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Post-pandemic pedagogy: Emergency remote teaching impact on students with functional diversity

Spyridon Tzimiris[1] · **Stefanos Nikiforos**[1] · **Katia Lida Kermanidis**[1]

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Abstract

The Covid-19 outbreak caused transition from face-to-face teaching to Emergency Remote Teaching (ERT). Due to the hastily and disorganized implementation of ERT considerable difficulties were caused for all the students. Aim of the present study was to investigate (i) parents' views of students with functional diversity regarding ERT during the Covid-19 pandemic and (ii) how their children's functional diversity affected participation in ERT. ERT proved to be an even greater challenge for those students, who faced various learning, psychological and technical problems that further hindered the learning process. In the current research, the views of 12 parents of students with functional diversity were collected with semi-structured interviews. A Modern Greek dataset of qualitative humanistic-linguistic data was created. A novel type of data analysis, combining qualitative descriptive analysis by hand and Artificial Intelligence (AI)-based linguistic analysis was performed on the interview text. Results revealed (i) how those students responded to ERT, (ii) the way that their functional diversity affected their attendance on the online courses and (iii) how their parents evaluate the educational dimension of ERT along with any changes noticed in their children's psychological and emotional state. Parents' evaluations disclosed the overall negative impact of ERT on their children and presented their suggestions for meeting their children's special needs in case of ERT appliance in the future. The current research is considered significant as it investigates ERT impact on K-12 students with functional diversity during the Covid-19 pandemic, based on authentic humanistic data. Our research contributes on (i) the creation of this kind of dataset, as this particular group of students is hard to come by and their collection constitutes a significant contribution and (ii) the two-fold way data analysis methodology, which is novel, combining linguistic and qualitative processes (semantic and sentiment analysis), providing important findings.

Keywords Covid-19 · Students with functional diversity · Information and Communications Technologies (ICT) · Emergency remote teaching (ERT) · Inclusive education · e-learning

Extended author information available on the last page of the article

1 Introduction

During Covid-19 outbreak in Greece (March 2020) it was hastily decided to implement Emergency Remote Teaching (ERT) at all levels of education. Thus, the unprecedented educational conditions required transformation of teaching and learning processes. Use of digital technology, which until then aimed at enhancing traditional methods, played a leading role in the teaching practice.

In the first phase of the pandemic (March 2020-June 2020), ERT was implemented both synchronously and asynchronously. Since ERT implementation was optional, some of the educators did not participate. Online courses aimed mainly at course repetitions. In the second phase of the pandemic (November 2020-May 2021) ERT implementation was mandatory and online courses aimed at teaching of new course material. Online courses were implemented with the video conferencing tool of Webex[1]. They were conducted on a daily basis (08.30am-14.10pm for the Secondary schools and 14:10pm-17:20pm for the Primary schools). Course duration was 40 min for the Secondary schools and 30 min for the Primary schools. Course breaks of 10 min were provided in between. Students were taught all the courses, just like in their school.

In the second phase, disregarding coronavirus incidents, it was decided that Special Education schools of all levels (Kindergartens, Primary and Secondary) would function physically, as it was judged that special education students would be disproportionately burdened by ERT. However, in General Education schools, where many students with functional diversities attend, ERT was implemented without taking into account their specific needs. As a result, those students found it difficult to attend. All those children have been diagnosed by the Differential Diagnosis, Evaluation, Counseling and Support Centers. Before the Covid-19 period, when courses were conducted with physical presence, those children had the ability to be supported by a parallel support teacher in their physical classroom. During ERT the parallel support teacher attended the virtual classroom and provided assistance to the students with functional diversity remotely.

The purpose of this study was (i) to investigate parents' views of students with functional diversity regarding ERT during the Covid-19 pandemic and (ii) how their children's functional diversity affected their participation in ERT. Contribution of our work lies in the fact that it highlights the ERT experience for both the parents and the children. Shortcomings and weaknesses faced by those students during the ERT period were revealed, while the common points and differences in comparison with other countries can also be highlighted.

Many research approaches have been conducted since ERT was universally implemented for students with functional diversity. Challenges faced by those students as well as the little focus they received was highlighted (Bond, 2021; Denisova et al., 2020). Most research approaches focused on the teachers' attitudes and opinions (Alqahtani, 2021; Bedaiwy et al., 2021; Myers et al., 2021; Schuck et al.,

[1] https://www.webex.com/.

2021; Stambekova et al., 2021, 2022). Existing research in the field varies in sample size targeting specific population, while others refer to the effect of ERT on specific subjects (Bond, 2021; Lambert & Schuck, 2021; Lambert et al., 2021; Roitsch et al., 2021). To the authors' knowledge, there is only limited relevant data focusing on the children's experience and the opinions of their parents, who had an essential role in the online courses. Most of the researches focus on higher education students. Available data for K-12 students with functional diversity is minimal. It was therefore imperative to collect and thoroughly analyze the parents' views. The current research is one of the first in this field. Our contribution lies in (i) the use of authentic humanistic data about students with functional diversity during the ERT period and (ii) our method of analysis carried out in an innovative way combining qualitative analysis by hand and AI-based analysis using NVivo software[2].

2 Literature review

Although much research regarding ERT has been reported, literature for K-12 students with functional diversity is limited. The point of view of the children and their parents is not sufficiently shown. Our literature review mainly focuses on K-12 students.

2.1 Inclusive education

Inclusive education is based on the inalienable right of all the children to attend the same schools, whether they have special educational needs or not (Florian, 2015). Thus, they gain equal access to learning, without exclusions (Gupta & Rous, 2016; Hess & Zamir, 2016; Urton et al., 2014). Especially today when diversity and heterogeneity prevail in the student population, such as students with behavioral problems, students with learning difficulties, foreigners, refugees, students with physical disabilities and special needs, inclusive education is more necessary (Stylianou, 2017).

In inclusive education, school adapts to the needs and particularities of the students. It formulates appropriate teaching practices and establishes social justice in the school environment, ensuring quality education for all the students (Hosford & O'Sullivan, 2015). Specialized teaching staff (specialist support teachers, speech therapists, school psychologists and nurses) that provides support makes it easier for students to overcome the constraints that limit them (Ainscow & Sandill, 2010; Hogg & Vaughan, 2010; King-Sears & Bowman, 2011). In general, smooth educational and social integration of all the students is promoted, with the co-existence of students with or without functional diversity and an inclusive culture is cultivated (Laws & Kelly, 2005; Hess & Zamir, 2016).

[2] https://www.qsrinternational.com/nvivo-qualitative-data-analysis-software/home.

