

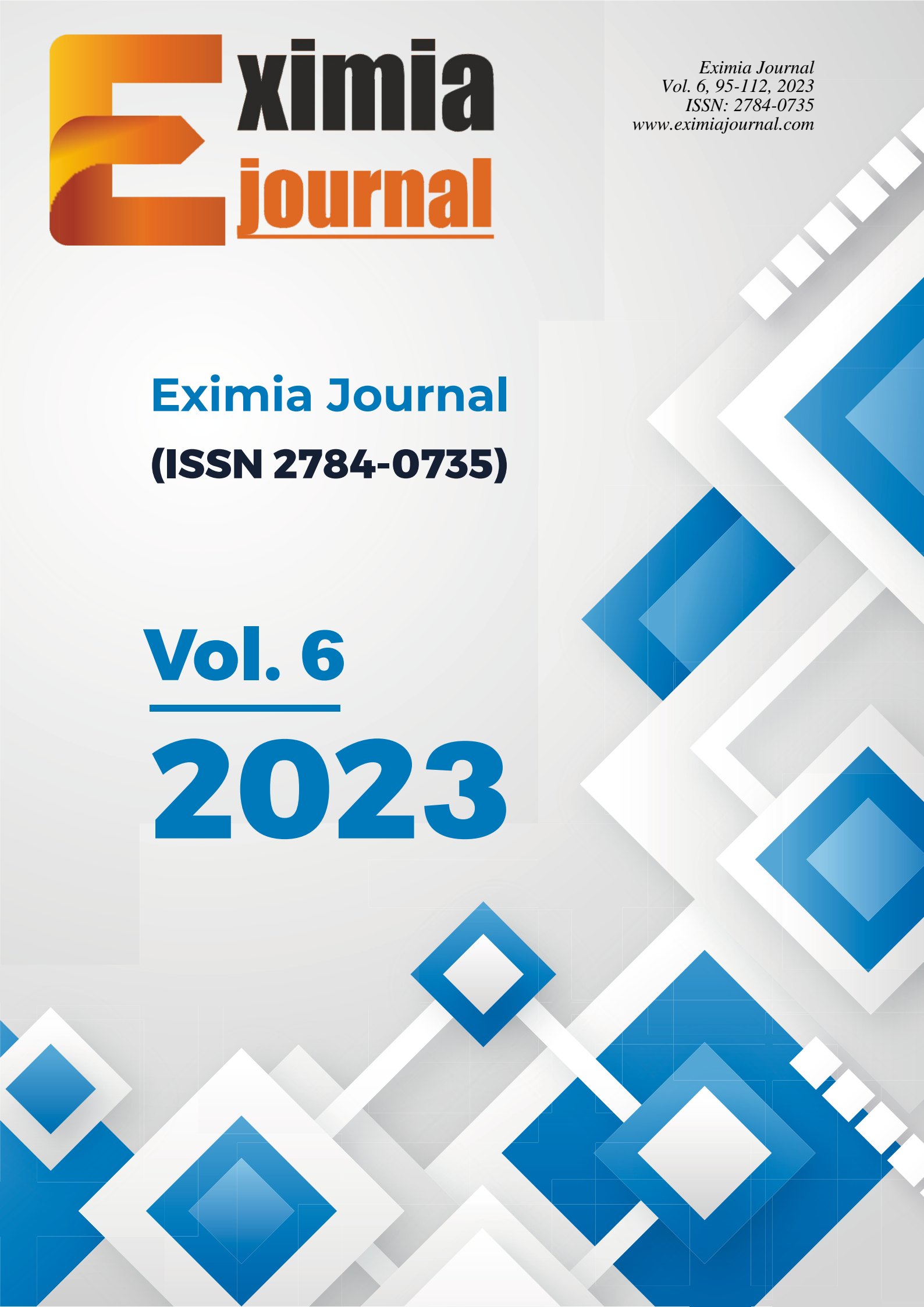


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The contribution of ICT to the education of students with special educational needs in the period of Covid-19

