concluded is a necessary condition for the success of innovative programmes, the teachers' priorities must be taken into account. The teachers are those who come in contact with the children on a day-to-day basis, and who are most aware of the needs of their students where computers are concerned. The teachers' attitudes will determine the final success or failure of every initiative to introduce computers into the classroom (Woodrow, 1991).

Resistance to the use of computers springs from insufficient knowledge of computers and from a more general fear of computers and technology (Harrington, McElroy & Morrow, 1990). Technological changes sometimes provoke adverse emotional responses, such as anxiety. Computer anxiety is defined as the fear and apprehension an individual may feel towards computers, their use, and effects (Leso & Peck, 1992; Loyd & Gressard, 1984; Marcoulides, 1989).

Teachers who are afflicted by computer anxiety tend to develop negative attitudes to computers and express opposition to their use (Corston & Colman, 1996; Hohmann, 1994). While computers can be highly effective tools for teaching and learning, resistance and anxiety will have adverse effects on learning and on computer use. Negative emotional reactions to computers affect the extent to which they can be used effectively (Marcoulides, 1989).

Research also examined those factors which influence the attitudes of teachers to computers and IT—factors which include the number of years of previous service and the age of the teachers, their use of a computer at home, their inservice training, previous experience and willingness to use computers in their classrooms. The length of a teacher's teaching experience and his/her age appear to have little impact on his/her attitude toward computers (Smith, 1985).

Teachers with Internet access at home demonstrate more positive attitudes to computers, feel a greater need for computers in their lives and have more incentives to use them (Yaghi, 1997). Their attitudes are related to computer usage outside work environment (Galowich, 1999). Since the 1970s there has been a growing body of literature on the subject of teachers' attitudes toward computers, which shows that teacher education programmes could play a vital role in making teachers less anxious and more confident about the use of computers (Pina & Harris, 1993). Teachers who have had computer training are more likely to show positive attitudes toward computer use in the classroom (Burke, 1986).

Teachers' attitudes (anxiety, confidence, and liking) significantly improved after the computer literacy course (Yildirim, 2000). Thus education can help teachers to feel less anxiety and more confidence, and generally value computers more highly (Savenye, 1993).

A positive attitude towards computers is associated with greater computer experience. The relation between attitudes and computer experience appears to be strong and positive (Dupagne & Krendl, 1992; Potosky & Bobko, 2001). Computer experience was found to be significantly related with reduced computer anxiety (Necessary & Parish, 1996). Teachers with previous computer skills tend to show lower levels of anxiety than other teachers (Okebukola, Sumampouw, & Jegede, 1992).

Research has shown that as experience rises, anxiety declines (Reed & Overbaugh, 1993). Teachers' attitudes toward computers are related to their experience levels. Thus little or no experience of computers is associated with more anxiety, while previous computer experience is associated with less anxiety (Necessary & Parish, 1996).

A reciprocal relationship between computer attitude and computer experience is probable (Potosky & Bobko, 2001). Of course, what plays a decisive role in determining attitudes to the computer is the quality rather

than the quantity of the previous experience (Rosen & Weil, 1995). Computer use is no longer a monolithic and singular construct. Indeed, it is multidimensional and there are different relationships between categories of use and attitudes towards computers (Mitra, 1998).

Teachers who feel secure in their personal use of computers will also feel positive about using computers in school. Teachers who use or own a computer are more likely to exhibit favourable attitudes toward computer use in the classroom. The more willing teachers are to use computers in the classroom, the more favorable their attitudes are toward computers. Teachers who are more familiar with computers are more confident about using them for instruction and report more positive attitudes about the instructional effectiveness of computers (Dupagne & Krendl, 1992).

Many teachers experience a feeling of anxiety when they confront the prospect of using computers in the curriculum (Woodrow, 1991). Negative attitudes (lack of confidence) and the teachers' lack of skills with computers constitute a serious obstacle to the introduction of computers into the classroom. The less anxious teachers are about computers, the more likely they are to implement computers in the curriculum (Dupagne & Krendl, 1992).