2.2 Students with functional diversity

In Greece, the inappropriate term *"retarded child"* was used for the first time in 1937, defining a person who is mentally and humanitarianly disadvantaged. Establishment of the first Special School was then envisaged (Zoniou-Sideri, 1998). Until the 1970s, the education of children with functional diversity was undertaken by charities and welfare institutions based on private initiative, while special care was provided mainly for the education of the blind children. A very important step was taken in 1981, when the education of children with special needs was undertaken by the Ministry of Education in special educational structures (Lambropoulou & Panteliadou, 2000), which, however, instead of achieving the integration of those children, led to their stronger stigmatization. Gradually, initially in 1985 and until 2000, the main goal was the inclusion of students with functional diversity in general education schools in special classes. In 2000 it was defined that people with functional diversity are those who *"have significant learning and adjustment difficulties due to physical, mental, psychological, emotional and social peculiarities"* (Zoniou-Sideri, 2000). Those people may have mental disabilities, immaturity, severe vision, hearing, speech and language problems, special learning difficulties such as dyslexia, numeracy, complex cognitive, emotional and social difficulties and may have autism and other developmental disorders (Zoniou-Sideri, 2000). For the education of those people, from then until today, various terms have been used alternatively, such as *"integration"*, *"embodiment"*, *"inclusive education"*, *"convergence"*, *"education for all"* and *"co-education"*, all of which are based on attending common courses by students with and without functional diversity in the formal school (Lambropoulou & Panteliadou, 2000). Thus, those children with severe learning disabilities may not be able to learn at the usual pace in the conventional educational methods learned by their peers. For this reason, specialized and individualized teaching is provided by teachers of parallel support, in order to overcome weaknesses related to the comprehension and production of written and oral speech, with mathematical skills as well as with problems of concentration and attention and routine disruption (Schuck & Lambert, 2020). Through inclusive education in general education schools, there are greater opportunities for improvement in relationships with classmates (Cole, 2006; Oswalt & Swart, 2011), teachers are more satisfied (Alnahdi et al., 2019) and the parents of those children feel justified (Emeagwali, 2009).

2.3 Students with functional diversity and new technologies

Rapid technological development undoubtedly affects education in general. Use of educational applications supported by appropriate pedagogical approaches (Laguador, 2014), determines the learning path of all the learners (Moore & Kearsley, 2012) and secures the right of children with functional diversity to access appropriate and equal education (Panteliadou & Argyropoulos, 2011). Use of new technologies strongly supports learning of children with functional diversity (Hermans et al., 2008; Perelmutter et al., 2017), providing support to courses (Reed, 2020), stimulating their interest and boosting their self-esteem (Alexander-Passe, 2006; Skiada

et al., 2014). In the enriched digital educational environment, learning horizons and recruits of these children are expanded (Bjekić et al., 2012), especially when the teaching material is accessible and properly designed (Alsobhi & Abeysinghe, 2013).

Integrated e-learning applications offer valuable educational opportunities to all groups of people with functional diversity (Alsobhi & Abeysinghe, 2013) and build an inclusive knowledge society (Bozkurt et al., 2015). For example, deaf students communicate with chat programs, the blind students read with the support of special text applications, and the dyslexics overcome their weaknesses through grammar and spelling programs or the use of audiovisual reading or Text-to-Speech (TTS) applications. Thus, they manage to increase their communication skills using interaction and communication tools (Williams, 2005) and gain greater autonomy (Fernández-López et al., 2013).

2.4 Emergency remote teaching

E-learning, either in its autonomous form or in its supplementary form, is a widespread practice in most countries of the world, while in Greece it was institutionally applied only in Higher education, with the most typical example being the Hellenic Open University (H.O.U.). The situation changed rapidly for Greek education due to Covid-19, when ERT was implemented at all levels of education (Nikiforos et al., 2020). The multifaceted and flexible educational process of e-learning, with the use of "modern" and "asynchronous" technological means, manages to overcome the entanglements of conventional education, activates the learner (Choi, 2016; Holmberg, 2002; Zygouris & Papadopoulou, 2021) and creates equal educational opportunities for all those interested in learning, interacting with the provided teaching material (Race, 2002).

In e-learning educational material is easily accessible, simple and easy to use (Wicks, 2010), while at the same time it provides students the opportunity to study and process it systematically and repeatedly (Barbour & Reeves, 2009). To improve students' learning and cognitive ability, it adapts to their specialized educational needs (Ismail et al., 2012) and utilizes Web 2.0 online tools that provide diversity (Jimoyiannis et al., 2013). Using sparse layout, colorful pictures and interactive videos, it particularly attracts young students and motivates them to get involved in the educational process (Palloff & Pratt, 2007). Teaching practice with the use of technology-based tools could have a positive impact on students' creativity, increasing their motivation to create and develop new forms of social interaction (Kolyvas & Nikiforos, 2021). According to Wopereis et al. (2010), students participate more actively in the discussions that take place in the online classroom.

Distance between the teacher and the student is bridged with the use of technological means. New technologies and the internet facilitate two-way communication between stakeholders (Moore & Kearsley, 2012), in a user-friendly and child-friendly environment, since the use of mobile devices, such as tablets and smartphones, gives a different and more attractive dimension in education (Wicks, 2010). In addition, it is used in parallel with the communication through the educational platforms and

the familiarization of students with the social media, which help towards direct communication in a friendlier and more intimate way (Heggart & Yoo, 2018; Ismail et al., 2012). Furthermore, parents' role must be effective on how to create effective e-learning environments (Bhamani et al., 2020). Also, in a Virtual Learning Community the teacher's role is important, as his/her active participation contributes to both the collaboration process and the learning outcomes (Nikiforos et al., 2018; Tzanavaris et al., 2021).

2.5 Emergency remote teaching and students with functional diversity

ERT being hastily implemented around the world during the Covid-19 pandemic had a significant impact to the students (Aliyyah et al., 2020; Habler et al., 2020; Mailizar et al., 2020; Misirli & Ergulec, 2021; Özer, 2020; Schuck & Lambert, 2020; WHO, 2020). ERT, along with its educational and pedagogical implications, had serious psychological consequences and led to social isolation, even in countries, where the appropriate infrastructure existed and the system was properly prepared (Liu et al., 2020; Schwartz et al., 2020). In countries with no previous experience in digital education and unavailable required resources, many students were unable to attend ERT due to key shortcomings such as accessibility, digital equipment and digital skills (Adnan & Anwar, 2020; Aliyyah et al., 2020; Pollock, 2020; Özer, 2020; Zhang et al., 2020). Additional support and encouragement were necessary for those students in order to have equal opportunities in an inclusive school (Averett, 2021; Kim & Fienup, 2022; Tremmel et al., 2020).

Especially for students with functional diversity, any efforts made to meet emerging needs in the short time it took the transition from the physical to the digital classroom were spasmodic and partially effective. Many studies note the contribution of the support, feedback and the computer skills and knowledge to the successful transition to e-learning procedure (Bond, 2021). A recent study in South Africa by Ngubane-Mokiwa and Zongozzi (2021) examining the impact of Covid-19 e-learning on students with disabilities highlighted the need for additional support needed by these students to make the most of their comparative ERT in times of crisis. For those with hearing and vision problems, mobility disorders, communication and learning difficulties, dynamic and inclusive digital learning environments are required, without restrictions and exclusions. Substantial interventions have been made in many countries to meet the needs of vulnerable students and their families. In Costa Rica, educators attempted to adapt online educational material to make it accessible to students with disabilities (McAleavy et al., 2020). In Jamaica, support was provided to vulnerable families through the organization of a parental hotline network to resolve any issues that arose (McAleavy et al., 2020), while in Turkey, a helpline was provided to provide psychosocial support to students and their families (Özer, 2020).