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Abstract: Through this quantitative educational approach, there is an attempt to investigate the views and attitudes of secondary teachers in relation to the use of ICT in the teaching of students with special educational needs and to highlight their contribution during distance learning due to covid 19. The present dissertation constitutes quantitative research in the field of special education with a view to yielding valuable conclusions. The results showed that the teachers hold positive views and attitudes towards the use of ICT for the teaching of students with special needs. It appears that age, years of service and education level constitute factors of differentiation in teachers' views. A positive differentiation was observed in the performance of students with special educational needs due to the use of ICT. The totality of teachers express the need for ICT training, readjustment of curriculums, whereas the preservation of the use of ICT in the post-covid era is statistically significant. The results of the study are discussed in terms of educational placement.

Key words: special learning difficulties, Information and Communication Technologies, educational software, applications, secondary teachers' views.

1. Introduction

In modern education, the common ground of all research is the decisive contribution of ICT to the teaching, planning and evaluation of students as a whole and especially students with special educational needs. ICT appears as the most suitable ally in the multidimensional role that the teacher is called to play in modern society and education. The set of digital tools, software and devices that can be used in education and specifically in teaching, enrich learning by offering audio-visual material, computer use and collaborative activities, with the result that students are attracted to interactive and multidimensional media, focus their attention, to gain interest and additional motivation for learning (Antoniou & Siskos, 2006). The COVID-19 pandemic has led to the escalation of distance education strategies as a response of the education sector as a whole to the sudden interruption of the operation of educational units as a measure of prevention and response to the pandemic. In particular there has been significant use of language and video conferencing applications, educational learning software and virtual teaching platforms (Cathy Li, Farah Lalani, 2020).

2. Theoretical Background

In Greece the special education units, as well as the general education attended by students with special educational needs, use the new digital media in school practice. Access to the internet, the use of computer systems, software, and technologies such as the interactive whiteboard form a more attractive and accessible learning teaching. The use of digital technologies and structured programs from educational software creates fluency in their use by students with learning difficulties and the possibility to combine it with other activities of their daily life (Tsantali & Nikolidakis, 2013).

A common conclusion of multiple researches in the field of special education is the benefit of students with special learning difficulties from the digital game as a means of learning. In particular, gamified applications and software adopting features of video games aim at learning in an attractive

and playful way by entertaining the student. The student manages to independently build knowledge and cultivate skills in a familiar environment, without experiencing negative emotions. The feedback he , cognitive and perceptual capabilities are strengthened. Multiple benefits of these gamified software have been noted in the areas of working memory, attention, and executive control. Especially students with special learning difficulties (dyslexia) benefit from their use in the educational process and develop their cognitive skills (Drigas & Pappas, 2015).

The education of students on the autistic spectrum, students with intellectual disabilities, special learning difficulties, physical disabilities, speech problems or other psycho-emotional disorders with the use of ICT helps to improve social skills, cognitive potential, communication, interaction and offer the possibility of transferring the educational activity as a follow-up and at home (Fernandez – Lopez et al., 2013) (see Table 1).

Table 1: Usefulness of ICT for all students

		N	%	M.O.	T.A.
Determine the extent to which all students in the class benefited from the use of ICT in teaching during the distance learning period	Not at all	1	0,9%		
	Little	22	18,8%		
	Enough	35	29,9%	3,61	1,14
	Much	23	19,7%		
	Very much	36	30,8%		

Undoubtedly, the use of new technologies and the use of appropriate educational software strengthen also the effectiveness of the teacher and contribute to the self-efficacy of students with special educational needs. In addition, the teacher is asked to compare and choose the appropriate digital support tool in order to realize the appropriate tool for planning and implementing an individualized teaching program. Training and education about new technologies in education plays a crucial role (Lum et al., 2016).