SURVEY DESIGN

Sample

The subjects of the survey were 107 inservice female early childhood teachers. They were taking part in a two-year programme of inservice training at the Department of Early Childhood Education of the Aristotle University of Thessaloniki, Greece. The research was carried out during the academic year 2000-2001.

The programme included a 40-hour course in "Computers in education," dealing with aspects of the support the new technologies can offer the teacher, and their incorporation into early childhood education. It also covered the use of educational software in kindergarten class activities.

Survey Instrument

The instrument used to carry out the survey was a questionnaire consisting of three components, (a) exploring the characteristics of the teachers, (b) their beliefs about the introduction of computers into preschool education, and (c) their attitudes toward computers and IT.

1. Characteristics of teachers. These included:
 - years of previous service;
 - use of computers and access to Internet at home;
 - attending the “Computers in education” course in the further education programme;
 - experience with computers.

With regard to experience with computers, the teachers were classified in four categories according to the experience with computers they claimed to have. This classification was based on the assessment sheet “Technology Inservice Needs Assessment 1996-97” (Christensen, 1998):

- *category 1*: “I haven’t a clue about computers” (ignorance);
 - *category 2*: “I just know how to turn it on and off, sometimes I play a game, paint or write something” (rudimentary experience);
 - *category 3*: “I just know the fundamental things about operating a certain programme, like word processing and some other things, like how to save and load files” (limited experience);
 - *category 4*: “I know more than the above about how certain programmes work, I can use a modem, scanner, I can access Internet sources” (extensive experience).
2. Teacher’s beliefs concerning the introduction of computers into early childhood education. The teachers were invited to answer the questions:
 - whether they believe that the introduction of computers into early childhood education is a matter of urgent priority, if it is of secondary importance, or if it is unnecessary;
 - if the idea of using computers in their own class in the immediate future is one about which they feel enthusiastic, or whether they have reservations or actually have negative feelings towards the idea.
 3. Teachers’ Attitudes Toward Computers and Information Technology. The measurement of attitudes was based on the questionnaire Teachers’ Attitudes Toward IT, TAT 3.2a of the Texas Centre for Educational Technology (TCET) (Knezek & Christensen) (<http://www.tcet.unt.edu>). This questionnaire is a Likert-type instrument for measuring teachers’ attitudes towards Computer and Information Technology and consists of combined short form Teachers’ Attitudes Towards Computers (TAC) and TAT questionnaires.

The instrument adopted by the current study measures teacher attitudes towards computers and Information Technology on 5 subscales. These subscales are as follows: *enthusiasm/enjoyment, anxiety, avoidance, impact on society, and productivity*. Each subscale contains a specific number of issues, whose total number for all five factors amounts to 69. The teachers were invited to state their own perceptions of the extent to which they agree or disagree with each item (1 – strongly disagree, 2 – disagree, 3 – undecided, 4 – agree, 5 – strongly agree). Table 1 presents the specific number of issues corresponding to each of the five subscales. The issues for each subscale are listed at the end of the article.

Table 1
Subscales for Measuring Attitudes Toward Computers
and Information Technology

Subscales		No of items	Reliability
1	Enthusiasm/Enjoyment	15	$r=0.96$
2	Lack of Anxiety	15	$r=0.96$
3	Acceptance	13	$r=0.90$
4	Impact on Society	11	$r=0.85$
5	Productivity	15	$r=0.96$

Source: Christensen, R. and Knezek, G. (1998). Parallel Forms for Measuring Teacher's Attitudes Toward Computers. *Proceedings of SITE 98*. Charlottesville, VA: Association for the Advancement of Computing in Education, p. 831-832.

Processing of Data

To explore the differentiation in teachers' attitudes toward computers and IT in relation to their characteristics and beliefs concerning the introduction of computers into early childhood education, the One-Way Analysis of Variance (ANOVA) was employed.

Once it was determined that differences exist among the means, the one-way ANOVA Post Hoc Test "Least Significant Difference" (LSD) was used to perform all pairwise comparisons between group means to determine which means differ. Finally, it should be noted that some items of the attitude subscales that had negative wording were reversed before adding to the related items in order to produce the various subscales scores.