In the case of students with functional diversity during the pandemic, literature is limited so far, as it is an emerging research field. Those few researches agree that the educational systems were not properly prepared, since there was no timely strategic planning (Stampoltzi et al., 2020). Face to face learning is preferred for the teaching,

learning and pedagogical function of the school, as confirmed by the teachers and the students (Baytiyeh, 2019; Stachteas & Stachteas, 2020). The comparative advantage of ERT is recognized either as a complementary learning tool or for circumstances where reasons of force majeure keep schools closed (Baytiyeh, 2019). Therefore, it is good to be always on alert if online courses lose social interaction that ensures face-to-face contact leading to isolation and psychological burden.

The most relevant research regarding ERT impact on students with functional diversity was conducted by Tomaino et al. (2022), in the USA, (Southern California), immediately after the suspension of schools due to Covid-19 pandemic. Researchers examined the views of the parents of children with functional diversity, as well as their special educators, regarding the ERT courses they attended. Students with functional diversities participated in group courses by the general educator in the morning schedule and in an individual course with the special educator in the afternoon. The personalized online course was evaluated more positively, as the students collaborated more efficiently, because there was flexibility to adapt to their needs or to be interrupted due to their needs. Also, there was no pressure from the classmates for better and faster learning efficiency, while immediate and automated feedback was provided. However, because the students were experiencing severe developmental disabilities and high behavioral needs, presence of a parent next to them was required throughout the courses in order to guide and assist them. This made it difficult for many parents who did not have time or familiarity with the use of digital media.

The research of Battistin et al. (2020) was conducted in Italy and focused on children who were blind or severely visually impaired. The research involved professionals being in their care and education such as psychologists, therapists, teachers, as well as parents of children. Research revealed that ERT applied to children with functional diversity was an unprecedented process and hindered their developmental improvement. Therefore, with the consent of their parents, a specialized visual support program built by the Robert Hollman Foundation-Distance Support Project (RHF-DSP), based on software adapted to the needs of children, was piloted for 106 children. This program was created in order for children with developmental disorders (autism spectrum disorder, attention deficit hyperactivity disorder) to continue to attend the services offered to them (Trabacca & Russo, 2020). It is really important for them to continue receiving those services because children with visual impairments are vulnerable to regressions (Dale & Sonksen, 2002; Vervloed et al., 2020) and developmental risk (Fazzi et al., 2010; Molinaro et al., 2020). At the same time, both the children and the professionals were provided technological equipment with special software installed and training on electronic platforms use. After the end of the pilot program, the parents were happier and evaluated positively the experience, because their children were assisted, while the professionals were pressured to create personalized digital educational material that required a lot of effort and time.

Frankova (2020) studying the impact of Covid-19 in people with autism, learning disabilities and mental health problems in the United Kingdom, concluded that those people experienced more intense exclusion and social isolation. According to the research, their caregivers found that because they were severely affected by the

effects of Covid-19, they were not easily manageable during that time and therefore individualized needs assessments and more intensive care were required.

Researches by Courtenay and Perera (2020) and Embregts et al. (2020) studied the effects of Covid-19 on people with intellectual disability. These people follow their own routines and because of the pandemic they were anxious and upset because this daily routine was overturned. Suspension of schools aggravated their psychological problems and led to regressions that could not be treated due to their inherent vulnerability and isolation. The pressure felt by children with functional diversity had a serious impact on their parents and caregivers. According to the research, families also received a lot of psychological pressure and needed additional support.

Unlike previous work, our research attempted to focus exclusively on children with functional diversity and to highlight the way in which they responded to these special learning conditions. More specifically, the aim was to reveal how their functional diversity affected their attendance in school courses, to highlight how they responded in the material and technical requirements, in the psychological/emotional and educational conditions. Suggestions were also sought which could be listened to and implemented, in order to develop the ERT conditions for students with functional diversity in the future.

2.6 Sentiment analysis

Sentiment analysis is one of the methods for content analysis. Emotion can be calculated as a variable whether it has a positive or a negative or even a neutral connotation. (Giachanou & Crestani, 2016). A word can have both a positive and a negative sentiment label. Polarity can be extracted depending on word collocation. Sentiment analysis can measure the opinions and attitudes of people about a topic (Antonakaki et al., 2021; Kim & Hovy, 2004). Natural Language Processing (NLP) can be used for sentiment analysis, including preprocessing procedures such as tokenization, stemming, lemmatization, stopwords removal, part of speech (POS) tagging, being necessary for text normalization before data import (Hasan et al., 2019). There are efficient tools performing those tasks, with minimal effort. The tool we used in our research is Nvivo software. This procedure is presented in detail in Section 4.2.

3 Research methodology

3.1 Research questions

Based on the above mentioned recent bibliographic review, the following research questions were formulated.

1. How did the students respond to the challenges of ERT? (transfer from physical to the virtual classroom: digital literacy, internet connection, digital equipment)
2. How did functional diversity affect their participation in ERT?

3. How did their parents evaluate the educational dimension of ERT?
4. Were there any differences noticed in the psychological and emotional state of students with functional diversity during ERT?

In order to answer the aforementioned research questions, 4 research topics were formed:

- Material and Technical Conditions
- Educational Dimension
- Psychological/Emotional Dimension
- Learning Difficulties and Emergency Remote Teaching

The current research examines assessments of the parents of children with functional diversity regarding ERT effectiveness and reflects their suggestions for meeting special needs of their children. In this qualitative research, the views of 12 parents of students with functional diversity, who attended ERT in General Education classes, were collected with semi-structured interviews (Cohen et al., 2002). A dataset consisting of 14,827 words of qualitative humanistic-linguistic data in Modern Greek was created from these interviews.

For the design of the research and the compilation of the questionnaire used in the interviews, a thorough review of the relevant international literature was made (Paraskevopoulou-Kollia, 2008).

3.2 Tool

Semi-structured interview was the selected method tool, as it moves more freely than the structured one and results in rich and authentic data (Evans, 2018). In order for the parents to reveal their authentic experiences during the ERT process, a relationship of mutual respect, parity and honesty prevailed in the interviews (Adams, 2010). Both the wording and the order of the predefined questions in each interview were differentiated and dynamically adapted to what emerged during the discussion. Questions were formulated in a different order or reworded, mainly to ensure clarity. Collection of the data took place from June to August 2021. The aim was to collect the data as immediately as possible in order for the interviewees to present as fully as possible what happened during ERT. For this reason, data collection was performed one month after returning to face-to-face learning. Average duration of the interviews was 45 min and they took place via skype, telephone or in person with the interviewee. In all cases where the interviews were conducted face to face, health measures according to the health protocol of that period were followed. Interviews were recorded using the mobile phone recording application. All the parents completed, filled in and signed a consent form to ensure protection of their personal data obtained. Data of both the respondents and the children will remain confidential.

After a thorough review of the relevant literature on the impact of ERT on students with functional diversities, a list of questions was formed. Questions are presented in the Appendix 1.