The mass closure of schools worldwide as a way of limiting the COVID-19 pandemic has led to the provision of distance education with the contribution of technology with the request to continue the learning process, without social and educational inequalities. In the international literature, the benefits of technologies are reflected in such a difficult moment of imperative adjustment of education, as well as the factors that make it difficult for the substantial contribution and offer of ICT in education. The specific field of study is poor, as the time period from distance education is short. However, there is strong interest and a dynamic that is reflected in the daily publication of new results, especially regarding the effectiveness of distance education for students with special educational needs. A commonplace of studies at the international level is the strengthening of educational strategies with the use of ICT in the post-Covid era. Educators and students can use a variety of ICT components, improving their overall self-efficacy. Emerging ICTs in education are pushing for more effective classroom teaching using 21st century tools and technology (Naresh, 2020). After all, the interest in redefining the global education policy given the wide effectiveness of interactive distance teaching and the application of new pedagogical techniques based on open educational programs is a given and has been strengthened considerably due to the urgent needs brought about by the management of emergency situations, specifically the closure of school units as a measure of prevention and protection against the covid-19 pandemic (UNESCO, 2020).

In Greece at the beginning of the pandemic, teachers' opinions were investigated regarding the period of remote education due to COVID-19 and the possibility of integrating it into the education system of our country. According to the findings, teachers show high rates of readiness and familiarity with modern technological means, while they desire the enrichment of teaching with ICT and modern educational means in the post-covid era (Stachteas & Stachteas, 2020). The positive attitudes of teachers and students of all levels are reflected in all the surveys before the pandemic period and in particular in

the last 10 years at least. Teachers and students consider it necessary to enrich teaching using ICT, as well as distance teaching methods, considering that they promote the learning process, enhance performance and the motivation to learn (see Table 2). Also, it is a common belief that the development of technological means in teaching and modern educational software benefits students with special educational needs (Kelenidou, Antoniou & Papadaki, 2017).

Table 2: Sustaining the use of ICT after the period of distance learning

		N	%	M.O.	T.A.
Determine the extent to which ICT use is maintained in your teaching beyond the distance teaching period	Not at all	1	0,9%		
	Less	45	38,5%		
	Enough	38	32,5%	2,92	0,91

The majority of researchers emphasize that in the midst of a pandemic, teachers should focus on the means of teaching and not exclusively on the content of learning. Technology and the skills to use it are a useful tool for conducting successful distance learning through the readjustment of curricula (see Table 3). Teachers should design flexible teaching models with freedom in interpersonal contact and ensure it in multiple ways, placing the needs of students with special educational needs as a priority (Karakaya, 2020).

Table 3: Need to readjust and enrich the study programs

		N	%	M.O.	T.A.
How necessary do you consider the adaptation of curricula and their enrichment using ICT in educational teaching in the post-covid era?	Not at all	0	0,0%		
	Little	4	3,4%		
	Enough	19	16,2%	4,24	0,85
	Much	39	33,3%		
	Very much	55	47,0%		

3. Method

3.1 Research Design

The purpose of this research study is to investigate the opinions and attitudes of secondary school teachers on the use of ICT in the teaching of students with special educational needs and to highlight their contribution during the period of distance education due to COVID-19. This work is a quantitative research in the field of special education in order to draw valuable conclusions. For the aforementioned purpose, quantitative empirical research was chosen.

3.2. Sample-Participants

The sample of the present descriptive quantitative research was N=117 secondary education teachers who work in general education (public) high schools and high schools in the prefecture of Attica and in their classrooms, whether there are students with special educational needs, whether they

work as special educators of parallel support, or they work as special educators in an integration department.

3.3. Research Tools

The measuring instrument/tool of this research is a specially structured questionnaire, which was designed appropriately and exclusively for this specific quantitative research. The questionnaire initially includes an introductory point in which the purpose of the research, its format, as well as the way and time needed to complete the questionnaire are presented. The design of the questionnaire was carried out under the guidance of observing the basic principles of a questionnaire that is completed in the workplace of the sample population, therefore the researcher paid particular attention to factors such as functional size, clarity in wording, convenient completion time and aesthetic appearance of the electronic format (Lodico, Spaulding and Voegtle, 2006). The questionnaire is divided into two axes, which were designed based on the purpose and research hypotheses of the research. The first axis includes 6 closed-ended questions about the participant's demographic and certain individual characteristics, such as gender, age, years of experience, educational level, knowledge level, etc. (questions (I., II., III., IV., VI., VII.)) Then follows the second axis which includes 2 dichotomous closed-type questions (Yes - No) and 13 questions based on a five-point "Likert" scale (1=Not at all, 2=A little, 3=Enough, 4=Much, 5= Very much).