RESULTS

Characteristics of Teachers

- 46.7% of the teachers had from 1 to 10 years previous service and 53.3% had from 11 to 20 years;
- 18.7% of the sample used a computer at home, with Internet access, while 15.9% used a computer but did not have Internet access, and, finally, 65.4% did not use a computer at home;
- 51.4% of the teachers attended the course “Computers in education” as part of the above further training programme, while 48.6% had not yet attended the course; and
- 24.3% of the teachers claimed to have no knowledge of computers, 43% stated that they had some rudimentary experience, 30.8% claimed limited experience, and just 1.9% claimed to have extensive experience.

Computer experience is significantly affected by the use of a computer at home ($p=0.000$) and by attending the relevant course ($p=0.000$).

Teachers' Beliefs Concerning the Introduction of Computers into Preschool Education

- 40.2% of the teachers believed that the introduction of computers into early childhood education is a matter of urgent priority, 51.4% believed that it is a matter of only secondary importance, while 8.4% did not believe that it is necessary at all; and
- 43.9% of the teachers stated that they were enthusiastic about the idea of computers soon being introduced into their own class, while 52.3% claimed to have reservations and 3.7% actually had negative feelings towards the idea.

The teachers' beliefs about computer use in their own classroom are affected by whether or not they had attended the relevant course in the further training programme ($p=0.05$). More specifically, of those teachers who claimed to be enthusiastic about the use of computers in their classrooms, 63.8% had attended the course. Furthermore, the majority of those who had attended the course (54.5%) were enthusiastic, while the majority of those who had not attended the course (61.5%) had reservations.

Teachers' Attitudes Toward Computer and Information Technology

A first presentation of the results, as offered in Table 2, shows that *acceptance* is the subscale with the largest mean, followed by *productivity*, *enthusiasm*, *anxiety*, and finally, *impact on society*. As far as standard deviation is concerned, *impact on society* and *anxiety* showed the largest standard deviation, while *acceptance* and *productivity* showed the slightest deviation.

Table 2
Mean Values and Standard Deviation of the Five Subscales

Subscales	Mean	Std. Deviation	Min.	Max.
Enthusiasm/Enjoyment	3.816	0.562	1.67	5.00
Lack of Anxiety	3.492	0.569	2.00	4.67
Acceptance	3.979	0.491	2.31	5.00
Impact on Society	3.092	0.591	1.64	4.45
Productivity	3.931	0.514	2.27	5.00

1. In relation to the characteristics of the teachers:

Teachers' years of previous service. Table 3 shows that the attitudes of the teachers do not show significant differentiation according to their years of previous service.

Table 3
Comparisons Among Teacher Group Means According to Their Years of Previous Service

Subscales	Previous Service	N	Mean	Std. Deviation	F	Sign.
Enthusiasm/Enjoyment	1-10 years	50	3.8200	0.5868	0.003	0.957
	11-20 years	57	3.8140	0.5459		
Lack of Anxiety	1-10 years	50	3.4933	0.5429	0.000	0.993
	11-20 years	57	3.4924	0.5957		
Acceptance	1-10 years	50	3.9400	0.4776	0.615	0.435
	11-20 years	57	4.0148	0.5056		
Impact on Society	1-10 years	50	2.9764	0.5796	3.724	0.056
	11-20 years	57	3.1946	0.5870		
Productivity	1-10 years	50	3.8800	0.4899	0.940	0.335
	11-20 years	57	3.9766	0.5349		

Computer use at home. Table 4 shows significant differences regarding the subscale *avoidance*. Thus differences emerge between those who use a computer at home and those who do not. Furthermore, more significant differences are to be seen in the subscale *avoidance* between those who use a computer at home with access to the Internet and those who do not use a computer at home (Table 5).