Table 1 Children's profiles

Parent's name*	Gender	Age	Functional diversity
John	Male	5	Speech Disorder (stuttering, dysarthria) Physical Disability
George	Male	7	General Learning Difficulties (GLD)
Thomas	Male	8	Attention Deficit Hyperactivity Disorder (ADHD)
Jacob	Male	8	Dyslexia, Developmental Dyscalculia
Niki	Female	9	General Learning Difficulties (GLD)
Alex	Male	13	Dyslexia, Speech Disorder (stuttering)
Joseph	Male	5	General Learning Difficulties (GLD)
Michael	Male	10	General Learning Difficulties (GLD)
David	Male	11	Attention Deficit Hyperactivity Disorder (ADHD), Aggressiveness
Robert	Male	10	General Learning Difficulties (GLD)
Mary	Female	10	Vision Disability
Anna	Female	14	Attention Deficit Hyperactivity Disorder (ADHD)

* Parents' names have been pseudonymized

3.3 Data collection

Prior to the interviews, all respondents signed the informed consent form to ensure that both their own and their children's personal information were pseudonymized. They were also informed that the collected data would be exclusively used for research purposes. All obligations for the collection, storage and management of personal data in accordance with the GDPR were implemented. After the questionnaire was developed, interviews followed.

3.4 Data sample

In the present research, parents of children diagnosed with functional diversity were interviewed. Sampling was carried out in order to be representative: to cover various (i) functional diversities, (ii) geographical areas (mainland-islands) and (iii) school grades (primary or secondary education). A prerequisite for the parents to participate in the research was that their children should (i) be previously diagnosed with any kind of functional diversity and (ii) had attended ERT during the Covid-19 pandemic. Their children, aged from 5 to 14 years, attended ERT online courses in public Kindergartens, Primary and Secondary Schools in Greece during the lockdown period. Parents of 9 males and 3 females participated in the research. All the interviewed parents were by the students' side throughout ERT. In alignment to most related work that address this particular group of students (Averett, 2021; Lambert & Schuck, 2021; Roitsch et al., 2021; Schuck et al., 2021), the seemingly small sample size of the present research is justified by the fact that concerns only parents of children with functional diversity. Therefore, it was able to collect limited data from a particularly small group of people. Only research cases that adopted questionnaire methodologies were able to collect a wider sample size (Myers et al., 2021). Gender, age and functional diversity information of each student is presented in Table 1.

4 Data analysis

Analysis of the research data was conducted with a mixed methodology. This selection aimed to determine whether there was a match of the results, enhancing reliability and validity of the research. Initially, a descriptive analysis was performed and then an AI-based/linguistic data analysis with the Nvivo software followed. After the interviews were conducted and recorded, they were firstly transcribed and edited in order to avoid identification of the persons interviewed. Then, data were anonymized, so that it was no longer possible for this data to be related to the data subject being referenced. For example, in case that a parent referred to his/her child by his/her name, it was replaced with the personal pronoun *"he"*/ *"she"* or with the noun *"child"*. Also, in case the interviewees mentioned other persons, situations or even the name of the teachers and the school, they were replaced with the word "teacher" or "person" in order to ensure anonymization. During transcription of the interviews, any mistakes, pauses, laughter, omissions and repetitions were kept true.

4.1 Descriptive analysis

In the first phase, thorough qualitative descriptive analysis was applied to the data. It was preceded by careful and repeated reading of the interviews in order to increase familiarity with the data and to highlight the most important points of the parents' views. A focused study followed, a greater deepening of the data and a thorough analysis with the descriptive method, which led to safer and documented conclusions. The thorough study was followed by thematic separation and data coding (Robson, 2010; Creswell, 2016; Papanastasiou & Papanastasiou, 2016). All parents' responses were first organized, classified, and grouped based on the research questions. Individual data of the interviews were systematically coded with the performance of appropriate codes, i.e., comprehensive conceptual definitions. The conceptual definitions were based on the relevant literature review and the theoretical framework of the issue under consideration. After processing the codes, all the excerpts that had the same code were collected and the thematic analysis began. The most important issues and themes were manually identified by thematic analysis. The thorough study was followed by thematic separation and data coding. Data were organized and grouped according to the topics mentioned in the beginning of this section. Then, the semantic analysis was performed and the results for each topic were extracted separately (Creswell, 2016). In each sub-topic, specific issues highlighted through the parents' answers were identified. Thus, separate files were created for each research question and for each sub-question (e.g., concern for personal data). In this way, complexity of the material was reduced and all the relevant excerpts found in other parts of the interviews were included in the common semantic file. Afterwards, passages being similar in content were studied separately, in order to identify common semantic patterns or any differences.

All the findings of the research were presented descriptively and documented with the appropriate excerpts from the interviews. At this stage, the "reverse" course was followed from the original. That is, during the descriptive analysis of the results

of the conducted research, first the issues were presented and then documented with the corresponding excerpts from the interviews.

4.2 AI-based/linguistic data analysis

AI-based/linguistic data analysis was performed with the Nvivo data analysis software in the second phase, because it was considered to be the best possible choice for the quality data collected from the semi-structured interviews, mainly due to their large volume. Nvivo provides tools to organize, analyze and visualize unstructured data and gives the opportunity to classify and sort data in ways that enable the identification of themes and patterns. Preprocessing was performed on data before their input into the Nvivo software. Due to the idiosyncrasies of the Greek language (rich morphology and declination categories) and the number of words or expressions with similar meaning, synonymous words or expressions were merged (e.g., "lesson"- "courses", "teacher"- "educator"- "tutor", "internet" – "web"). Words in different cases or single/plural words were also merged (e.g., "course-courses", "difficult" – "difficulties"). Additionally, merging of words in different gender endings (e.g., male and female teacher in Greek language) as well as the replacement of phrasal expressions with one word took place (e.g., "could not/was impossible" were replaced with the word "impossible"). Use of common words on the same subject (e.g., "he/she was missing his/her friends", "he was looking for his friends") were replaced with a phrase ("lack of friends"). Furthermore, in order for the semantics of the interviews to emerge, stopwords removal was applied. Tree maps were also created in order to reveal correlations of key concepts. Finally, in order to capture the assessment of ERT's efficiency for students with functional diversity per each topic, based on the views of their parents, their comments were grouped regarding their sentiment polarity into four categories very positive, positive, negative, very negative) ones.

Nvivo analysis was performed as follows:

Stopwords removal: stopwords are the words that occur most frequently in the dataset and contain little information, not usually required. For the present research a greek stopwords dictionary (https://www.translatum.gr/forum/index.php?topic=3550.0) of 632 words was used in order to remove common words (for example "him", "them", "other", "a") as they do not add much meaning to a sentence. 5,264 stopwords were removed from the initial dataset (14,827 words). So, the dataset consisted of 9,564 words.

Stemming: counting the variant forms of a word as instances of a root word. Removing the words endings (case, number, gender etc.), including often the removal of derivational affixes, improves the system's ability to match the query. The Greek language is rich in endings and increases the statistical reliability of the measured cooccurrence. Examples of the word stemming procedure are presented in Table 2.

