Research Article https://doi.org/10.12973/eu-jer.12.4.1645

European Journal of Educational Research
Volume 12, Issue 4, 1645 - 1656.
ISSN: 2165-8714
http://www.eu-jer.com/

Self-Efficacy and Attitudes Toward Computers of General and Special Education Teachers in Greece During the COVID-19 Period

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Received: November 28, 2022 ▪ Revised: April 3, 2023 ▪ Accepted: May 2, 2023

Abstract: During COVID-19 in Athens, Greece, 535 general education and 170 special education teachers were tested for computer use self-efficacy, ICT competence, and computer attitudes. Demographic and occupational factors impacted computer attitudes and computer use self-efficacy. The GCAS and GCSES showed that general and special education teachers liked computers. Teachers were computer-savvy and confident. Computer attitudes boosted computer use self-efficacy. Computer self-efficacy is strongly linked with computer attitudes, subscales of confidence and affection and moderately linked with cognitions about computers. Age, position, and ICT training substantially influenced computer attitudes and computer use self-efficacy. ICT-trained teachers had improved their attitudes and computer use self-efficacy. Computer self-efficacy and attitudes about computers did not change for special education teachers, but computer confidence increased. Except for those under 25, younger teachers demonstrated higher computer self-efficacy than older ones.

Keywords: *ICT, general education, special education, teachers.*

To cite this article: Proedrou, A., Stankova, M., Malagkoniari, M., & Mihova, P. (2023). Self-efficacy and attitudes toward computers of general and special education teachers in Greece during the COVID-19 period. *European Journal of Educational Research*, *12*(4), 1645-1656. https://doi.org/10.12973/eu-jer.12.4.1645

Introduction

The use of computers is becoming more common in today's educational system. This was the case prior to the COVID-19 pandemic, and it remained the same during the lockdown period in order to continue offering online training. There are several factors that impact the use of computers by educators, and during the pandemic, the incorporation of technology into the instructional process was, for a significant number of educators, most likely forced and required. In general, educators have a positive attitude toward the use of information and communications technology (ICT) in education (Jimoyiannis & Komis, 2006; Sánchez et al., 2012). This includes educators who are involved in the education of children who have special educational needs (Jimoyiannis & Komis, 2006; Katsarou, 2020; Sánchez et al., 2012; Stankova, Kamenski et al., 2018; Stankova, Mihova et al., 2021). It has been shown that self-efficacy is one of the most important positive aspects connected with computer use, particularly during the pandemic in the context of online learning (Hong et al., 2021).

Literature Review

The positive attitude towards the use of ICT in education is influenced by many factors: the experience of educators in working with technology, cultural conditions (Albirini, 2006), general computer attitudes (Hermans et al., 2008), technological innovativeness (van Braak et al., 2004), teachers' beliefs about learning (Jacobson et al., 2010), teaching experience (Jimoyiannis & Komis, 2006), self-efficacy (Kramarski & Michalsky, 2015), computer anxiety (Celik & Yesilyurt, 2013), and computer experience (Cavas et al., 2009). Teachers' personal characteristics, computer self-efficacy, motivation, and attitudes are also key to the introduction of modern technologies in education (Paraskeva et al., 2008).

Self-efficacy and the way teachers perceive their competence play a significant role in the skills of lesson preparation and the application of computers. It largely determines the extent to which they perceive computers positively as part of learning and successfully apply technology (Kent & Giles, 2017). In addition to self-efficacy, access to technology (Siyam, 2019), self-efficacy beliefs, and ICT training is needed for success (ELDaou, 2016). Age is also relevant to the use of

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computers, with younger educators usually indicating higher levels of computer use in their work, including those that work with children with special educational needs (Stankova, Tuparova et al., 2021).

Despite educators' generally positive orientation toward using computers, there are barriers. For example, regarding the use of computer games in education, common barriers for teachers are the high costs of software products, insufficient technical equipment, and lack of both special training and specific products that correspond to the school curriculum (Tuparova et al., 2019). Employers in education point to the fear of technology and unwillingness to add extra workload as barriers to the use of computers in the educational process (Yurinova et al., 2021); more experienced professionals point to a lack of time as a serious barrier (Stankova, Tuparova et al., 2021).