Table 4

Comparisons Among Teacher Group Means According to Their Use of Home Computer and Internet Access

Subscales	Use of home computer	N	Mean	Std. Deviation	F	Sign.
Enthusiasm/ Enjoyment	computer/Internet	20	3.9300	0.5143	1.218	0.300
	computer	17	3.9373	0.4469		
	no use	70	3.7552	0.5968		
Lack of Anxiety	computer/Internet	20	3.6900	0.6436	2.132	0.124
	computer	17	3.5843	0.5640		
	no use	70	3.4143	0.5385		
Acceptance	computer/Internet	20	4.1731	0.4594	4.030	0.021
	computer	17	4.1448	0.4590		
	no use	70	3.8846	0.4877		
Impact on Society	computer/Internet	20	3.2227	0.6908	1.895	0.156
	computer	17	3.2674	0.6591		
	no use	70	3.0130	0.5344		
Productivity	computer/Internet	20	4.1133	0.5523	1.766	0.176
	computer	17	3.9608	0.4510		
	no use	70	3.8724	0.5116		

Table 5

Multiple Comparisons Among Teacher Group Means According to Their Use of Home Computer and Internet Access on the Subscale Acceptance

Acceptance		Mean Difference	Sign.
I	J	I-J	
computer/Internet	computer	2.828E-02	0.858
	no use	0.2885	0.019
computer	computer/Internet	-2.8281E-02	0.858
	no use	0.2602	0.047
no use	computer/Internet	-0.2885	0.019
	computer	-0.2602	0.047

Attending the relevant course. Whether or not they have attended the “Computers in education” course leads to a differentiation in the teachers’ attitudes in the subscales *impact on society* and *anxiety* (Table 6). Thus the teachers who attended the course experienced less anxiety and felt that Information Technology had a more positive impact on society.

Table 6
Comparisons Among Teacher Group Means According to Their Training

Subscales	Training	N	Mean	Std. Deviation	F	Sign.
Enthusiasm/ Enjoyment	No	52	3.7897	0.6094	0.233	0.631
	Yes	55	3.8424	0.5192		
Lack of Anxiety	No	52	3.3615	0.6143	5.621	0.020
	Yes	55	3.6170	0.4968		
Acceptance	No	52	3.9453	0.4696	0.498	0.482
	Yes	55	4.0126	0.5141		
Impact on Society	No	52	2.8776	0.5487	15.177	0.000
	Yes	55	3.2959	0.5610		
Productivity	No	52	3.9551	0.5330	0.213	0.646
	Yes	55	3.9091	0.4998		

Experience of computers. In Table 7 significant differences can be seen between the four groups of teachers, formed by their experience with computers, in the subscales *anxiety* and *avoidance*. The differentiation in the subscale *anxiety* is more significant.

The pairwise comparisons between group means showed that the teachers who claimed to know nothing about computers differed significantly from those who claimed to have rudimentary or limited knowledge both in the subscale *anxiety* and in the subscale *avoidance*, as can be seen in Tables 8 and 9 respectively.

Table 7
Comparisons Among Teacher Group Means According to
Their Computer Experience

Subscales	Computer experience	N	Mean	Std. Deviation	F	Sign.
Enthusiasm/ Enjoyment	ignorance	26	3.7718	0.6254	0.348	0.790
	rudimentary	46	3.8812	0.4663		
	limited	33	3.7636	0.6360		
	extensive	2	3.8000	0.8485		
Lack of Anxiety	ignorance	26	3.2077	0.6180	3.890	0.011
	rudimentary	46	3.5116	0.4805		
	limited	33	3.6646	0.5714		
	extensive	2	3.9333	0.6600		
Acceptance	ignorance	26	3.7663	0.5336	2.554	0.059
	rudimentary	46	4.0067	0.4402		
	limited	33	4.1096	0.4914		
	extensive	2	4.0000	0.5439		
Impact on Society	ignorance	26	2.8881	0.4968	1.597	0.195
	rudimentary	46	3.1146	0.5261		
	limited	33	3.2121	0.7106		
	extensive	2	3.2727	0.7714		
Productivity	ignorance	26	3.9282	0.6174	0.073	0.974
	rudimentary	46	3.9319	0.3924		
	limited	33	3.9434	0.5738		
	extensive	2	3.7667	0.9899		

