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SOCIO-EMOTIONAL CHARACTERISTICS OF EMERGENCY DISTANCE TEACHING: A MIXED-METHOD INVESTIGATION IN GREECE

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ABSTRACT

Aim/Purpose	The study examines the teachers' perceptions towards a set of socio-emotional characteristics of distance education (DE) in primary and secondary schools during the Covid-19 pandemic. The examined characteristics include perceived joy, stress, effort/fatigue, isolation, inclusiveness, and collaboration/interaction.
Background	The transition to emergency distance education had a large socio-emotional impact on teachers. Recent evidence certifies an increase in mental health issues like stress and load. Studies also recognized online teaching barriers including difficulties in communication and interaction with students. This study focuses on the examination of the socio-emotional characteristics of distance education as perceived by primary and secondary education teachers in Greece. The study also investigates differences between primary and secondary education, teaching disciplines, and the role of individual factors like gender, age, and experience.
Methodology	The study used a mixed-method research design with closed-ended and open-ended questions on a sample of 845 teachers of primary and secondary education in Greece. The closed-ended questionnaire consisted of 19 items of socio-emotional DE characteristics, measured in a 5-point bipolar format. Exploratory Factor Analysis (EFA) was conducted on 16 items, indicating three components: (a) effort/fatigue, (b) inclusiveness, and (c) collaboration/interactivity. A single-item scale was considered for joy, fatigue, stress, and isolation. The

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finalized measurement model was evaluated in terms of item loadings, reliability of measures, convergent, and discriminant validity, with the help of the SmartPLS software. Descriptive statistics and percentages were calculated with the help of SPSS software. Because of the non-normal distribution of the data, non-parametric methods of Mann-Whitney and Kruskal-Wallis were performed to examine significant differences in teacher groups.

The qualitative part of the analysis was conducted on text data received from two open-ended questions, on a sample of 602 cases. The identified qualitative constructs were investigated through content thematic analysis focusing on the identification of the socio-emotional codes and references, excluding non-relevant themes and cases.

Contribution	The findings of the study contribute towards the deeper understanding of the teachers' psychological or emotional state during the early stage of the Covid-19 emergency DE, as well as on the role of individual and other factors like gender, age, teaching stage, and teaching subject. The results can be leveraged during or after the pandemic, to design pedagogical or psychological practices and strategies to encourage and facilitate the teachers' transition to DE.
Findings	<p>A measurement model of the teachers' perceived socio-emotional characteristics towards emergency distance education was developed and validated. The model includes the components of: (a) effort/fatigue, (b) inclusiveness, (c) collaboration/interactivity, (d) isolation, (e) joy, and (f) stress.</p> <p>The quantitative results indicated that teachers experienced increased levels of fatigue, and perceived DE as difficult and time-consuming. Teachers of primary education reported significantly lower levels of perceived collaboration/interaction than secondary teachers. Female teachers reported significantly higher scores of both joy and stress, while the youngest age groups expressed the highest scores of joy. The teaching subject also revealed differences in fatigue. Through qualitative analysis, this study also identified several socio-emotional thematic codes revealing the teachers' difficulties in interaction and communication with students as well as a set of emotional attributes like fatigue, joy, and stress.</p>
Recommendations for Practitioners	Teachers should modify their face-to-face teaching material and adjust it to online teaching principles, avoiding future load and frustration. Different approaches should be implemented in primary and secondary education and indifferent teaching disciplines. Also, teachers should be trained on DE-oriented digital skills, ICT competencies, and socio-emotional skills, e.g., by receiving psychological and socio-emotional support from experts. Strategies to decrease fatigue and stress, especially in synchronous teaching should be traced by schools and educators.
Recommendations for Researchers	The findings provide theoretical evidence on the teachers' socio-emotional attitude towards DE and their experiences in the first stages of the emergency remote education due to the Covid-19 pandemic.
Impact on Society	This research highlights the perceived DE characteristics and the barriers to online teaching during Covid-19. Schools, educators, and society should collaborate to provide awareness and opportunities for successful distance education practices.
Future Research	The survey is based on individual self-reported measures, and this restricts the deeper understanding of the findings. Hence, future research should extend this work by using different methods of data collection like for instance observations, course recordings, interviews, or focus groups.

Keywords emergency distance education, socio-emotional characteristics of distance education, teachers' emotions towards distance teaching, teachers' attitude towards distance education

INTRODUCTION

Due to COVID-19 health directives about social distancing, schools were closed worldwide shifting teaching from face-to-face to fully online. This sudden disruption of the education systems and the transition to emergency distance education (DE) had a large socio-emotional impact on teachers and on the way that they deal with the new rising educational challenges (United Nations, 2020; UNESCO, 2020a). In this situation, teachers had to adapt their teaching material and pedagogical practices and manage to use digital technologies and various pedagogical methods for online teaching ensuring that all students participate in education (European Commission, 2020; School Education Gateway, 2020).

Recent evidence certifies an increase in mental health issues like severe or moderate stress (Husky et al., 2020; Zilka, 2021), depression, and decreased emotional self-efficacy among teachers and students (J. C. Chen et al., 2020). Attempting to discover the main sources of DE adoption and psychological outcomes, research is directed towards the examination of DE socio-emotional characteristics like students' perceived stress and loneliness (Händel et al., 2021), communication, interaction, and collaboration (Chung et al., 2020; Tanis, 2020; Tsai et al., 2021), the teachers' and students' perceived acceptance (Romero Martínez et al., 2020), and their experienced enjoyment or stress (Abdous, 2019; Händel et al., 2021; Wettstein, 2020). Moreover, research shows that demographics, attitude, and prior experience in DE might be key factors of the successful adoption of DE (Abdous, 2019; Chung et al., 2020; Lawrence & Tar, 2020).