Word frequency analysis: a frequency list records the number of times that each stem occurs in the dataset. Words with 1–3 characters were removed. As a result,

Table 2 Word stemming

Word stem	Words
δυσκολ-	δυσκολεύω (difficult-verb), δυσκολία (difficulty-noun), δυσκολίες (difficulties-noun) δύσκολα (difficult-adverb), δύσκολο (difficult-adjective), δύσκολος (difficult-adjective), δύσκολες (difficulty-adjective), δύσκολη (difficulty-adjective), δύσκολης (difficult-adjective case), δύσκολων (difficult-adjective case), δυσκόλεμα (difficult-noun)
προβλημ-	πρόβλημα (problem-noun), προβληματίζω (trouble-verb), προβληματισμένος (troubled-adjective), προβληματισμένη (troubled-adjective), προβληματισμένο (troubled-adjective), προβληματικό (problematic-adjective), προβληματικά (problematic-adjective or adverb), προβληματική (problematic-adjective), προβληματικός (problematic-adjective), προβληματικότητα (problematicity- noun), προβληματισμός (problem-noun)
αδυνατ-	αδυνατώ (can not-verb), αδυνατούσε (could not-verb), αδυνάτησε (could not-verb), αδυνατίσει (can not-verb), αδυναμία (weakness-noun), αδυναμίες (weaknesses-noun), αδυναμιών (weakness-noun case), αδύνατος (weak-adjective), αδύνατη (weak-adjective), αδύνατο (weak-adjective), αδυνάτισμα (weakening-noun), αδύνατα (impossible-adverb)
βελτι-	βελτίωση (improvement-noun), βελτιώνω (improve-verb), βελτιώνομαι (improve-verb), βελτιστοποίηση (improvement-noun), βελτιστοποιώ (improve-verb), βελτιώσιμος (improvable-adjective), βελτιώσιμη (improvable-adjective), βελτιωμένος (improved-participle), βελτιωμένη (improved-participle), βελτιωμένο (improved-participle), βελτιώσιμο (improvable-adjective), βελτιωτικός (improving-adjective), βελτιωτική (improving-adjective), βελτιωτικό (improving-adjective)
αρνη-	αρνητής (denier-noun), άρνηση (denial-noun), αρνούμαι (deny-verb), αρνητικός (negative-adjective), αρνητική (negative-adjective), αρνητικό (negative-adjective), αρνητικές (negative-adjective case), αρνητικών(negative-adjective case), αρνητικότητα (negativity-noun), αρνητισμός (negativity-noun), αρνητικά (negative-adverb)
ικανοπ-	ικανοποίηση (satisfaction-noun), ικανοποιώ (satisfy-verb), ικανοποιητικός (satisfying-adjective), ικανοποιητική (satisfying-adjective), ικανοποιητικό (satisfying-adjective), ικανοποιητικά (satisfactorily-adverb), ικανοποιήσιμος (satisfiable-adjective), ικανοποιήσιμη (satisfiable-adjective), ικανοποιήσιμο (satisfiable-adjective), ικανοποιημένος (satisfied-participle), ικανοποιημένη (satisfied-participle), ικανοποιημένο (satisfied-participle)

128 words were removed from the dataset. A thorough check of those words was carried out in order to ensure that no semantically important words were removed. The most frequently used words in the interviews were automatically detected using Nvivo software. The total number of words-lemmas was 9,436.

Wordclouds:as a next step to the aforementioned procedure a graphic display of the most frequent words was created in order to abstract and visualize the most important themes based on the occurrence rate in the dataset. The words are depicted with different size and color (the larger the size, the more frequent word).

Treemaps creation: treemap visualization represents a hierarchically-ordered (tree-structured) set of data in nested rectangles of varying sizes. A node with a large number of coding references displays as a large rectangle. The key term stands at the "root", while the "leaves" reveal the sub-concepts. It is mainly used for relations identification between words and highlights the main concepts. Based on the most frequent words detection a treemap was created using Nvivo

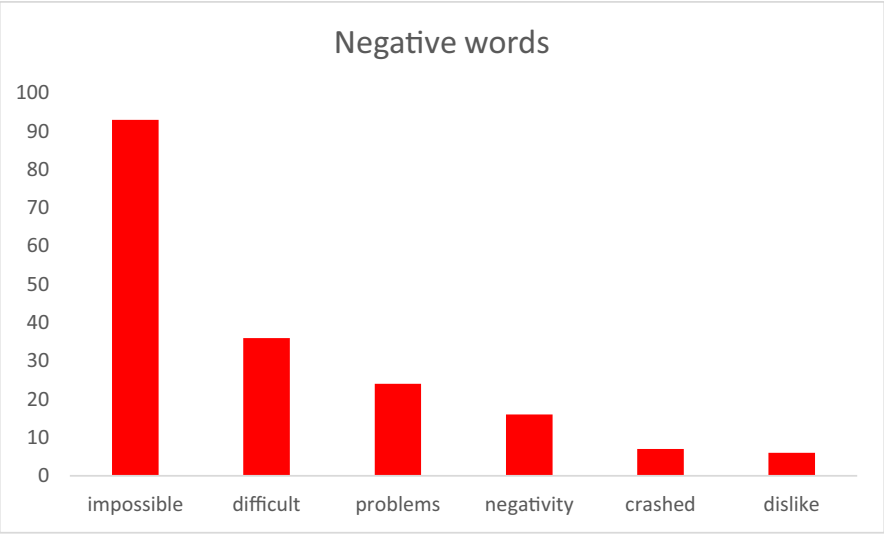

Fig. 1 The most frequent negative words

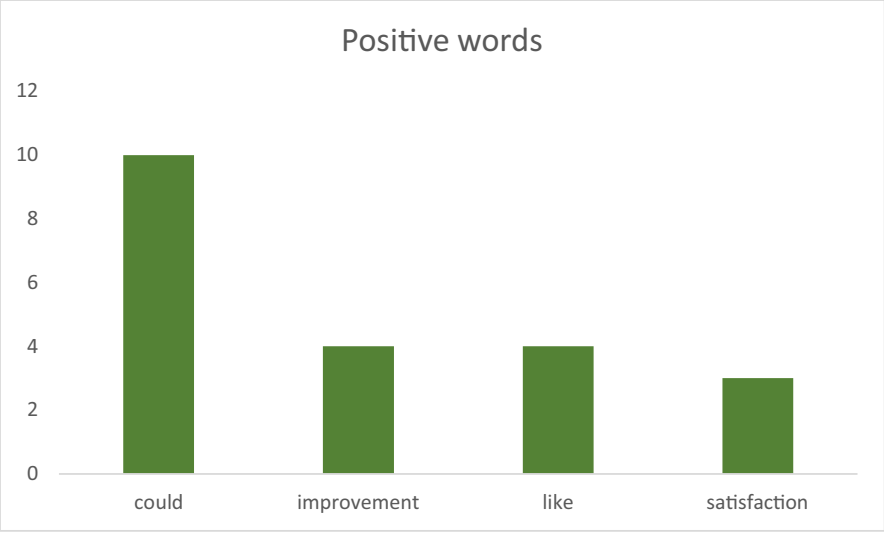

Fig. 2 The most frequent positive words

software. Having as a root the three most frequent words in the interviews, correlations of these key concepts were revealed.