Table 8
Multiple Comparisons Among Teacher Group Means According to Their
Computer Experience on Subscale Lack of Anxiety

Lack of anxiety		Mean Difference	Sign.
I	J	I-J	
ignorance	rudimentary	-0.3039	0.026
	limited	-0.4570	0.002
	extensive	-0.7256	0.074
rudimentary	ignorance	0.3039	0.026
	limited	-0.1531	0.223
	extensive	-0.4217	0.288
limited	ignorance	0.4570	0.002
	rudimentary	0.1531	0.223
	extensive	-0.2687	0.502
extensive	ignorance	0.7256	0.074
	rudimentary	0.4217	0.288
	limited	0.2687	0.502

Table 9
Multiple Comparisons Among Teacher Group Means According to Their Computer Experience on Subscale Acceptance

Acceptance		Mean Difference	Sign.
I	J	I-J	
ignorance	rudimentary	-0.2404	0.044
	limited	-0.3433	0.008
	extensive	-0.2337	0.510
rudimentary	ignorance	0.2404	0.044
	limited	-0.1029	0.351
	extensive	6.689E-03	0.985
limited	ignorance	0.3433	0.008
	rudimentary	0.1029	0.351
	extensive	0.1096	0.755
extensive	ignorance	0.2337	0.510
	rudimentary	-6.689E-03	0.985
	limited	-0.1096	0.755

2. In relation to teachers' beliefs concerning the introduction of computers into early childhood education.

A reading of Table 10 shows that all five subscales of attitudes differ significantly according to the teachers' beliefs concerning the introduction of computers into early childhood education. More significant differences are to be seen between the teachers who regarded the introduction of computers into early childhood education as an urgent priority and those who felt that it was not necessary at all (Table 11).

Table 10
Comparisons Among Teacher Group Means According to Their Beliefs Concerning the Introduction of Computers in Early Childhood Education

Subscales	Beliefs	N	Mean	Std. Deviation	F	Sign.
Enthusiasm/ Enjoyment	urgent priority	43	4.1380	0.4435	18.815	0.000
	secondary importance	55	3.6630	0.4517		
	unnecessary	9	3.2222	0.8192		
Lack of Anxiety	urgent priority	43	3.6388	0.6037	4.366	0.015
	secondary importance	55	3.4485	0.5337		
	unnecessary	9	3.0667	0.3480		
Acceptance	urgent priority	43	4.2379	0.4142	13.884	0.000
	secondary importance	55	3.8462	0.4594		
	unnecessary	9	3.5641	0.4518		
Impact on Society	urgent priority	43	3.2875	0.5861	5.784	0.004
	secondary importance	55	3.0116	0.5401		
	unnecessary	9	2.6566	0.6262		
Productivity	urgent priority	43	4.2264	0.3847	17.877	0.000
	secondary importance	55	3.7818	0.4429		
	unnecessary	9	3.4370	0.7119		

Table 11
Pairwise Comparisons Among Teacher Group Means According to Their Beliefs Concerning the Introduction of Computers in Early Childhood Education

Subscales	I	J	Mean Difference I-J	Sign.
Enthusiasm/ Enjoyment	urgent priority	unnecessary	0.9158	0.000
Lack of Anxiety	urgent priority	unnecessary	0.5721	0.006
Acceptance	urgent priority	unnecessary	0.6738	0.000
Impact on Society	urgent priority	unnecessary	0.6310	0.003
Productivity	urgent priority	unnecessary	0.7893	0.000

Table 12, likewise, indicates significant differences in the attitudes of the teachers with respect to their beliefs concerning the use of computers in their own classes. Of particular significance are the differences between the teachers who reacted enthusiastically to the idea of using computers in their own classes in the immediate future, and those who had reservations (Table 13.).