However, there appear to be few studies that examine the DE challenges from the teachers' point of view during this pandemic crisis. Most studies (Dennen et al., 2021; Ladendorf et al., 2021; Trust & Whalen, 2021; Yang et al., 2021) examine teachers' adopted teaching approaches, the provision of teacher support to students, and the areas they focused on to address the sudden transition to remote education. Also, similar research in the field (e.g., Akram et al., 2021; Zilka, 2021) focuses on the generic examination of teachers' attitudes towards DE without considering their individual factors on their attitude towards DE, the difference between teachers of different stages of education (e.g., primary versus secondary), or teaching subjects. Overall, further research is needed to provide clear insights on the teachers' attitude in different countries of the world during the Covid-19 emergency distance education. These findings can be useful for the research community, state governments, and educational institutions towards the design of teacher-oriented DE-transition strategies.

Motivated by the mentioned challenge, this study seeks to investigate the teachers' very first emotions and perceptions towards distance teaching at the beginning of the COVID-19 crisis in primary and secondary education in Greece. The study also examines the role of individual characteristics like gender, age, teaching subject, and teaching stage in the examined socio-emotional constructs. Qualitative analysis is also conducted to identify and confirm the perceived barriers of distance teaching during the first semester of Covid-19 in Greece. Overall, there is a need to answer the following questions:

Research Question 1: *What are the teachers' perceptions towards the socio-emotional characteristics of distance teaching during this pandemic?*

Research Question 2: *What are the differences in perceptions towards the socio-emotional characteristics of distance teaching between different groups of teachers?*

Research Question 2.1: What are the differences between teacher groups of different gender?

Research Question 2.2: What are the differences between teacher groups of different age?

Research Question 2.3: What are the differences between teacher groups of different educational background?

Research Question 2.4: What are the differences between teacher groups of different teaching experience?

Research Question 2.5: What are the differences between teacher groups of different teaching stage (primary, secondary)?

The findings of the study may contribute towards a deeper understanding of the teachers' psychological state during the early stage of the Covid-19 emergency DE. The results can be leveraged during or after the pandemic, to design pedagogical or psychological practices and strategies to encourage and facilitate the teachers' transition to DE.

This paper is organized as follows. The second section presents useful terms and definitions met in the manuscript. Then, the literature review is presented. The next section is the research methodology that explains the procedures of the instrument development, the experimental design, the data collection, and the data analysis methods. Then the results are presented in terms of quantitative and qualitative analysis. A discussion section follows to discuss the main findings and practical implications of the study. The last section presents the main conclusions and some future research directions.

USEFUL TERMS AND DEFINITIONS

Socio-emotional characteristics in teaching and learning include the personality, emotions, and values of socially participating individuals (Delahunty et al., 2014). The emotional dimension of the term usually regards the individuals' perceived states of the six basic emotions of enjoyment, sadness, anger, surprise, disgust, and fear (Ekman, 2003) or a subset of learning-related emotions (Pekrun, 2006) including stress, joy, boredom, and confusion. One other emotional dimension in DE is cognitive load and fatigue. Cognitive overload, which is also called 'mental fatigue', reflects a learning-related emotional state since it can affect engagement and performance (Atiomo, 2020). Teachers of higher education have reported high levels of fatigue and tiredness in the first months of the Covid-19 pandemic, mainly due to the number of online courses, visual load, and "Zoom" fatigue (Leiba & Gafni, 2021).

The social aspects regard interaction, collaboration, and communication. Early research had suggested that online participation, since it is not physical, should involve cognitive aspects, emotions, and interpersonal social relations (Wenger, 1998). To define interaction in the DE context, it usually regards actions via the keyboard in synchronous or asynchronous discussion boards, blogs, and emails (Delahunty et al., 2014). Interaction in DE can occur in many different forms like user-generated interaction and system-triggered interaction (Bates, 2019). In any of its forms, interaction plays a crucial role in student engagements and the success of the DE teaching approach.

Usually, collaboration in DE reflects the collaboration among students in the context of online collaborative activities through the DE-provided means (e.g., virtual rooms). Communication, on the other hand, regards the communication between students and teachers or students with their peers through the DE platform provided or other communication means like synchronous (e.g., chat rooms), and asynchronous (e.g., email, forum) ones (Bates, 2019). Online communication among peers has proved essential in facilitating preservice teachers' emotional support (Gleaves & Walker, 2010). According to Bates (2019), efficient communication is the greatest challenge and most essential component of the DE teaching quality.

LITERATURE REVIEW

Recent research has shown that the Covid-19 pandemic has affected human lives in almost every area, including health, management, and administration (Karakose et al., 2021a). In the context of education, several studies have investigated the socio-emotional impact of the Covid-19 pandemic and the forced quarantine on the general population (Brooks et al., 2020; Chao et al., 2020; Czeisler

et al., 2020; Salari et al., 2020), school administrators (Karakose et al., 2021a), or students (Händel et al., 2021; Husky et al., 2020; Odriozola-González et al., 2020). However, there do not appear to be many studies investigating the impact on teachers.