Word distribution per sentiment polarity: the interview text was manually annotated. An emotion polarity label ("very negative", "negative", "positive" and "very positive") was assigned to each sentiment word-term or phrase in the extracted lexicon aiming to identify sentiment polarity. Then, the software auto-

matically calculated (based on the word count of the corresponding polarity) the words with the highest polarity (positive or negative) value of the whole input text. The most frequent negative sentiment words and phrases over the whole dataset were: "impossible", "difficulties", "lack of friends", "inappropriate", "aggressiveness", "contact loss", "weakness" (Fig. 1).
The most frequent positive words and phrases over the whole dataset were: "useful", "improved", "advantage", "like", "satisfaction" (Fig. 2).
Sentiment polarity extraction per topic: polarity results were also obtained at topic level, i.e., the parents' most frequent positive and negative words were extracted for each of the four topics. Based on the occurrence rate of these words, results were extracted. Based on these results the parents' sentiment for each topic was manually identified (see Section 5.2.3 - Figs. 5, 6, 7 and 8).

5 Results

5.1 Descriptive analysis

Descriptive analysis illuminates the data and highlights many details in all aspects of the topic. All the findings of the research are presented thematically and are documented with the appropriate excerpts from the interviews. For this reason, in the current research, findings from the analysis of the interviews are presented in detail, quoting original excerpts from the parents' utterances for each of the following themes: (i) *Material and Technical Conditions, (ii) Educational Dimension, (iii) Psychological/Emotional Dimension and (iv) Learning Difficulties and Emergency Remote Teaching*.

5.1.1 Material and Technical Conditions

At the beginning of ERT implementation, the majority of the parents (75%) obtained their children's passwords from the platform of the Greek School Network (GSN), along with all the necessary instructions from the school in their personal emails. Almost everyone (92%) welcomed the school's immediate response to advise and help with the technical issues (David: "*They were very helpful*"), claiming that school principals also contacted them in person to help them with everything they needed (Mary: "*The principal helped us very much. He explained the password procedure in detail*"). Teachers also provided step by step instructions. In general, they overcame technical problems very quickly. Even those who reported problems, they emphasized that it was only for the first days.

When parents were asked whether they had the necessary digital devices for ERT, most of them (58%) ironically scolded the fact that they did not have any such coverage from the state. Even though digital devices were required, that was not a given that everyone had. Thus, there were three parents being not able to meet those needs and their children were forced to take part in the courses using the mobile phone, which definitely made attendance more difficult (John: "*The connection in the online course was made from the mobile phone. We are rich and we are not entitled for a*

tablet. Yes, I say it ironically"). One parent pointed out: Michael: *"How many computers should we have for our four children? Only the elder one who went to High school connected through her computer. The younger ones attended courses with their mobile phones. And we did not have a third mobile phone. My daughter connected from my phone in the morning in high school courses and my younger child in Elementary school courses in the afternoon*", proving that equal opportunities for all students were not guaranteed in ERT. In general, most of the parents stated that they had a computer or tablet (75%). Two of them didn't have camera or microphone, so they had to buy it specifically for the ERT courses. Many parents admitted that for their own convenience, they mainly used a mobile phone, even though they had other electronic devices.

All the parents reported that they have an internet connection, but many of them (75%) complained about technical problems, as several times they missed courses due to poor connection or other technical issues regarding the educational platform. In particular, according to the parents, poor internet connection caused a lot of problems, while the Webex platform had many issues very often (Thomas: "*… internet connection was too slow and we had issues. It crashed several times…*, Anna:"*… several times we did not have electricity or connection at that time. I don't know what was wrong… Maybe twice a week… the child missed the course"*). There was an exceptional case of a parent who claimed that ERT was implemented smoothly, since they did not face any issues with the internet connection.

In cases that the parents were not familiar with the technology, there was panic and great anxiety. They did not know how to solve technical problems and they felt that they could not help their children (Michael: *"It* was *generally very difficult, I didn't know what was needed to help him … The bad thing is that I do not know much about those things to help him solve the issues").* Other family members, being familiar with ICT, were often asked to provide help for joining ERT courses.

Younger children had more difficulty in the process, because they did not know how to use digital devices (John: "*No, no, our child cannot log in alone* ", George: "*The child had no contact with electronic devices… He only could press the microphone and speak* ". On the other hand, there were also exceptional cases that children, despite their young age, were able to respond to those needs. According to their parents, the elder children with functional diversity, who were already familiar with ICT, did not face significant problems and they connected to the online platform on their own. Two parents pointed out that their children were more experienced than them.

Concerns of parents regarding the time their children were forced to spend in front of monitors were also explored. Parents were really worried, mainly about potential health issues caused due to ERT and also about addiction to digital devices. Typically, a parent said: Joseph "*Well, of course I was worried about that. Until then, we always told him to avoid use of a mobile phone so that he would not get addicted at this early age. Suddenly, it became a part of our child's daily life. I was definitely worried. His eyes started to hurt and he was complaining about headaches. I was mainly worried about addiction and health issues*."

Other parents talked about vision problems, fatigue and headaches (George: "*Because I saw that he was too tired. His eyes were watering from one point*

onwards). Other eye problems and eye doctor visits were also reported by other parents (Anna: *"Six consecutive hours a day is an exaggeration…she was too tired after the third hour. His eyes were watering and his head was aching. During that time, we went to the ophthalmologist and she took eye drops"*). Children with functional diversity already having vision problems faced a greater burden (Mary: "*First of all, because vision is strained, headaches occur… my daughter was constantly complaining that she wasn't feeling good, could not concentrate…We have done some eye surgeries in the past to restore vision and we were worried that remote teaching would ruin everything").*

On the other hand, there were three parents who had accepted their children's daily contact with digital devices and therefore did not worry about it.

Parents did not seem to be particularly aware regarding students' personal data leakage. Most of them (75%) answered that they did not care about this. These parents justified the lack of awareness, answering that in modern life everything is exposed and as a result all personal data of students are recorded electronically. In fact, one parent, who is an educator, pointed out that the school's digital files contain all the information about all the students and their parents.

Although they were not worried about their children's or their own personal information exposure, they avoided opening the cameras in the online course, so as not to expose their faces (David: " *We did not open the camera. Although we bought it for this purpose, we only opened it for the first week").* One parent claimed that what bothered him during ERT was that his child was being watched by the parents of his classmates, who entered the online classroom and commented on his weaknesses maliciously (Robert: "I *was mainly worried because other parents were usually watching with malice and gossip, but could we do? They compared the children's performance and criticized the teacher"*). A parent of a child with stuttering had similar suspicions, claiming that they influenced her child's behavior and participation in online courses because of fear of mockery (Alex: *"…he may have thought that some parents were listening and others were watching and that's why he hesitated in order not to be exposed… he didn't have the expected behavior"*).

5.1.2 Educational dimension

It should be noted that, most of the children missed many online courses often due to external factors. A bad internet connection posed difficulties. In addition, parents noticed that in some days online courses were not implemented due to technical problems of either the Webex platform or the Greek School Network. Similar problems were faced even by the teachers: they couldn't log in, so the courses were cancelled for all the students.