In online learning, teachers are presented with another challenge – at certain moments, computers are used as the only means to implement the educational process with students, including children with special educational needs (SEN). Here again, digital competence and opportunities to learn and enhance digital skills are key for teachers in helping them adapt to the new environment (König et al., 2020). At the same time, the use of an educational technology solution can have a positive effect on online learning outcomes, whereas the age of the teacher and school infrastructure may not (Dincher & Wagner, 2021). A teacher's confidence in the use of technology corresponds to their ICT self-efficacy (Ninković et al., 2021; Rabaglietti et al., 2021). Teachers' ICT self-efficacy and their communication with students and families can increase along with an increase in their motivation to improve their skills in using technology (Beardsley et al., 2021).

Given that situation with the pandemic of COVID-19 has definitely changed the use of technology in education and, for some time, established online education as the only possible option, the factors that influence the use of ICT among general and special education teachers have also undergone changes. We believe that special educators represent a particular group in these studies, since working with children with special needs is more specific, not least because of the frequent difficulties in holding children's attention and presenting the material in an appropriate way. Before online learning was highly necessary, years of computer use had an impact on teachers' attitudes towards technology (Teo, 2008), but whether the necessity of their use as the sole means of instruction can change these attitudes remains unclear.

Skills in the applications of technology in a distance-learning environment can predict high levels of teachers' self-efficacy, (Andreou et al., 2022), but computer use self-efficacy is another factor that is interesting to learn about. The demographic and work characteristics that are related to attitudes towards computers and computer use self-efficacy have not been studied a lot, and probably they have also undergone changes due to the forced use of online learning, both for general and special education teachers.

Even before the COVID-19 pandemic, special education teachers were using technology when working with children with special educational needs (Stankova, Tuparova et al., 2021).

This is because many children with special educational needs prefer technology and, before the pandemic, specialists worked hard to create tools that support special education teachers in diagnosis and therapy. As the pandemic has changed the situation, an emerging question is whether there are current differences between general and special education teachers in terms of attitudes towards computers and computer use self-efficacy.

Methodology

Objectives of the Present Study

The aim of our research was to assess the familiarity with and use of ICT among general and special education teachers. Specifically, four research questions were formulated:

1. How familiar are general and special education teachers with ICT?
2. How much do general and special education teachers use ICT?
3. What is the relationship between attitudes towards computers and computer use self-efficacy?
4. Do demographic and work characteristics affect attitudes towards computers and computer use self-efficacy?

Participants

The participants in the study were N = 705 teachers of primary and secondary education. Of these, 535 were general education teachers (76%), while 170 were special education teachers (24%). The participants were approached using a non-random convenience sampling method (Creswell, 2014). Each participant had to be an adult teacher who worked at the primary or secondary level in general or special education. These primary and secondary general and special education teachers were employed in public schools in the greater area of central Athens.

Participants were approached in the school environment through email. The aim of the research was briefly described, and all potential participants were informed that their participation would be anonymous and voluntary, given that none of the information they provided could be used to identify them, and that they could withdraw from the study at any time without the need for an explanation. No deception was used in this research, and there was no physical or psychological

risk or harm to the participants, according to the Ethics Committee of the British Psychological Society (Ethics Committee of the British Psychological Society, 2018).

Participants were 88% female and 12%, male. Their ages varied, with 53% of teachers aged 26–40 and 39% over 40. Most participants were general education teachers (76%), with 24% working in special education. Most teachers worked in high schools (67%), while the remaining 33% worked in elementary schools. Many participants had less than five years of experience (43%), with 16% having five to 10 years, 18% having 11 to 15 years, and 23% having more than 15 years of work experience (Table 1).