The shift to online learning platforms has proved to be difficult and frustrating for teachers. Teachers were confused, stressed, angry, sad, and unsure of their responsibilities and how to continue teaching from a distance. Also, many teachers were unwilling to return to face-to-face teaching because they were worried about virus infection (UNESCO, 2020b).

There was intense psychological pressure on teachers due to many reasons, such as fear of virus infection, fear of losing their job and salaries, increased workload and family responsibilities, unclear educational guidelines, poor digital infrastructure and digital educational resources, low digital skills, online teaching skills, and more (Burke & Dempsey, 2020; School Education Gateway, 2020; United Nations, 2020). According to Statista (2020), 57% of U.S. teachers were worried about being exposed to Covid-19 at work at much higher rates than other workers (21%). Teachers needed to protect their health as well as that of their family and their students.

In the European Union (EU), almost all schools have switched to some form of distance teaching since the beginning of the Covid-19 crisis. EU teachers considered that their workload and stress have increased, affecting their physical, psychological, and socio-emotional well-being (School Education Gateway, 2020). Irish teachers experienced high-stress levels due to the sudden school closure, their low skills in distance teaching and learning, the lack of support and collaboration from some parents, their concern about the health of their students and their own families (Burke & Dempsey, 2020). Also, over 60% of Austrian teachers felt (rather) burdened by the conversion of school teaching to home teaching (Austria, 2020). Teachers experienced medium to high-level stress due to virus infection risks as well as work requirements to deliver online teaching without adequate digital equipment, Internet connectivity, clear official guidelines, preparation, and training (Burke & Dempsey, 2020; Fox et al., 2020; Klapproth et al., 2020; MacIntyre et al., 2020). Also, teachers were stressed because they were required to manage stressed, isolated, and unmotivated students as well as overloaded parents without having digital skills to support their children (Klapproth et al., 2020). Furthermore, female teachers were experiencing significantly higher stress than male teachers (Klapproth et al., 2020; Oducado et al., 2020).

In addition to stress, teachers felt techno-fatigue (Estrada-Muñoz et al., 2020) and load (Zilka, 2021), having no time for professional development and working without any pleasure (Hawani & Chikha, 2020). Finally, other teachers had difficulties in establishing a cognitive and social presence with young teenagers during online learning (Rannastu-Avalos & Siiman, 2020).

All these previous studies investigated primary and secondary education teachers' perceptions regarding their emotions in general during the Covid-19 pandemic and the forced quarantine. However, there are not any studies that investigate the teachers' perceptions and emotions towards utilizing distance teaching during the Covid-19 pandemic and the forced quarantine. So, this study addresses this research gap.

METHODS

MIXED-METHODS DESIGN AND QUESTIONNAIRE

Combining quantitative and qualitative methods tends to provide an integrated view of a research problem (Creswell, 2012). Based on this approach, qualitative data carry greater value than quantitative data (Brewer & Hunter, 1989). One more reason for using a mixed-method design is that quantitative data can be used to triangulate, provide more evidence, and confirm the qualitative data from the same participants (Creswell, 2012).

The data in the present study were gathered through a questionnaire that contained both closed-ended and open-ended questions. The first section included closed-ended questions about the teachers' demographics, teaching subject, educational level, teaching stage, and teaching experience using digital technologies. The second section consisted of 19 closed-ended bipolar questionnaire items rated in a 5-point Likert style format, regarding the teachers' socio-emotional perceptions towards DE. The items were scaled from negatives to positives (e.g., from isolation to social or from discrimination to inclusion, etc.). The third part contained two open-ended questions regarding the difficulties and opportunities they met within the context of emergency distance teaching.

ITEM GENERATION

The questionnaire's closed-ended scaled items were selected mainly from previous studies and were reviewed by three experts in the field of Teacher Training and Technology Enhanced Learning (TEL) to eliminate any typos and difficulty in perceived words or expressions. In particular, the selection and formulation of the questionnaire items were based on previous studies in other contexts (B. Chen et al., 2017; J. C. Chen et al., 2020; Joo et al., 2018; Romero Martínez et al., 2020; Ullah et al., 2017; Zhou, 2016; Zhu et al., 2020) who attempted to quantify perception items by examining a set of various behavioral and cognitive characteristics, like perceived ease of use, interest, attention/engagement, enjoyment, satisfaction, motivation, self-regulation and more. According to these studies, socio-emotional characteristics towards DE can be quantified in merged and/or adjusted measurement models. In the context of this pandemic, this study focused on measuring the teachers' perceived: (i) effort and sense of fatigue, (ii) inclusiveness or generic sense of discriminations, (iii) collaboration and interactivity, (iv) isolation as opposed to sociality, (v) joy or pleasantness, and (vi) stress or anxiety, as opposed to relaxation, in distance teaching activities.

To measure perceived fatigue, inclusiveness, and collaboration/interaction, this study used 16 items, as emerged from the above-mentioned literature. However, a single-item question was applied to measure isolation, joy, and stress. The selection of one item per emotional variable is based on the condition that it is acceptable for the reliability of the model (Sarstedt & Wilczynski, 2009) and is applied for particular psychological (Hoepfner et al., 2011) or non-complex constructs that can be clearly and homogeneously perceived. Several works have used single-item questions to measure emotions (Ding & Chao, 2020).

PARTICIPANTS AND PROCEDURE

This study was applied to a sample of teachers in secondary and primary education in Greece, who participated in a National Project of "Advanced Training for the Utilization and Application of Information and Communication Technologies (ICT) in the Teaching Practice". The questionnaire for this survey was in the Greek language and it was created using the online software QuestionPro.