All of the parents pointed out that even when their children connected to the courses, they could not meet the conditions and the pace of remote teaching. Therefore, their participation was characterized by a formality and non-substantial process, which could not provide the desired educational and pedagogical results (Anna: *"… most of the time she didn't participate normally in the courses… she didn't have time to follow the course pace and that's why she was lost"*). ERT may facilitated completion of the course material, but in no case, according to the

parents, did their children actually learn. This is why three parents stated that there was a need for satisfactory and effective coverage of the course material, because, in the online courses, teachers covered the curriculum at rates similar to or even faster than those taught in the physical classroom. (George: *"…the course pace was the same and was done exactly as it should be, which means that the children were progressing normally"*). But most parents (75%) do not consider this positively, because they understand that this teaching pace did not correspond to a simultaneous understanding of the curriculum. Thus, they claim that course material coverage in the online courses was mainly a formality and for the children with functional diversity there was no substantial consolidation of the material (Anna: *"remote teaching was very monotonous and it was very fast. I think the teachers were moving very fast … they covered all the course material. At least typically. Now what children actually learned, is another matter").*

Other problems were related to loss, especially for children with Attention Deficit Hyperactivity Disorder (ADHD), who found it difficult to concentrate even in the physical classroom and they get easily distracted. Parents pointed out that those children were unable to concentrate on the screen and felt discomfort during the online course (Anna: *"… for children with attention deficit, remote teaching is inappropriate"*, Robert: *"Because he has attention deficit and hyperactivity, he often was distracted…sometimes he looked abstractly and focused at one point without understanding what was happening and other times he was shaking anxiously, playing with his pencils and not listening to anything ").*

In these cases, parents' reactions varied, according to their statements. Some parents,3 out of 12 insisted and forced their child to connect so as not to miss the course or at least make some effort (John: "*I pushed him a little bit to participate in the course, because their teacher showed them some interesting things… so he sat by force. When I saw that he could not take it anymore then we logged out*"). However, most of the parents (9 out of 12) were more tolerant, because they understood their children's fatigue. Being by their side almost every hour of remote teaching, they watched closely how many difficulties they faced (Niki: *"…since she was very negative, I didn't insist because I didn't want to push her* ", Joseph: "*The times he complained to me that he had a headache or that his stomach hurt or something else, we didn't log in"*).

Many times, the parents themselves realized that the problems their children reported to them were pretexts, since they stopped as soon as they were disconnected (Joseph: *"I think it was an excuse. When I told him to log out from the course, he spent a little time playing, he forgot it and then he was fine. Without going to the doctor or taking medicine. That's why I didn't insist on him attending the online classes every day so as not to take it badly and then when the schools would open, he did not want to go"*). Thus, 4 out of 12 parents were forced to seek help from specialists to deal with the new conditions of remote teaching. Because they did not know how to manage their children's negativity and the new problems that arose, they turned to specialists (e.g., child psychologists) to monitor their children, to ask for instructions on their behavior and attitude. After receiving the instructions, they were not pressing their children, as the experts suggested that they should let their children feel more freely, because they needed a more personal learning pace (Jacob:

"I didn't want to push him too much so that we would not have the opposite results. "His case, as the child's psychologist who is watching him tells us that does not need pressure, because it creates additional stress and then he does not work harmoniously and the problems get increased").

During the courses, parents realized that their children were having difficulty following the learning process. Depending on their functional diversity, they faced particular problems. This may have been related to the particular response rates each child had and the time it took them to process knowledge. In case that a teacher asked a question to the whole class, children with functional diversity did not have enough time to process the question and answer it. Only when the teacher addressed a question to a certain student and provided him time to think and respond, there was active participation in the educational process. But this rarely happened (Michael: *"…the teacher asked him a simpler question to answer. If the teacher was asking him something, but at the same time the whole class raised their hands to answer, then he usually couldn't or didn't understand the question and until I had explained what the teacher asked, the time passed and someone else answered faster*").

Of course, there were also major weaknesses that did not help children with speech problems to attend the online class (John: *"Our child has a speech delay and he couldn't answer. I answered for him and then he repeated what I had said*", Alex: "*It was not possible to participate because he has a serious stuttering problem and for this reason, he didn't participate in the process. He listened to his teacher, but he hesitated to speak. He participated only when he answered the written questions*"). In addition, participation in oral procedures was more difficult in a *"foreign"* educational environment that significantly differed from the physical classroom, to which children with functional diversity were accustomed. Those difficulties became more pronounced in elder children who were even more reluctant to speak due to fear of exposure in front of the other parents who were also attending.

For a visually impaired student who reads and writes in Braille, disadvantages of attending online courses were even greater. Her mother was adamant: Mary: "*Without me next to her she couldn't participate at all*". Although the student was *"very focused and tried too much beyond her capabilities"* she could not participate in the whole process, as there were no special tools tailored to the needs of those students. This, of course, only happened with the oral questions that were addressed to her personally. Otherwise, she didn't have time to speak, since she couldn't raise the *"hand"* on the Webex platform by herself, since there was a functional weakness (Mary "*She did not raise her hand because by the time she told me to press the button, other children had already answered. Only when the teacher asked her personally, she answered, after I turned on the microphone*").

For all the above-mentioned reasons, all of the parents were not satisfied with the ERT process. When they were asked whether the method used facilitated learning outcomes, they claimed that ERT had a negative impact on their children (Alex: *"Surely his progress was going backwards"*, John: *"I don't find anything positive"*, George: *"No, I don't think he was benefited. I think we had the opposite results"*, Michael: *"Not at all… For almost two years there was no progress. He didn't learn anything").* It seems that they had many difficulties to deal with, since the conditions of ERT were considered as unsuitable for these students.

They have considered ERT to be a *"necessity solution"*, being abruptly implemented, so as not to cut off children from school. However, although they believe that ERT was an urgent need, due to the pandemic, they claimed that it was completely unsuitable for children with functional diversity (Michael: *"I consider it completely unsuitable for children with such learning or psychological problems"*).

Parents pointed out that their children needed more attention from the teachers, more time and more facilitative explanations. They found that throughout the online courses their children were equated with the other students and they were marginalized from the educational process (Mary: *"Remote learning was a solution of need that treated all the students in a class in the same way"*). They believed that in cases when a child had difficulty on concentrating or attending classes intermittently (because he/she had attention deficit or stuttering or vision problems) it was impossible to participate in the ERT process.

Comparing online with face-to-face courses, all the parents considered online courses to be at a significantly lower level (Thomas: *"…it was inferior. Much inferior! What was happening had nothing to do with the course in the physical classroom"*. In fact, they noticed this lag from the whole process, since distance created further difficulties and the classrooms with a large number of students didn't allow for good coordination in the pace of the course (Thomas: *"… all the time there was just reading. There were 23 children in the first grade of the Primary School…you understand how difficult that was until all of them had to read something. All the time passed like this"*, Robert: *"Without interpersonal contact it is not possible to do the same job. The whole process was lagging behind in many respects. How can a teacher manage 25 children?"*).

Conditions for ERT courses in Primary Education were not ideal, since younger students cannot easily follow the new rules being set outside the physical classroom (Robert: *" Children were usually talking whenever they wanted, without the permission of the teacher. This thing couldn't work out well with the microphones, turning them on and off all the time. Most of the kids, like mine, forgot to turn off the microphones and that's why there was too much noise"*). Especially for the students in Kindergarten, where the courses are more experiential and do not cover any specific course material, problems regarding students' participation were of more importance. Parents pointed out the weaknesses they identified: (Joseph: *"In kindergarten the remote learning was a completely formality process… I really can't find anything positive. Teachers are not to be blamed for what I am saying. What can they do behind this 'cold' screen?"*). The physical distance created deprived children from playing together, which, especially for young children with special needs, helps and determines their cognitive and psychological development.