3.4. Validity and Reliability

Validity and reliability are the most important factors of an effective quantitative research. A research tool is valid when it is capable of delivering the theoretical concept that is the reason for its construction. The reliability check in the present research study on the contribution of ICT in the teaching of students with special educational needs and their contribution during the distance education period due to covid-19 is calculated through the Cronbach Alpha reliability coefficient. The values of this coefficient range from 0.00 to 1.00, with a reliable measurement considered to be around 0.80.

3.5. Research Questions

Through this research we attempted to answer the following research questions:

1. Are there any gender, age, experience or educational level differences (of teachers) regarding the use of ICT in teaching and its outcomes?
2. Was software or online material - sites of educational content used for the planning of the educational process?
3. What was the degree of impact of ICT on student performance?
4. What is the degree of use of ICT in the post-covid era for teaching?
5. How imperative or not is the need for ICT training considered as part of educational planning and teaching?

4. Data Analysis

Statistical Tools

Descriptive and inductive statistical methods were used for the analysis and presentation of the data. More specifically, the aggregate responses collected through the questionnaire are presented through absolute and relative frequency distribution tables, as well as measures of position and dispersion (mean and standard deviation). Also, to perform statistical tests, χ^2 tests (between nominal variables), t-test for independent samples and ANOVA (between numerical and nominal variables) were used. Pearson's test was used to test correlations between numerical variables. It is noted that the data processing was implemented with the statistical package SPSS 20.0.

5. Results

5.1 Necessity to use ICT before the distance learning period

Utilizing the statistical analysis of the results and delving further into the citation of the results, the teachers of the sample show a relatively increased necessity for the use of ICT in the educational process before the distance education period (M.O.=3.21, T.A.=0, 94) (See Table 4).

Table 4: Necessity to use ICT before the distance learning period

	N	%	M.O.	T.A.	
Determine whether you considered it necessary to use ICT in the educational process before the distance learning period	Not at all	4	3,4%		
	Little	20	17,1%		
	Enough	51	43,6%	3,21	0,94
	Much	32	27,4%		
	Very much	10	8,5%		

In addition, the degree of response of the students to the use of educational material before the distance learning period is also considered to be quite high, with the average score of the relevant question being equal to 3.33 (T.A.=1.07) (see Table 5).

Table 5: Students' response to ICT use before the distance learning period

	N	%	M.O.	T.A.	
Determine the degree of student response to the use of instructional materials prior to the distance learning period	Not at all	4	3,4%		
	Little	26	22,2%		
	Enough	29	24,8%	3,33	1,07
	Much	43	36,8%		
	Very much	15	12,8%		

Regarding the degree of student response to the educational process using ICT in distance education, it is judged that this is quite high. It turns out that the average score of the relevant question is equal to 3.47 (T.A.=1.10) (see Table 6).

Table 6: Students' response to ICT use before the distance learning period

	N	%	M.O.	T.A.	
Determine students' response to the educational process using ICT in distance education	Not at all	0	0,0%		
	Little	32	27,4%		
	Enough	22	18,8%	3,47	1,10
	Much	39	33,3%		
	Very Much	24	20,5%		

5.2 Difference in student achievement in distance learning and need for teacher training for using ICT

In addition, it appears that the use of ICT in distance teaching was quite an important reason for differentiating the performance of students, as the average score of teachers' perceptions is equal to 3.21 (T.A.=1.04) (see Table 7).