The link to the questionnaire was sent via email to 5,800 teachers and all participants were asked to consent for their volunteer and anonymous participation. Finally, 845 teachers completed the online questionnaire (631 females and 214 males), with an average age of 41-50 years old. Of those, 233 teachers worked in primary education, while 599 worked in secondary education (there were 13 non-defined cases). Data were collected according to the ethical standards of the institutional research committee.

Table 1 presents the socio-demographic characteristics of the participants including their experience in teaching using digital technologies.

Table 1. Socio-demographic characteristics of participants (n=845)

Age	n%	Teaching subject	n%	Teaching experience using digital technologies (duration in years)	n%	Educational level	n%
<30	-	Literary	6,98%	<5	24,50%	Bachelor	44.38%
40	14.6%	Natural Sciences	3.55%	5-10	37.51%	Master	49.11%
41-50	54.4%	Mathematics	4.38%	11-15	22.13%	Doctoral	6.15%
51-60	29.10%	Informatics	5.09%	15-20	11.01%	Other	0.36%
>60	1.90%	Primary education	27.57%	>20	4.85%		
		Foreign Languages	17.28%				
		Good Arts	4.85%				
		Physical Education & Health	12.78%				
		Educational Engineering	5.68%				
		Economics, Management & Social Sciences	6.51%				
		Earth Professions	2.13%				
		Special treatment	1.66%				
		Other	1.54%				

DATA ANALYSIS

The data were analyzed across a sample of 845 teachers participating in the survey. The normality test revealed non-normally distributed data ($p < 0.01$) across all the measured variables and the examined groups of teachers.

The respondents' profile and socio-demographic characteristics were extracted from the questionnaire software (QuestionPro) and no further processing was needed. For the components' extraction, the validation of the questionnaire, and the statistical analysis, the SPSS software and SmartPLS were used.

The qualitative part of the analysis was conducted on text data received from the teachers' answers to the open-ended questions, on a sample of 602 (456 female, 146 male) cases. The identified qualitative constructs were investigated through content thematic analysis (Hsieh & Shannon, 2005). The content analysis focused on the identification of the socio-emotional codes and references, excluding non-relevant themes and cases.

RESULTS

QUANTITATIVE RESULTS

The phase of quantitative analysis included: (i) the extraction of a set of distinct attributes (regarding the multi-item scale), (ii) the validation of the measurement model, (iii) the calculation of the descriptive statistic results, and (iv) the examination of significant group-based differences in the measured variables of distinct socio-emotional characteristics towards distance teaching.

EXTRACTING SOCIO-EMOTIONAL VARIABLES

The Kaiser-Meyer-Olkin (KMO) analysis confirmed the sample adequacy (KMO=0.925) and Bartlett’s Test of Sphericity (=8216.852; p=0.000) revealed the factorability of the data (Bartlett, 1954). Then, the Exploratory Factor Analysis (EFA) results (using the Promax extraction method) on the 16 measured items (isolation, joy, and stress were excluded to be studied individually) indicated three components and accounted for almost 71% of the variance. All final factor loadings were above the threshold of 0.5, meaning that the assigned items constitute good measures of their respective factors (Hair et al., 2010).

The extracted components consisted of three items each and were named based on their relevance to the item context and the research mode. The study identified the following constructs measuring the teachers’ perceived socio-emotional characteristics towards emergency distance education: (a) effort/fatigue (3 items), (b) inclusiveness (3 items), and (c) collaboration/interactivity (3 items). The final structure of the questionnaire is shown in Table 2.

Table 2. Closed and open-ended items to measure the teachers’ perceived socio-emotional characteristics towards emergency distance education

Closed-ended items	
Description: <i>Distance teaching (both synchronous and asynchronous) is:</i>	
Range [1,5]	
Item	Content (in bipolar format: [option 1, option 2])
Effort/Fatigue	
EE1	[Difficult, Easy]
EE2	[Tiring/Needs effort, Effortless/Without load]
EE3	[Time demanding, Time saving]
Inclusiveness	
IN1	[Biased/Discriminant, Inclusive/Without discriminations]
IN2	[Limited access, Open access, and use]
IN3	[Expensive, Cheap/Affordable]
Collaboration/Interaction	
FC1	[Individual, Collaborative]
FC2	[Restricted, Flexible/Personalized]
FC3	[One way, Interactive]
Isolation	
IS1	[Isolated, Social]
Joy	
JO1	[Unpleasant, Enjoyable/Funny, Pleasant]
Stress	
ST1	[Stressful/Causes anxiety, Calm]
Open-ended items	
Item	Content
1	What was the biggest difficulty (problem, obstacle) you encountered in distance teaching during the coronavirus crisis and how did you deal with it?
2	What was the biggest opportunity (advantage, benefit) you encountered in distance teaching during the coronavirus crisis and how did you take advantage of it?

VALIDATING THE MEASUREMENT MODEL

The measurement model was evaluated in terms of item loadings, reliability, convergent, and discriminant validity. As shown in Table 3, all items indicated reliability according to the Cronbach Alpha's minimum threshold of 0.60 (Hair et al., 2010). Also, all values of composite reliability were above the threshold of 0.70 (Gefen et al., 2000). Convergent validity was calculated through the average variance extracted (AVE) and counted above the minimum required value of 0.50 (Bagozzi & Yi, 1988). The discriminant validity was valid according to the criteria of Fornell and Larcker (1981), as shown in Table 4.