Table 1. Descriptive Statistics for Teachers' Demographic and Other Information (N = 705)

		Frequency	Percent
Gender	Male	85	12.1
	Female	620	87.9
Age	Up to 25 years old	55	7.8
	26-30 years old	135	19.1
	31-35 years old	110	15.6
	36-40 years old	130	18.4
	41-45 years old	85	12.1
	46-50 years old	95	13.5
	Over 50 years old	95	13.5
Position	General education teacher	535	75.9
	Special education teacher	170	24.1
School type	Elementary school	235	33.3
	High school	470	66.7
Years of experience*	Less than 5 years	300	42.7
	5-10 years	114	16.2
	11-15 years	129	18.3
	More than 15 years	160	22.8

*. N = 703

Study Design

The study used a quantitative questionnaire approach (Patten & Newhart, 2018). The instrument used comprised one survey and two questionnaires.

The survey collected demographic and other information for the sample, including gender, age, position, school type, years of experience, and training in ICT. This section also asked the participants to respond to four items pertaining to their use of ICT ('Were you forced to use ICT due to the pandemic?'; 'Does the school environment help you in the use of ICT?'; 'Does the school principal encourage you to use ICT?'; and 'Before the onset of distance education, did you use ICT in your teaching?'). The survey was created by the researchers in order to understand what happened during the lockdowns and under COVID-19, before and after the onset of distance education.

The first questionnaire included the Greek Computer Attitudes Scale (GCAS), developed by Kassotaki and Roussos (2006), which comprises 30 items that assess teachers' views about the use of computers. The questionnaire provides total computer attitudes score as well as three sub-scores for confidence with computers (15 items), affection/feelings for computers (10 items), and cognitions about computing and computers (five items). The total score and subscores are calculated by adding up all the relevant item responses. Sixteen items are reverse-coded. The questionnaire is rated on a five-point Likert scale ('completely disagree' to 'completely agree'). The original version of the questionnaire, proven by testing participants from four Greek samples (including teachers) showed adequate internal consistency and test–retest reliability, as well as good concurrent validity (Roussos, 2007).

The second questionnaire is the Greek Computer Self-Efficacy Scale (GCSES), which comprises 29 items that provide a total score for teachers' self-efficacy in using a computer or the extent to which they feel competent in using and solving simple problems that occur when using a computer. The items are rated on a five-point Likert scale ('completely disagree' to 'completely agree'). The original Greek version of the questionnaire was found to have acceptable validity and reliability (Kassotaki & Roussos, 2006).

Reliability for the Scales

Concerning the reliability of the scales of the study, a series of Cronbach's alpha tests were performed. The GCSES had a very high reliability of a = 0.97 (Table 2).

Table 2. Cronbach's Alpha Reliability for Computer Use Self-Efficacy Questionnaire

	Cronbach's Alpha	N of Items
Computer Use Self-Efficacy (Total)	.971	29

Given this high reliability, Cronbach's alpha was calculated for the GCAS (Table 3). The total scale of computer attitudes had a high reliability, of a = 0.93 (30 items). The computer attitudes subscales also had acceptable reliability: the 'confidence with computers' and 'affection towards computers' subscales had a = 0.92 (15 items) and a = 0.83 (10 items), respectively. The subscale of 'cognitions about computing and computers' had lower but acceptable alpha reliability (a = 0.66; five items).

Table 3. Cronbach's Alpha Reliability for Computer Attitudes Questionnaire

	Cronbach's Alpha	N of Items
Computer Attitudes Scale (Total)	.927	30
Confidence with computers	.918	15
Affection towards computers	.830	10
Cognitions about computing and computers	.664	5

The data were entered and coded into the Statistical Package for the Social Sciences SPSS version 25.

Descriptive analysis was provided for the demographic and other information of the sample, through frequencies and percentages, while descriptive statistics were calculated for the items of the GCAS and GCSES through means and standard deviations. Next, Cronbach's alpha for reliability was computed for the scales and subscales of the questionnaire, and the dimensions of the study were calculated. The means and standard deviations for the computer attitudes and computer self-efficacy of teachers were provided, and the data were tested for normality using the Kolmogorov–Smirnov normality test. Given that the data did not follow the normal distribution, non-parametric Spearman rho correlations were performed between the dimensions of the study. Additionally, Mann–Whitney and Kruskal–Wallis tests were used to examine the potential effect of gender, age, ICT training, and position (general or special education), as categorical independent variables, on the attitudes and self-efficacy of teachers regarding computer use, as continuous dependent variables. Mann–Whitney tests were used for the dichotomous independent variables of gender, position, and training in ICT, while a Kruskal–Wallis test was used for the independent variable of age.