Table 12
Comparisons Among Teacher Group Means According to Their Beliefs Concerning the Use of Computers in Their Own Classes

Subscales	Beliefs	N	Mean	Std. Deviation	F	Sign.
Enthusiasm/ Enjoyment	enthusiastic	47	4.1574	0.4070	29.861	0.000
	reserved	56	3.6048	0.4462		
	negative	4	2.7833	0.9574		
Lack of Anxiety	enthusiastic	47	3.7078	0.5658	7.244	0.001
	reserved	56	3.3440	0.5199		
	negative	4	3.0500	0.4194		
Acceptance	enthusiastic	47	4.2439	0.3995	19.924	0.000
	reserved	56	3.8118	0.4120		
	negative	4	3.2308	0.7870		
Impact on Society	enthusiastic	47	3.3288	0.5535	9.181	0.000
	reserved	56	2.9399	0.5529		
	negative	4	2.4545	0.4328		
Productivity	enthusiastic	47	4.1887	0.4096	17.539	0.000
	reserved	56	3.7726	0.4496		
	negative	4	3.1333	0.8415		

Table 13
Pairwise Comparisons Among Teacher Group Means According to Their Beliefs Concerning the Use of Computers in Their Own Classes

Subscales	I	J	Mean Difference I-J	Sign.
Enthusiasm/				
Enjoyment	enthusiastic	reserved	0.5527	0.000
Lack of Anxiety	enthusiastic	reserved	0.3638	0.001
Acceptance	enthusiastic	reserved	0.4320	0.000
Impact on Society	enthusiastic	reserved	0.3889	0.001
Productivity	enthusiastic	reserved	0.4160	0.000

DISCUSSION

Early childhood educators have limited access and positive, but temperate, attitudes to the world of computers. The use of computers is not yet widespread, nevertheless a by no means negligible number of educators use a computer at home. Their experience with computers is rudimentary or limited, while one in four of them profess complete ignorance of computers.

Without being negative towards the introduction of computers into early childhood education, teachers are divided concerning the level of priority they attach to this introduction. They are also divided in their attitude to the prospect of the immediate introduction of computers into their own classrooms. Teachers who view the prospect with enthusiasm tend to be those who have received inservice training.

Moreover, teachers who regard the introduction of computers into early childhood education as a matter of urgent priority and who are enthusiastic about the prospect of using computers in their classrooms, also have more positive attitudes to computers and Information Technology in general. Inservice training appears to influence the beliefs of teachers and could play a decisive role in the successful integration of the computer into the kindergarten class.

The lack of adequate teacher training is one of the major obstacles to the use of computers in the classroom (Yaghi, 1997). It is therefore evident that suitable preparation of teachers is now a matter of vital importance. The content of inservice training should guide teachers in the use of computers in their work. Research has shown that early childhood teachers support the use of computers in early childhood education and recognise the necessity of appropriate inservice training (Specht, Wood, & Willoughby, 1999).

In overall terms, teachers are favourably disposed towards computers and Information Technology. They accept computers and acknowledge their necessity, while at the same time expressing reservations about their possible negative impact on society.

Their acceptance is influenced by the use of a computer at home and by their degree of experience. Experience also reduces anxiety. Other studies have come to the same conclusions (Hakkinen, 1995).

The level of computer anxiety is related to the extent of previous experience and is a modifiable condition (Leso & Peck, 1992). Thus teachers who have received inservice training are less anxious and recognise the positive impact of computers on society.

Anxiety prevents the effective use of computers in education (Hakkinen, 1995). Technological and social changes require that teachers should be capable of using computers in education with minimal anxiety (Russel & Bradley, 1997).

When teachers appreciate and experience the broad range of useful educational applications of computers, their anxiety tends to diminish and ceases to operate as a hindrance to the introduction of computers in schools. But the subsiding of this anxiety is not enough in itself to secure the successful integration of computers into the classroom. This also requires the active support and involvement of the teachers (Woodrow, 1991). Of course, the attitudes of students and parents must also be taken into account, and the administration and community must also provide a supportive environment (Davidson & Ritchie, 1994).

The question of teachers' attitudes toward computers and Information Technology is a complicated one. The relationship between computer attitudes and independent variables is neither direct nor simple. Computer attitudes do not change rapidly or easily (Hannafin, 1999). There is still resistance and fear whenever the time comes to incorporate anything new into the classroom, and teachers do not always recognise the usefulness or the necessity of the use of technology in teaching and learning. The importance of teachers' attitudes needs to be re-emphasised and to form the subject of ongoing research.