Table 3. Construct validity and reliability of the three EFA extracted components

	Cronbach's Alpha	Rho A	Composite Reliability	Average Variance Extracted (AVE)
Effort/Fatigue	0.789	0.958	0.862	0.676
Collaboration/Interaction	0.816	0.815	0.891	0.731
Inclusiveness	0.757	0.765	0.861	0.674

Table 4. Discriminant validity of the EFA extracted components

	Effort/Fatigue	Collaboration/Interaction	Inclusiveness
Effort/Fatigue	0.822		
Collaboration/Interaction	0.422	0.855	
Inclusiveness	0.487	0.563	0.821

DESCRIPTIVE STATISTICS

Overall, the teachers expressed a neutral attitude (3.00/5.00) towards the measured socio-emotional DE characteristics. However, it is worthy to mention the percentage of teachers who experienced lower or higher values. For instance, while 33% of the participants expressed a neutral state of joy, 43% of the respondents perceived distance teaching as highly unpleasant, while only 24% stated that they felt joy or pleasantness. This is important to understand that overall, teachers did not experience any joy during distance teaching in the period. Furthermore, several teachers stated that they find distance teaching quite difficult (33%) and time-consuming (51%).

Effort and fatigue received the highest scores since 52% of the respondents stated that they feel highly tired during distance teaching, as opposed to only 19% who stated no high levels of perceived effort or fatigue. Similarly, 53% of the participants perceived it as time demanding. Interestingly, only 28% of the respondents perceived distance teaching as not stressful while 37% perceived it as highly stressful. The stress-related results are quite encouraging since recent research has shown that most teachers and students experience high levels of stress in distance learning (Ajmal & Ahmad, 2019; School Education Gateway, 2020), and some possible factors might include the students' lower engagement or lack of motivation (Wettstein, 2020), as well as network and technical issues (Saadé et al., 2017).

Around 33% of the teachers perceived distance teaching as social and not isolating, as opposed to 36% who experienced isolation, and 32% who stated a neutral state. Around 38% of the respondents stated that they perceive DE as non-inclusive, as opposed to 27% who stated a neutral state, and 33% who perceived it to be quite inclusive. Finally, 36% perceived DE as collaborative and interactive, as

opposed to 20% who perceived it as an individual activity. The descriptive statistics for the measured constructs are shown in Table 5.

Table 5. Descriptive statistics results (n=845)

	Mean		Std. Deviation	Variance
	Statistic	Std. Error	Statistic	Statistic
Collaboration/Interaction	3.089	.035	1.030	1.062
Inclusion	3.097	.035	1.032	1.065
Effort/Fatigue	3.296	.034	1.012	1.025
Joy	2.835	.041	1.213	1.472
Isolation	3.060	.042	1.242	1.543
Stress	3.132	.041	1.199	1.440

GROUP-BASED DIFFERENCES

Since the distribution of the observed mean values does not provide clear patterns of emotions, it is essential to analyze them in terms of teachers' groups and examine the significant differentiation among them. For this, a list of group differences was measured based on the teachers' characteristics of gender, age, teaching subject, educational background, and teaching stage (primary or secondary education).

The gender-based analysis revealed significant differences (p -value < 0.05) in the emotional variables, where female teachers expressed significantly higher scores both of joy and stress. The results seem to differ from previous studies (Chung et al., 2020; Hung et al., 2010; Šabić et al., 2021) that reported no gender differences in attitudes towards distance teaching and ICT integration, implying that further research is needed in the context of gender-based differences in perceptions and emotions towards DE. A possible explanation could be based on the results of Karakose et al. (2021b) who identified that female school administrators experienced high levels of Covid-19 phobia, however, their levels of life satisfaction were higher than those of males. In any case, the gender-based analysis of this study might be biased due to the under-representation of male teachers in the sample.

The characteristics of inclusion and collaboration/interaction were perceived differently between primary and secondary education teachers. Teachers of primary education revealed significantly lower scores of perceived collaboration/interaction, whereas they revealed higher scores of inclusion. Interestingly, there were not any significant emotional differences between the two teaching stage groups, indicating that teachers in primary and secondary education experience equal levels of stress and joy. Figure 1 and Figure 2 present the differences in the mean values for the female and male teachers in every teaching stage (primary and secondary).

In addition, age revealed some significant differences in the emotional construct of joy. The highest scores were expressed by the youngest group of teachers (age: 31-40). Previous research (Chung et al., 2020; Hung et al., 2010) has not reported any significant age differences in attitude towards DE hence further research is suggested.