Results

Use of ICT

Most of the teachers had undergone training in ICT (61%). A large majority were compelled to use ICT due to the pandemic (89%), and the school environment helped 33% of participants in the use of ICT a lot or very much. Thirty percent were not helped by their school environment. Overall, the school principal encouraged 41% of teachers to use ICT a lot or very much, while 24% of teachers were encouraged a little or were not encouraged at all. Before the onset of distance education, 37% used ICT very often in their teaching, while 36% used it a little or did not use it at all (Table 4).

Table 4. Teachers' Training in and Use of ICT (N = 705)

		Frequency	Percent
Do you have training in ICT	Yes	430	61.0
	No	275	39.0
Were you forced to use ICT due to the pandemic?	Yes	630	89.4
	No	75	10.6
Does the school environment help you in the use of ICT?	Very much	55	7.8
	A lot	180	25.5
	Average	260	36.9
	A little	155	22.0
	Not at all	55	7.8
Does the school's principal encourage you to use ICT?	Very much	70	9.9
	A lot	220	31.2
	Average	245	34.8
	A little	75	10.6
	Not at all	95	13.5
Before the onset of distance education, did you use ICT in your teaching?	Very often	85	12.1
	Often	175	24.8
	Average	190	27.0
	A little	180	25.5
	Not at all	75	10.6

As expected, the percentage of teachers using technology increases during the pandemic, but unfortunately, our expectation that the school would support teachers seriously in this situation is not fully justified. The implication of these results is that teachers probably went through enormous difficulties in trying to introduce technology quickly and forcefully into learning.

Results for the Computer Attitudes Scale

Regarding the items on the computer showing the attitudes of the teachers, there were no missing values (valid sample N = 705). Using a five-point Likert scale, where 1 = 'completely disagree', 2 = 'disagree', 3 = 'neither agree nor disagree', 4 = 'agree', and 5 = 'completely agree', on average, teachers 'agreed' /(mean) between 4.5 and 3.5/ that computers do not scare them at all (mean = 4.13), that they could learn to use any computer software (mean = 3.99), that they feel comfortable when they have to use a computer (mean = 3.90), that they have a lot of self-confidence when it comes to using a computer (mean = 3.89), that they could get good grades in computer courses (mean = 3.85), that they enjoy working with computers (mean = 3.80), that if someone gives them a new computer to look at, they could get some programs to run (mean = 3.79), that anyone can use a computer (mean = 3.79), and that computers are enjoyable (mean = 3.74).

The results showed that although teachers were not afraid of computers, the more complicated the conditions related to the presence of computers, the more their positive responses decreased, reaching the lowest for the question related to whether computers are enjoyable. Obviously, computers are still a challenge, and even if they are needed in the work, teachers approach them with some uncertainty that they can use any computer, could work with some programs, even if they are not in a completely familiar situation.

On the other hand, on average, teachers 'disagreed' /(mean) between 2.5 and 1.5/ that not many people can use computers (mean = 2.13), that computers are boring (mean = 1.97), that one has to be young to learn how to use a computer (mean = 1.86), that one needs to be 'brainy' in order to work with computers (mean = 1.83), that computers are difficult to understand (mean = 1.81), that they hesitate to use a computer for fear of making mistakes they cannot correct (mean = 1.80), and that they are no good with computers (mean = 1.79). Participants also disagreed with the following statements: that they hope to never reach the point of having to use computers (mean = 1.71), that they are not the type to do well with computers (mean = 1.70), that they need someone experienced nearby when they use a computer (mean = 1.68), that they avoid using a computer whenever they can (mean = 1.60), that they feel hostile towards computers (mean = 1.56), that they hesitate to use a computer in order not to look like a fool (mean = 1.50), or that they get a sinking feeling when they think of using a computer (mean = 1.50).