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APPENDIX ITEMS *

Subscale 1. Enthusiasm / Enjoyment

- I think that working with computers would be enjoyable and stimulating.
- I want to learn a lot about computers.
- The challenge of learning about computers is exciting.
- Learning about computers is boring to me (reversed).
- I like learning on a computer.
- I enjoy learning how computers are used in our daily lives.
- I would like to learn more about computers.
- I would like working with computers.
- A job using computers would be interesting.
- I enjoy computer work.
- I will use a computer as soon as possible.
- Figuring out computer problems does not appeal to me (reversed).
- If given the opportunity, I would like to learn about and use computers.
- Computers are not exciting (reversed).
- Computer lessons are a favorite subject for me.

Subscale 2. Anxiety

I get a sinking feeling when I think of trying to use a computer (reversed).
 Working with a computer makes me feel tense and uncomfortable (reversed).
 Working with a computer would make me very nervous (reversed).
 Computers intimidate and threaten me (reversed).
 Computers frustrate me (reversed).
 I have a lot of self confidence when it comes to working with computers.
 I sometimes get nervous just thinking about computers (reversed).
 A computer test would scare me (reversed).
 I feel apprehensive about using a computer terminal (reversed).
 Computers are difficult to understand (reversed).
 I feel at ease when I am around computers.
 I sometimes feel intimidated when I have to use a computer (reversed).
 I feel comfortable working with a computer.
 Computers are difficult to use (reversed).
 Computers do not scare me.

Subscale 3. Acceptance

If I had a computer at my disposal, I would try to get rid of it (reversed).
 Studying about computers is a waste of time (reversed).
 I can't think of any way that I will use computers in my career (reversed).
 I will probably never learn to use a computer (reversed).
 I see the computer as something I will rarely use in my daily life as an adult (reversed).
 Not many people can use computers (reversed).
 Learning to operate computers is like learning any new skill- the more you practice, the better you become.
 Knowing how to use computers is a worthwhile skill.
 I do not think that I could handle a computer course (reversed).
 I would never take a job where I had to work with computers (reversed).
 If given the opportunity, I would like to learn about and use computers.
 You have to be a "brain" to work with computers (reversed).
 Someday I will have a computer in my home.

Subscale 4. Impact on Society

Computers are changing the world too rapidly (reversed).
 I am afraid that if I begin to use computers I will become dependent upon them and lose some of my reasoning skills (reversed).
 Computers dehumanize society by treating everyone as a number (reversed).

Our country relies too much on computers (reversed).
 Computers isolate people by inhibiting normal social interactions among users (reversed).
 Use of computers in education almost always reduces the personal treatment of students (reversed).
 Computers have the potential to control our lives (reversed).
 Working with computers makes me feel isolated from other people (reversed).
 I dislike working with machines that are smarter than I am (reversed).
 Using a computer prevents me from being creative (reversed).
 Working with computers means working on your own, without contact with others (reversed).

Subscale 5. Productivity

Computers would increase my productivity.
 Computers would help me learn.
 I feel computers are necessary tools in both educational and work settings.
 Computers can be a useful instructional aid in almost all subject areas.
 Computers improve the overall quality of life.
 Knowing how to use computers is a worthwhile skill.
 Having a computer available to me would improve my general satisfaction.
 Computers will improve education.
 Someday I will have a computer in my home.
 I will use a computer in my future occupation.
 If I had to use a computer for some reason, it would probably save me some time and work.
 Computers can be used successfully with courses which demand creative activities.
 Teacher training should include instructional applications of computers.
 I'll need a firm mastery of computers for my future work.
 I believe that it is important for me to learn how to use computer.

*Source: Christensen, R. and Knezek, G., *Parallel Forms for Measuring Teacher's Attitudes Toward Computers*. Proceedings of SITE 98. Association for the Advancement of Computing in Education: Charlottesville, VA, 831-832. (1998). *[Online] Available:

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