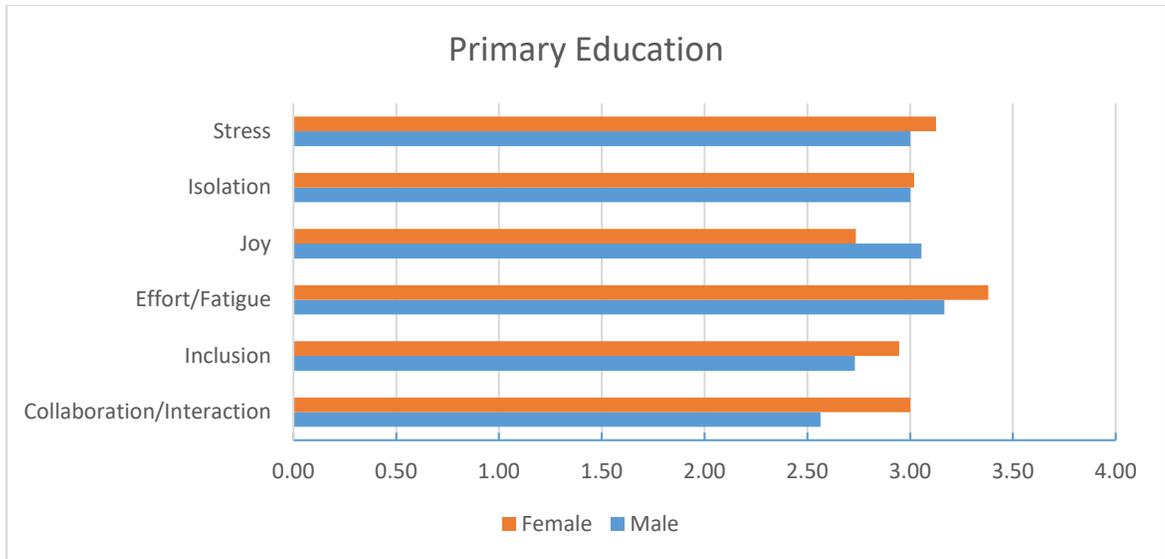


Figure 1. Differences in the mean values of the measured constructs between primary education teachers’ groups according to gender

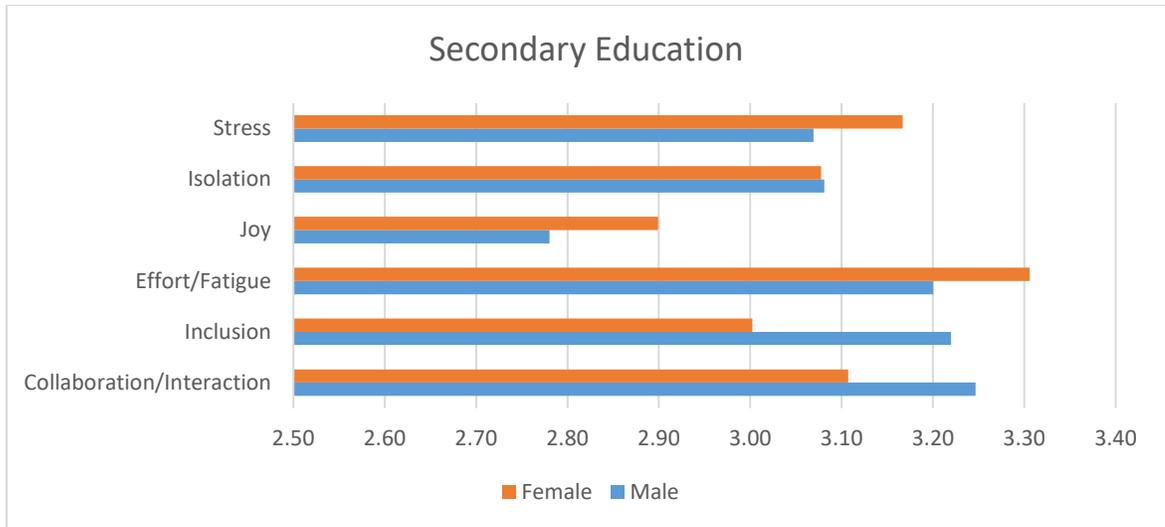


Figure 2. Differences in the mean values of the measured constructs between secondary education teachers’ groups according to gender

The results of the subject-based analysis showed significant differences across the constructs of effort/fatigue and inclusiveness. Teachers of Informatics and Educational Engineering in secondary education expressed the highest scores in both variables. The lowest scores of effort/fatigue and inclusiveness were observed in teachers of Fine Arts and those reported in the ‘Other’ option, most of whom were teaching subjects of Music, Religion, Theatre, or other “secondary” courses.

Educational level and experience in teaching using digital technologies did not reveal any significant difference among the measured constructs. All the results of the significant differences in the examined groups of teachers are shown in Table 6.

Table 6. Kruskal-Wallis/Mann Whitney tests among teacher groups (n=845)

	Effort/Fatigue	Inclusiveness	Collaboration/ Interaction	Isolation	Joy	Stress
Grouping variable: gender						
Mann-Whitney U	65407.500	62420.500	66338.500	63849.000	57800.500	61377.500
Wilcoxon W	264803.500	261816.500	265734.500	263245.000	257196.500	260773.500
Z	-.687	-1.660	-.384	-1.222	-3.255	-2.053
Asymp. Sig. (2-tailed)	.492	.097	.701	.222	.001*	.040*
Grouping variable: age						
Chi-Square	2.361	6.778	2.863	.180	8.923	3.642
df	3	3	3	2	3	3
Asymp. Sig.	.501	.079	.413	.914	.030*	.303
Grouping variable: teaching subject						
Chi-Square	21.916	22.525	14.212	7.471	10.357	11.578
df	12	12	12	12	12	12
Asymp. Sig.	.038*	.032*	.287	.825	.585	.480
Grouping variable: teaching stage (primary/secondary)						
Mann-Whitney U	67553.000	63049.500	59323.500	67812.000	66552.000	68531.500
Wilcoxon W	247253.000	242749.500	86584.500	95073.000	93813.000	95792.500
Z	-.720	-2.174	-2.599	-.651	-1.073	-.415
Asymp. Sig. (2-tailed)	.472	.030*	.009*	.515	.283	.678