There is a positive trend among teachers, which shows that they do not think that there are serious obstacles for a person to work with a computer. Their answers point out the idea that computer mastery is an accessible skill that is not related to specific conditions or personal characteristics.

The results also show means of more than 3 ('neither agree nor disagree') but less than 3.5 (4 = 'agree') for the following statements: I can do advanced computer work; I could probably teach myself most of the things I need to know about computers; the challenge of using a computer is very appealing to me; when I have a problem with the computer, I will usually solve it on my own; and I like to spend a lot of time using a computer. The results for the following statements fall just between 2 = 'disagree' and 3 = 'neither agree nor disagree: computers fail very frequently; and I do not enjoy talking with others about computers.

Results for the Computer Use Self-Efficacy Scale

Following teachers' self-efficacy in using computers, there were no missing values (N = 705). Using a five-point Likert scale, where 1 = 'completely disagree', 2 = 'disagree', 3 = 'neither agree nor disagree', 4 = 'agree', and 5 = 'completely agree', teachers 'completely agreed' /means > 4.5/ that they feel they can copy parts of a text to another section of the same text (4.68), search for information on the internet using search engines (4.67), download files from the internet (4.67), compose texts on the computer (4.63), the forward email they have received to other recipients (4.62), format text documents (4.60), download and read email attachments (4.59), move files to a folder on the computer (4.57), and use the spell check provided by word processors (4.52).

Means of between 4.5 and 3.5 were observed for the following items: participants could organize computer files into folders (4.47), import objects (4.35), use objects comfortably (4.30), modify files for printing (4.26), tackle simple computer problems (4.26), customize the interface of applications they use (4.17), save files to any storage media (4.16), understand concepts related to computer hardware (4.07), back up their computer files (4.04), modify file properties (3.94), update computer programs (3.91), and overcome issues such as computer freezes or crashes (3.82). Furthermore, teachers agreed that they can use programs help files to learn something they did not know (3.82), understand computer storage (3.79), and learn how to use a new version of a program by reading the manual without help (3.73), understand concepts related to computer software (3.67), understand computer speed (3.65), draw graphics (3.57), and buy the appropriate software (3.52) and hardware (3.52) for their needs.

Following these results, we see that the teachers do very well with the basic operations that are carried out with the computers, and of course, as they become more difficult, their confidence decreases. However, their good general skills can be noted, which are the basis for upgrading additional abilities, if necessary, even if only by self-training.

As a result, the dimension of computer attitudes and its subdimensions and the dimension of computer self-efficacy were calculated. Teachers had positive attitudes toward computers (mean score 115.81); they were confident with computers (mean score 59.41); they felt positive about computers (mean score 39.28); and they had positive thoughts about computing and computers (mean score 19.35). The teachers' self-efficacy regarding computer use was even higher (mean score of 120.59). Table 5 presents these findings.

Table 5. Mean Scores for the Dimensions of the Study

	Min	Max	Mean	Std. Dev.
Computer Use Self-Efficacy (Total)	**50**	**145**	**120.59**	**22.011**
Computer Attitudes Scale (Total)	64	142	115.81	16.860
Confidence with computers	27	75	59.41	10.603
Affection towards computers	21	50	39.28	6.598
Cognitions about computers	9	25	19.35	3.106

Normality tests showed that none of the data followed the normal distribution, and, given that finding, a series of non-parametric Spearman correlations were performed between the dimensions and subdimensions of the study (Table 6). Results showed that computer self-efficacy had high positive correlations with the dimension of computer attitudes, as well as with the attitude subdimensions of confidence and affection, while it had a low positive correlation with cognitions. Furthermore, it is interesting to note that all computer attitude subdimensions had positive, significant correlations, which were low for affection and cognitions, medium for confidence and cognitions, and high for confidence and affection.