Table 7: Difference in student achievement using ICT in distance learning

	N	%	M.O.	T.A.	
Determine whether there has been a difference in student performance using ICT in distance learning	Not at all	2	1,7%		
	Little	34	29,1%		
	Enough	31	26,5%	3,21	1,04
	Much	37	31,6%		
	Very Much	13	11,1%		

More necessary (M.O.=4.48, T.A.=0.75) is considered the training of teachers under the responsibility of the ministry regarding the use of ICT as one of the necessary teaching tools (see Table 8).

Table 8: Need for teacher training

	N	%	M.O.	T.A.	
How necessary is the training of teachers under the responsibility of the ministry regarding the use of ICT as one of the necessary teaching tools?	Not at all	0	0,0%		
	Little	3	2,6%		
	Enough	9	7,7%	4,48	0,75
	Much	34	29,1%		
	Very much	71	60,7%		

5.3 Necessity of using ICT before, during and after the distance learning period due to Covid-19

It emerges based on the relevant t-test for paired observations, based on teachers' opinions, the students' response to the use of ICT in distance education is shown to be increased compared to the period before distance education ($p=0.038$). At the same time, through the correlation of the above data, it is observed that in the cases where the students' response was increased during the period before the

distance education, it was also high during the distance education ($r=0.789$, $p<0.001$) (see Table 9 & 10).

Table 9: t-test for paired observations of students' response to ICT use before and during the distance learning period

Response before the distance education period		Response to distance education		p
M.O.	T.A.	M.O.	T.A.	
3,33	1,06	3,47	1,10	0,038

Table 10: Pearson correlation of students' response to ICT use before and during the distance learning period

	Response before the distance education period	Response to distance education
Response before the distance education period	1	
Response to distance education	0,789	1
	0,000	

Additionally, as observed from the results of the relevant correlations, the increased response of students to the use of ICT in distance education leads to an increase in the difference in their performance compared to the period before distance education ($r=0.753$, $p<0.001$), in an increased degree of their usefulness ($r=0.788$, $p<0.001$) and in maintaining the use of ICT by teachers ($r=0.362$, $p<0.001$). Of course, teachers' increased perception of a difference in student performance is associated with an increased degree of benefit from the use of ICT ($r=0.713$, $p<0.001$), prompting teachers to proceed with maintaining it ($r=0.390$, $p<0.001$). Finally, as expected, the higher the students' benefit from the use of ICT, the higher the degree of retention ($r=0.295$, $p=0.001$) (see Table 11).

Table 11: Pearson Correlation of Students' Response to ICT Use, Performance Difference, Benefit and Retention of Use

	Student response	Difference in student performance	Degree of student benefit	Degree of retention of ICT use
Student response	r	1		
	p			
Difference in student performance	r	0,753	1	
	p	0,000		
Degree of student benefit	r	0,788	0,713	1
	p	0,000	0,000	

Degree of retention of ICT use	r	0,362	0,390	0,295	1
	p	0,000	0,000	0,001	

5.4 Controlling for participant gender, age, level of academic education & years of teaching service differences

Using the t-test for independent samples, we investigate the existence of statistically significant differences in the mean scores of students' response to the use of ICT in distance education ($t=-0.748$, $df= 115$, $p=0.456$), the difference in performance them ($t=-0.554$, $df= 115$, $p=0.580$), their degree of usefulness ($t=-1.239$, $df= 115$, $p=0.218$) and the degree of retention of ICT use by teachers ($t=-0.611$, $df= 115$, $p=0.542$), based on their gender. As it turns out in each case the observed level of significance is higher than $p=0.05$ and therefore, the relative mean scores are not statistically significantly different (see Table 12).