*Significance at level $p=0.05$

QUALITATIVE RESULTS

The results of the thematic analysis confirm that DE highly depends not only on technology or digital infrastructure but also on a set of personal and socio-emotional attributes (Bozkurt & Sharma, 2020). Table 7 shows the coding categories that make up the two main themes of social and emotional DE characteristics as perceived by the respondents. The identified codes included the following: (i) collaboration/interactivity, (ii) communication, (iii) stress, (iv) effort/fatigue, (v) frustration/difficulty, and (vi) joy. Emotions related to stress and joy were explicitly mentioned in the text by the participants. As depicted, collaboration/interaction and communication issues were the most frequently expressed social DE characteristics, confirming previous studies that identified lack of student engagement and interactivity (Shernoff et al., 2017) as the main issue/difficulty in DE. This result is also reflected in the code of frustration/difficulty that was recognized 35 times in the provided feedback. Interestingly, the emotion of joy has not been widely met, contrary to stress that was identified in 42 cases, confirming previous research that highlights the increase of teachers' stress levels in DE. Barriers to communication and limited interaction have been pointed out as the main online teaching challenges during the Covid-19 pandemic (Akram et al., 2021). However, the findings of this study extend previous findings by highlighting and including teachers' emotional characteristics like stress, fatigue, and joy.

Table 7. Thematic analysis of socio-emotional statements in text-unstructured data (n=602)

Content area (theme/code)	References	Example(s)
Theme 1: Social		
Collaboration and interactivity (lack of/difficulty in)	102	<i>"Lack of students' collaboration and difficulty to engage them in the course."</i>
Communication (lack of/difficulty in)	129	<i>"Difficulty in communication with students. I had to solve it through both synchronous and asynchronous methods."</i>
Theme 2: Emotional		
Stress	42	<i>"Fatigue, lack of time, stress. Psychological pressure from the director of the school."</i>
Effort/Fatigue	36	<i>"High workload." "I needed to have a lot of patience and work many hours a day."</i>
Frustration/Difficulty	116	<i>"It was difficult for all of us to make the transition to DE in such a short time frame." "The emergent closure of schools found us unprepared in terms of creating online material and communicating with the students."</i>
Joy	7	<i>"There were several ways (digital tools and multimedia) to make the course more enjoyable/pleasant." "I felt happy because I managed to work digitally and help my students."</i>

Some respondents expressed a set of Covid-19 related effects on their psychology that further affected their teaching practice. For instance, one teacher stated that he/she was feeling insecure and isolated from friends and family. Working many hours in a day and walking a lot helped him/her to face such difficulties.

DISCUSSION

Our combined research findings extend previous findings by focusing on the socio-emotional characteristics of distance teaching during the pandemic. Like previous studies, the analysis in Greece also confirmed that during emergency distance teaching teachers feel techno-fatigue (Estrada-Muñoz et al., 2020), experience medium to high levels of stress (Burke & Dempsey, 2020; Fox et al, 2020; Klaproth et al., 2020; MacIntyre et al., 2020), and work without any pleasure (Hawani & Chikha, 2020). This research also highlighted the main difficulties that teachers confronted towards the DE characteristics of collaboration/interaction and communication with their students. Barriers in collaboration and communication were evident also in other countries like Pakistan (Akram et al., 2021) or Israel (Zilka, 2021). In summary:

- Although in the quantitative metrics the teachers expressed on average a neutral state in their emotions and perceptions toward emergency distance teaching, all findings revealed several significant polarities highlighting the characteristics that are essential to be considered. For instance, perceived joy was low-rated in the statistical results and was rarely identified in the text dataset. This finding implies that teachers mainly experienced neutral or negative

emotions during distance teaching, but not positive ones. This finding aligns with previous studies concluding that teachers do not enjoy distance teaching (Hawani & Chikha, 2020). Similarly, the emotion of stress or psychological pressure was met several times (compared to joy) in their open-ended answers and there was some significant percentage of the participants (mainly female teachers) who expressed high levels of stress. Similar outcomes were confirmed by previous studies (Burke & Dempsey, 2020; Fox et al., 2020; Klapproth et al., 2020; MacIntyre et al., 2020).

- Significant associations were detected between the examined dimensions and the teachers' individual factors of gender, age, teaching stage, and teaching subject. Interestingly, the youngest age groups expressed the lowest level of fatigue, and teachers of Informatics expressed the highest levels of fatigue. Also, as expected, teachers of primary education revealed significantly lower scores of perceived collaboration/interactions, and possibly this can be explained by the young age of their students and their difficulty to communicate and work digitally. Finally, the fact that female teachers expressed higher levels of both joy and fatigue suggests that further research is needed to deeper examine gender-based emotional differences in online teaching.
- The sense of effort or fatigue received higher scores in the statistical analysis, reflecting the case of techno-fatigue as explained in Estrada-Muñoz et al. (2020). Complementary, its detection in the thematic analysis validated the statistical result and confirmed that several teachers faced issues of mental effort, cognitive load, and extreme tiredness (fatigue) during distance teaching. However, the significant differences that were observed among the teaching subject groups (where some groups experience higher levels of fatigue than other ones) need to be examined further.
- Regarding the social attributes of DE, no themes or codes were detected in terms of inclusion and isolation. However, the thematic analysis revealed several cases of negative perceptions towards communication and collaboration/interaction with/among the students and the professors. The identified issue was not clear in the statistical analysis since teachers of primary education gave lower scores to collaboration/interactions compared to the teachers of secondary education who expressed a more positive experience. One possible reason is the fact that young students lack digital skills and have difficulty concentrating for a long time in front of a screen without human contact. This is also explained by recent evidence that students with lower digital skills tend to experience higher levels of stress and overload (Händel et al., 2021). So, deeper analysis is needed in the future to exploit the reasons or other DE characteristics that make teachers of primary education negatively perceive communication and collaboration/interaction in emergency distance teaching.