Table 6. Spearman Rho Correlations Between the Dimensions of the Study

	Computer attitudes (Total)	Confidence with computers	Affection for computers	Cognitions about computers
Computer self-efficacy (Total)	.710*	.758*	.541*	.307*
Computer attitudes (Total)		.959*	.869*	.536*
Confidence with computers			.743**	.477*
Affection for computers				.302*

*. $p < 0.05$; **. $p < 0.001$

Computer self-efficacy probably leads to an increase in confidence with computers and thus likely increases the use of computers and teachers' understanding that technology does not require special characteristics, knowledge, or skills that are difficult to achieve. Of course, we consider the fact that the longer teachers use technologies, the more Computer self-efficacy would increase, and the pandemic forced relatively long online learning, which in turn led to the need for the application of technology in education.

Effects of Age, Position, and ICT Training on the Dimensions of the Study

Finally, the effects of age, position, and ICT training on the dimensions and subdimensions of the study were studied. The effect of gender was not calculated since there was a large difference between the number of males (N = 85) and females (N = 620) in the sample.

The means and standard deviations for computer attitudes (total), confidence with computers, affection for computers, cognitions about computing and computers, and computer self-efficacy (total) for both groups – general education teachers and special education teachers – are presented in Table 7.

Table 7. Mean Scores for the Dimensions of the Study by Position

	Position	Mean	Std. Deviation
Computer attitudes (Total)	General education	115.24	17.053
	Special education	117.59	16.154
Confidence with computers	General education	58.77	10.828
	Special education	61.44	9.614
Affection for computers	General education	39.21	6.631
	Special education	39.50	6.510

Table 7. Continued

	Position	Mean	Std. Deviation
Cognitions about computing and computers	General education	19.51	2.826
	Special education	18.82	3.819
Computer self-efficacy (Total)	General education	119.78	22.807
	Special education	123.15	19.131

There was a significant effect of position (general/special education teaching) on confidence with computers (Mann–Whitney U = 39525.0, $p < 0.05$) in the sample. General education teachers in our study (N = 535) had lower confidence with computers than special education teachers (N = 170).

This is probably due to the fact that even before the pandemic, special education teachers paid great attention to technology and its inclusion in their work with children with special educational needs.

Being a general education teacher or a special education teacher did not affect the total dimensions of computer attitudes or computer use self-efficacy or the computer attitude subdimensions of affection for computers or cognitions about computing and computers (all $p > 0.05$).

Furthermore, there were significant effects of ICT training in our sample on the dimension of computer attitudes (U = 49362.5, $p < 0.001$), as well as on the subdimensions of confidence (U = 49812.5, $p < 0.001$) and affection (U = 49412.5, $p < 0.001$). ICT training also had a significant effect on the dimension of computer use self-efficacy (U = 53912.5, $p < 0.05$), even if the difference is small (Table 8). Teachers who had received ICT training had more positive attitudes toward computers, higher confidence and affection towards computers, and higher computer use self-efficacy than teachers who had not received ICT training.

Table 8. Comparison Between Means of Teachers Who Received and Did Not Receive ICT Training

	ICT Training	Mean	Std. Deviation	p
Computer attitudes (Total)	Yes	117.65	16.359	< 0.001
	No	112.92	17.253	
Confidence with computers	Yes	60.55	10.163	< 0.001
	No	57.64	11.045	
Affection for computers	Yes	39.91	6.719	< 0.001
	No	38.29	6.292	
Cognitions about computing and computers	Yes	19.52	3.128	> 0.05
	No	19.07	3.056	
Computer self-efficacy (Total)	Yes	122.56	19.320	< 0.05
	No	117.51	25.393	

Finally, we wanted to check whether significant differences exist between the different age groups. Table 9 includes the means for the different age groups for computer attitudes (total), confidence with computers, affection for computers, cognitions about computing and computers, and computer self-efficacy (total), and differences between different age groups using Kruskal–Wallis tests.