Table 12: Independent samples t-tests of student response to ICT use, difference in performance, benefit, and retention of use by teacher gender

	Gender				t	df	p
	Male		Female				
	M.O.	T.A.	M.O.	T.A.			
Student response	3,38	1,16	3,54	1,06	-0,748	115	0,456
Difference in student performance	3,15	1,00	3,26	1,08	-0,554	115	0,580
Students' benefit level	3,46	1,18	3,72	1,10	-1,239	115	0,218
Degree of retention of ICT use	2,87	0,99	2,97	0,85	-0,611	115	0,542

Through the relevant One-way Analysis of Variance tests, it is observed that corresponding results arise, based on the age of the teachers, with the average differences of the scores of students' response to the use of ICT in distance education ($F_{3,113} =0.532$, $p=0.661$), of difference in their performance ($F_{3,113} =0.731$, $p=0.536$), their degree of usefulness ($F_{3,113} =1.593$, $p=0.195$) and the degree of retention of ICT use by teachers ($F_{3,113} =0.872$, $p =0.458$) not to be statistically significant (see Table 13)

Table 13: ANOVA tests of student response to ICT use, difference in performance, benefit and retention of use by teacher age

	Age								F	df	p
	25-35		36-45		46-55		56 και άνω				
	M.O.	T.A.	M.O.	T.A.	M.O.	T.A.	M.O.	T.A.			
Student response	3,29	1,16	3,58	1,22	3,56	0,95	3,43	0,79	0,532	116	0,661
Difference in student performance	3,21	1,21	3,38	1,08	3,09	0,82	2,86	0,69	0,731	116	0,536

Students' benefit level	3,47	1,13	3,75	1,28	3,75	0,95	2,86	0,90	1,593	116	0,195
Degree of retention of ICT use	2,92	1,00	3,08	0,94	2,81	0,74	2,57	0,98	0,872	116	0,458

Additionally, it is observed that there are statistically significant differences of the averages of the difference in the performance of students from the use of ICT ($F_{3,113} = 3,537, p = 0,009$), of their degree of usefulness ($F_{3,113} = 2,890, p = 0,025$) and of degree of retention of ICT use by teachers ($F_{3,113} = 2,961, p = 0,023$), based on their knowledge in special education. PhD holders show lower mean levels in each case (see Table 14).

Table 14: ANOVA tests of students' response to ICT use, difference in performance, benefit and retention of use based on teachers' knowledge in Special Education

Knowledge – Retraining in Special Education													
	Master's in Special Education		Doctorate in Special Education		Annual training or PEK in Special Education		No training in Special Education				F	df	p
	M.O.	T.A.	M.O.	T.A.	M.O.	T.A.	M.O.	T.A.	M.O.	T.A.			
Student response	3,35	1,26	4,43	0,53	3,74	0,92	3,22	0,80	3,50	0,71	2,225	116	0,071
Difference in student performance	3,19	1,08	4,43	0,53	3,30	0,97	2,83	0,89	3,00	0,00	3,537	116	0,009
Students' benefit level	3,56	1,20	4,57	0,53	3,91	1,04	3,13	1,01	3,50	0,71	2,890	116	0,025
Degree of retention of ICT use	2,84	0,91	3,71	0,95	3,17	0,94	2,61	0,72	3,50	0,71	2,961	116	0,023

Finally, it is judged that teachers with fewer years of experience consider to a greater extent that with the use of ICT in distance teaching, there is a greater difference in student performance ($F_{3,113} = 5,014, p = 0,008$), but also that they benefit from her ($F_{3,113} = 3,280, p = 0,041$) (see Table 15).

Table 15: ANOVA tests of students' response to ICT use, difference in performance, benefit and retention of use by teachers' years of service

	1-10		11-21		22 and more		F	df	p
	M.O.	T.A.	M.O.	T.A.	M.O.	T.A.			
Student response	3,64	1,21	3,39	1,07	3,19	0,81	1,417	116	0,247
Difference in student performance	3,47	1,15	3,15	0,94	2,67	0,66	5,014	116	0,008
Students' benefit level	3,76	1,23	3,68	1,13	3,05	0,67	3,280	116	0,041
Degree of retention of ICT use	2,95	1,01	2,98	0,85	2,76	0,77	0,409	116	0,665

6. Discussion & Conclusions

Concluding we underline the importance of the digital technologies in education domain which are very productive and successful, facilitates and improves the assessment, the intervention and the educational procedures via Mobiles which brings educational activities everywhere [24-33], various ICTs applications which are the core supporters of education [34-71], AI, STEM & ROBOTICS which raise educational procedures into new levers of performance [72-91], and games which transforms the education in a very friendly and enjoyable interaction [92-100]. Additionally the enhancement and combination of ICTs with theories and models of metacognition, mindfulness, meditation and emotional intelligence cultivation [101-146] as well as with environmental factors and nutrition [20-23], accelerates and improves more over the educational practices and results, especially in the support of students with disabilities domain and its practices like assessment and intervention.