PRACTICAL IMPLICATIONS

Overall, teachers face several challenges, including psychological pressure, in emergency distance teaching during the pandemic, hence they need psychological support. Teachers should develop their ICT and distance teaching skills to eliminate their perceived levels of fatigue or stress. Specialized training on DE platforms and tools (Reimers & Schleicher, 2020; UNESCO, 2020c) would assist teachers in increasing their ICT-related self-efficacy levels or motivation and relieve them from the overwhelming sense of frustration. Training is also needed to introduce tools and methodologies that increase the students' engagement and the sense of joy both for teachers and students, like for instance teaching videos (Harrison, 2020), game-based learning (Hernández-Ramos & Belmonte; Wang & Tahir, 2020), and more. Tools and methods of collaborative learning (J. C. Chen et al., 2020) and efficient communication should also be introduced. Similar research in different countries like Pakistan (Akram et al., 2021), emphasize the need for teacher professional development opportunities to develop their ICT competencies and successfully teach online. Assessment methods for both students' and teachers' readiness and ability to learn and teach through distance education (e.g.,

Tzafilkou et al., 2021) can be very useful at the early stages of the ERE transition to support ‘digitally weak’ teacher groups and facilitate the procedure.

Teachers should be trained on socio-emotional skills as well. Psychological and socio-emotional support from experts is essential (UNESCO, 2020c) to assist teachers in avoiding high levels of stress and anxiety as well as help them to manage their time and maintain a healthy working rate.

Emotional training to teachers has shown a positive effect both on their teaching practice and their relationships with their students (Dolev & Leshem, 2017). Also, peer support activities should be performed among teachers, since it is shown that they are perceived positively in the context of DE (Rahman, 2019). Inclusion and non-discrimination should also be supported in DE sessions and learning environments (Di Pietro et al., 2020; UNESCO, 2020d).

School strategies to decrease the teachers’ load and stress should be highly considered. For instance, as suggested in Zilka (2021), online student groups in synchronous sessions should be organized in small groups of five to ten students. Similarly, different teaching approaches should be adopted in primary and secondary education, as well as in the design of different teaching subjects/courses. For instance, shorter lectures could be designed for primary students and interaction/engagement techniques should be highly adopted, inspired from collaborative learning and game-based learning to engage young students. Also, Science, Technology Engineering, and Mathematics (STEM) related disciplines should be designed online differently than other theoretical disciplines. Overall, experts in the field of DE (Bates, 2019) strongly suggest that teaching online must be different from a face-to-face approach to succeed. For this, teachers also need to understand that to avoid future frustration and load, they need to modify their teaching material.

CONCLUSIONS

The sudden and ‘hard’ transition to DE has caused psychological pressure and general frustration in the teachers’ community. The study was mixed methods. The data gathering was by survey with open and closed questions applied on 845 teachers in primary and secondary education in Greece, to examine their emotions and perceptions towards emergency distance education.

This study is different from previous ones since it conducted a large-scale survey analysis on a sample of teachers who were involved actively in the distance education process during the first months of the pandemic. Overall, this study designed and validated a measurement model of the teachers’ perceived socio-emotional characteristics towards emergency distance education. The model includes the components of: (a) effort/fatigue, (b) inclusiveness, (c) collaboration/interactivity, (d) isolation, (e) joy, and (f) stress.

The quantitative analysis showed that the emotion of effort/fatigue was expressed frequently among the participants. Female teachers expressed higher levels of joy and stress than male teachers in both primary and secondary education stages. Also, teachers of primary education expressed lower levels of collaboration/interaction but higher levels of perceived inclusion during DE compared to teachers of secondary education. Joy for DE was expressed higher in groups of younger teachers. Finally, secondary stage teachers of the subjects Informatics and Educational Engineering expressed the highest levels in effort/fatigue and inclusiveness, while teachers of Fine Arts were the lowest.

The qualitative analysis on text-based feedback indicated that teachers expressed several teaching challenges, confirming their high levels of fatigue and stress as well as their difficulties in communication and interaction with students.

The findings of the study provide theoretical evidence on the teachers’ socio-emotional attitude towards DE during the pandemic and can contribute towards the design of effective teaching and teacher training strategies in the context of DE and its socio-emotional dimensions.

The main limitation of this study regards the generalizability of the findings. The survey was conducted on a sample of Greek teachers and several local and cultural factors have possibly affected the results. Similar surveys should be conducted in different locations to get more insights and compare the results.

A second limitation is that all the primary and secondary education teachers used the same platform for synchronous teaching (as dictated by the ministry), and hence the platform's particularities and some technical issues that emerged at a national level, maybe have affected the participants' perceptions and emotions.

Finally, the survey is based on individual self-reported measures and hence it is prone to bias. Future research should extend this work by using different methods of data collection, for instance, observations, course recordings, and focus groups.

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