Table 9. Mean Scores for the Dimensions of the Study by Age

Age		N	Mean	Std. Deviation	Kruskal-Wallis p
Computer attitudes (Total)	Up to 25 years old	55	116.18	16.391	
	26-30 years old	135	119.33	15.337	
	31-35 years old	110	117.86	16.505	
	36-40 years old	130	116.50	12.705	< 0.001
	41-45 years old	85	118.41	19.043	
	46-50 years old	95	111.11	17.013	
	Over 50 years old	95	109.63	19.942	
Confidence with computers	Up to 25 years old	55	60.36	11.033	
	26-30 years old	135	62.56	8.747	
	31-35 years old	110	61.55	8.963	
	36-40 years old	130	60.12	7.315	< 0.001
	41-45 years old	85	59.82	12.112	
	46-50 years old	95	56.21	10.389	
	Over 50 years old	95	53.79	13.936	

Table 9. Continued

Age		N	Mean	Std. Deviation	Kruskal-Wallis p
Affection for computers	Up to 25 years old	55	38.55	5.080	= 0.001
	26-30 years old	135	39.26	5.951	
	31-35 years old	110	40.09	8.161	
	36-40 years old	130	39.96	5.743	
	41-45 years old	85	40.71	7.581	
	46-50 years old	95	37.63	6.574	
	Over 50 years old	95	38.21	6.019	
Cognitions about computing and computers	Up to 25 years old	55	19.73	3.498	< 0.05
	26-30 years old	135	19.70	3.355	
	31-35 years old	110	18.59	2.931	
	36-40 years old	130	19.23	2.802	
	41-45 years old	85	20.12	2.412	
	46-50 years old	95	18.79	3.537	
	Over 50 years old	95	19.53	2.978	
Computer self-efficacy (Total)	Up to 25 years old	55	113.82	19.578	< 0.001
	26-30 years old	135	125.93	19.97	
	31-35 years old	110	124.18	20.591	
	36-40 years old	130	121.88	15.593	
	41-45 years old	85	122.82	23.873	
	46-50 years old	95	117.74	21.623	
	Over 50 years old	95	111.84	29.382	

Age had a significant effect on all dimensions and subdimensions of our study, specifically on the dimension of attitudes towards computers and confidence with computers, affection for computers, cognitions about computers, and the dimension of computer use self-efficacy (Table 9).

Non-parametric post-hoc tests indicated that, for the total score of computer attitudes, teachers aged 46–50 and teachers over 50 had less positive attitudes about computers than teachers aged 26–30 ($p < 0.05$ and $p < 0.05$, respectively) and teachers aged 41–50 ($p < 0.05$ and $p < 0.05$, respectively).

For the subscale of confidence with computers, post-hoc tests showed that teachers over 50 had lower confidence with computers than teachers aged 26–30 ($p < 0.001$), 31–35 ($p < 0.05$), and 41–45 ($p < 0.05$). Furthermore, teachers aged 46–50 had lower confidence in their use of computers than teachers aged 26–30 ($p < 0.001$) and 31–35 ($p < 0.05$).

Regarding the subscale of affection for computers, post-hoc tests indicated that teachers aged 46–50 had less affection for computers than teachers aged 31–35 ($p < 0.05$) and 41–45 ($p < 0.05$), while participants over 50 also had less affection for computers than participants aged 41–45 ($p < 0.05$).

Concerning teachers' cognitions about computing and computers, participants aged 31–35 had fewer positive cognitions than participants aged 26–30 ($p < 0.05$) and 41–45 ($p < 0.05$).

Finally, with respect to the total score of computer self-efficacy, participants aged up to 25 actually had lower computer self-efficacy than participants aged 26–30 ($p < 0.001$), 31–35 ($p < 0.05$), and 41–45 ($p < 0.05$). Participants over 50 also had lower computer self-efficacy than participants aged 26–30 ($p < 0.05$) and 31–35 ($p < 0.05$). Additionally, teachers aged 46–50 had lower computer self-efficacy than teachers aged 26–30 ($p < 0.05$).

Discussion

The present study examined attitudes towards ICT and computer self-efficacy in 705 teachers in primary and secondary education. In general, the teachers held positive views regarding computers and felt confident with, and had positive cognitions and feelings about, computers.