More specifically from the presentation of the demographic and professional data, it follows that there is no significant difference between the participants in terms of gender, although women predominate among them. . Regarding the knowledge and further training of the respondents in special education, it appears that half of the participants hold a relevant master's degree and a minimal percentage of them hold a doctorate. A relatively significant percentage of teachers have attended annual training or PEK in special education, while a similar percentage of them have no knowledge or have not been retrained in special education. Teachers with fewer years of experience consider to a greater extent that with the use of ICT in distance teaching, there is a greater difference in the performance of students as a whole and especially those with special educational needs, but also that they benefit from it (use of ICT).

It is noteworthy that the teachers of the sample show a relatively increased necessity of the use of ICT in the educational process, before, during and after the distance education period. It is easy to conclude that using the multitude of technological means and educational software can facilitate the access and functionality of students with special educational needs, cultivate skills and promote their active participation in school activities. The acquisition of autonomy and cognitive skills is facilitated by the use of ICT with generalization in the daily life of students (Drigas & Kostas, 2014).

The degree of usefulness of all students from the use of ICT is judged to be particularly high, while the degree of retention of ICT use by teachers after the period of distance teaching shows a relative deficiency. A fact that reveals possible deficiencies in the logistical infrastructure of the units, in access to the internet, or the inability to adopt flexible learning programs due to the pressure, teachers face to comply with and implement the Analytical Study Programs. Such weaknesses and deficiencies are also found in the international literature and especially in research that examines through qualitative methods the difficulties faced by teachers of all levels at the time of the forced interruption of the daily operation of school units due to the pandemic (Thomas & Rogers, 2020) .

The teachers in the sample consider it necessary to readjust the curricula and enrich them with the use of ICT in the educational process in the post-covid era, while the training of teachers under the responsibility of the ministry regarding the use of ICT is considered equally necessary as one of the necessary teaching tools (Politis-Georgousi & Karabatzakis, 2019).

The increased response of students to the use of ICT in distance education leads to an increase in the difference in their performance compared to the period before distance education and to the maintenance of the use of ICT by teachers. Of course, teachers' increased perception of a difference in student performance is associated with an increased degree of their benefit from the use of ICT, prompting teachers to proceed with their maintenance. More generally, teachers' attitudes towards the use of ICT are the most basic factor shaping teaching, whether ICT is used or not (Smith et al. 2000).

There was no difference in teachers' perceptions taking into account the factor "gender", however teachers of younger age and higher level of education (e.g. master's degree) with training in ICT had a more positive attitude towards its implementation, before and after the period of distance learning, considering them a valuable tool for planning, implementing and evaluating a more effective teaching for students with special educational needs. The high level of knowledge of teachers in the use of PCs and in general in the use of technological media as recorded in the present research can lead to further enrichment of the educational process. Such a perspective and perception, as well as the development of ICT integration strategies in the school classroom with the use of a multitude of teaching and learning tools and software, also prevailed in corresponding previous research (Koufopoulos & Mouka, 2004).

Finally, the vast majority of teachers characterize the imperative need for teacher training, as a result of institutionalized educational policy, in ICT matters and consider it appropriate to readjust the Analytical Study Programs and enrich them with the use of ICT in educational teaching in the post-covid era, with aiming to create open flexible learning programs that will meet the needs of all students and follow the modern educational trend and society, a landmark of which is the abundance of recruits and the rapid development of technological achievements in every manifestation and field of people's life and activity.

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