The teachers had an even high computer use self-efficacy. Computer use self-efficacy was significantly and highly positively related to computer attitudes and its subscales of confidence and affection. This probably means that teachers generally use computers in their practice and feel prepared to incorporate technology into the educational process. Other authors report similar data - a positive correlation between computer self-efficacy and attitudes towards the use of web-based instruction (Doğru, 2020). A positive relationship exists also between teachers' ICT self-efficacy and the use of ICT in the educational environment (Hatlevik & Hatlevik, 2018).

Other findings suggest that Computer self-efficiency correlates with teachers' computer experience (Sarfo et al., 2017; Šabić et al., 2022) and attitudes towards computers (Gudek, 2019).

In our study computer self-efficacy had a low positive correlation with cognitions about computing and computers. We must note, however, that teachers in most cases use computers only as a tool that supports the educational process.

ICT training, position, and age significantly affected the attitudes and self-efficacy of teachers regarding computer use. Teachers who had had ICT training held more positive views towards computers, had more confidence in and higher affection for computers and showed more computer use self-efficacy than teachers without ICT training. Thus, technology training emerges as an essential factor to consider. That corresponds to other findings - training in the use of computers increases the inclusion of computers in educational practice and computer self-efficacy (Ikhlas & Dela Rosa, 2023; Krause et al., 2017).

Additionally, general education teachers showed less confidence with computer use than special education teachers (computer attitudes subdimension), while there was no effect of position (general or special education teaching) on either total computer attitudes and computer use self-efficacy or on affection for computers and cognitions about computing and computers (computer attitudes subdimensions). The difference is probably due to the fact that special teachers usually work individually and often use computers in their work with children, and many children with special needs enjoy learning activities that incorporate technology.

Finally, age affects attitudes towards computers and their subscales, confidence, affection, and cognitions about computers, as well as computer use self-efficacy. In general, older teachers had less favorable attitudes toward computers, less confidence, less affection, and less positive cognitions regarding computers than younger teachers. Senior teachers also had lower computer use self-efficacy than younger teachers, except for teachers aged up to 25, who had lower computer self-efficacy than teachers aged 26–35 and 41–45, which is probably due to the general lack of confidence in very young teachers. These results correspond to results from other studies where teachers over 50 years old have consider less the use of ICT in education (Admiraal et al., 2017).

Conclusion

Despite the pandemic, technology development is developing in the field of education, and it is currently playing a very significant role in the process of supporting children who have special needs. The question of whether or not ordinary educators and special educators have appropriate training to make effective use of technology is an essential one for the administration of educational institutions. On the other hand, many children and parents have a positive attitude toward the application of technology in education. However, during this process, the relationship between the teacher or special education teacher and the child should not be lost because it is an important part of children's lives at school. The selection of technology, the acquisition of new abilities to make use of those technologies, and the development of new skills to evaluate their impact all require assistance for educators.

The present study attempts to shed a light on the changes in the use of computers by both general and special education teachers following the COVID-19 pandemic, as well as to look for the interrelationships between various factors that could influence the inclusion of computers into the educational process, considering the enormous challenges facing modern professionals who work with children.

Recommendations

The successful inclusion of technologies in the learning process must consider the following factors as important in the educational environment: training and support from the school to general teachers and special educational teachers is essential for the development of attitudes towards technologies; emphasizing the benefits of the technologies and the satisfaction of children when working with technologies can increase the interest of teachers in using them; improving attitudes towards computers and increasing the experiences of the teachers in the use of computers as an useful tool in the educational process can support their computer self-efficacy.

In order to gain more knowledge and insight into the factors that influence the use of computers, it is suggested that additional research be conducted. This would allow for the effective use of information and communication technologies in the classroom to be fostered, which would be beneficial for students, teachers, and society.

Limitations

The primary limitation of the study is that only 535 Athens-based educators from the general education cohort and 170 from the special education cohort participated. Another limitation of this study is the lack of prior research on the influence of the use of computers by educators, particularly in a pandemic situation, as well as the introduction of technology into the educational process for many instructors during the epidemic.

Authorship Contribution Statement

Proedrou: Methodology, data analysis. Stankova: Design and project management. Malagkoniari: Literature review, conceptualization. Mihova: Review-editing and writing, original manuscript preparation. All authors have read and approved the published final version of the article.

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