Throughout the quarantine period, parallel support teachers attended online courses and then in personal communication with the child via phone or social network applications, they explained any difficult points of the course and provided supporting material for further understanding (David: *"The parallel support teacher couldn't do anything more. After the course we talked with the parallel support teacher on Skype in order for him to explain to my child some exercises that he struggled with, especially in math").*

Parents highlighted that their children were not treated with care and their peculiarities were not taken into account. This suddenly changed their daily lives, as they were familiar with being next to their parallel support teacher. They complained about the absence of the parallel support teacher (Anna: *"In the physical class there are students with special needs who have their special personal teacher to support them and all of a sudden, all that was lost in remote teaching"*. Naturally, this process did not satisfy most of the parents who saw their children face many difficulties.

Remote teaching for students with functional diversity had limited positive effects: (i) contact with the learning process was maintained (Alex: *"It was positive that he didn't lose contact"*) (ii) they were still able to watch and talk to their friends-classmates through their camera (David: *"At least he could still see and talk to his friends through the camera").*

5.1.3 Psychological / emotional dimension

Peculiarities of children with functional diversity were also revealed by the way they dealt with online courses. Most of them (7 out of 12) were nervous because of the confinement and the pressure caused by the everyday life upheaval (Alex: *"He was really nervous all the time. There were a lot of factors for this, he is old enough now, he was at the end of the Elementary school, he was trapped and he lost his social life, he couldn't talk to his friends in the school courtyard. Great stress and nerves"*, Thomas: *"Nervousness, hyperactivity, whining"*). Those students had not been able to assimilate online courses, mainly because they couldn't keep up with remote teaching (Michael: *"He had a denial of school in general not existed before the 'Webex period'. He became anxious and insecure, he thought he knew nothing. Although I had seen him starting to progress and the parallel support teacher had helped him a lot, then I realized that remote teaching took him back again"*).

During ERT, many children (5 out of 12) with functional diversity developed various psychosomatic problems, because the whole situation was depressing. They often complained of headaches and other problems that prevented them from attending courses smoothly, prompting parents to interpret these reactions as excuses for the children to avoid the course (Joseph: *"Deep down he didn't want remote teaching. He has never reacted like this when he had to go to school"*). In some cases, the issues they had in the past regarding communication and sociability returned (Jacob: *"He became very shy again, much more selective. He stopped talking in his classroom"*). New ones that continue to exist even after the end of ERT also arose (Thomas: *"…when he comes back from school, he grumbles again… We didn't face that before. This happened from the remote teaching period on and later"*).

Two parents noticed that, during ERT, their children showed unusual or unexpected behavior. They stated that these reactions did not exist in the past and they showed up during ERT. That made them particularly worried (George: *"The problem was that he had to wait too long for his turn to answer… this made him very tired… created other neurological conditions for him. They adopted some neurotic twitches. He made some sudden and repetitive movements. He started shaking his head left and right… Too much irritation and as time went on this created a*

neurological issue for him", Niki: *"Sometimes she was more aggressive than before. She was throwing things… She was tired"*).

In most cases (9 out of 12), parents pointed out that ERT process greatly affected their child's bonds with the school. Children avoided connecting to the online courses, especially the younger ones giving various excuses; the parents were worried that this negative view would continue. The whole process was difficult for those children who needed a special teaching method and a different approach. Some of them protested and did not want to attend courses, finding excuses and when schools finally reopened, they did not want to return back (Robert: *"…when the schools reopened, his morning awakening was bad. He was used to easiness from home, without much obligation"*).

Another key parameter highlighted by the research is that the emotional relationship with the teacher and their friends is very important for the children with functional diversity. The safe and stable environment significantly affects their psychological state and the abrupt cut from school life shook their mental world (Thomas: *"He was very upset"*, George: *"Hyperactivity, some outbursts of anger that he didn't usually have"*, Mary: *"Loneliness, sadness, grief…"*). Isolation and distance further limited them and they missed their friends (Mary: *"When she went to school, she came back happier"* Jacob: *"At that time he was very distant, he didn't play, he didn't laugh and he was constantly nervous. Now… he's happy. He plays, he laughs."*, Anna: *"…she was closed to herself, she wanted to be alone for many hours, as if she doesn't need anyone").*

What children mostly missed was playing games with their classmates, socializing and interpersonal contact during course breaks (Mary: "*It was very different to see her friends on the screen than playing with them, hug them and laugh in the schoolyard"*).

ERT process also affected parent-child relationship. Parents spent many hours by their children's side in online courses, since in many cases their presence was necessary as they could not connect and participate on their own. After all, many parents (8 out of 12) were not working during the pandemic and they stayed at home, having a lot of time available for their children (David: *"We spent many hours together, I helped him, we argued about a lot things, but we talked a lot and I understood him better. Also, I saw how he works in the online classroom"*). They pointed out that due to their active role in helping their children with their homework, their relationships were strained and frustrated (Thomas: *"I think the parent's role is not to be a teacher. I had to impose things. I couldn't teach him properly. We argued a lot… This affected our relationship and there was tension and fighting… We had epic fights"*, Robert: *"She had some tensions with me and her mom because she was irritated by the lockdown"*, Mary: "*She threw all her sufferings and complaints at me… Our relationship was tested").*

In addition, some parents pointed out that spending so many hours with their children created a particularly burdensome situation and they admitted that they were irritated at the same time (John: *"…I was more nervous with him. I didn't have the same patience, as I had"*). They were also affected by the lockdown (Michael: *"… because of the lockdown, we were all tense and suffered from depression"*). For a parent whose child's autonomy is of particular importance, the quarantine period

affected them negatively, as the number of hours the child worked independently was reduced (Joseph: *"We were stuck together all day. This creates a great deal of dependence, which even now I can't manage. I want him to have his autonomy and I try hard for that")*.

On the other hand, 2 out of 12 parents claimed that remote teaching had a positive effect on their relationship with their children. They spent time together as never before and bonded more (Jacob: *"Because we were together for many hours, I realized his weaknesses better"*). A father who undertook to help his son to attend online classes admitted that during remote teaching, he appreciated his wife's patience, who had usually been helping their child with homework until then. He realized how much patience was needed for a hyperactive child (Robert: *"I spent many hours with him and realized how much patience is needed for such cases. My wife has a lot of patience"*).

5.1.4 Learning Difficulties and Emergency Remote Teaching

As previously mentioned, the transition from the face to face learning process in school to ERT surprised the whole school community and caused even greater concern to the parents of children with functional diversities who did not know how to prepare their children for this transition. Being confused and waiting for the official clarifications, all they did was to talk to their children about the expected changes, because it is very important for those children to prepare themselves psychologically for what will follow.

Two parents noticed that their children's adaptation to remote teaching was immediate. However, for the rest of the children, whose learning pace was very slow, the adaptation to the online courses was slower (John:*"…it took us a month "*, Joseph: "*It needed about two weeks to get organized* ").

Many children did not accept remote teaching and their behavior in online courses was different from the physical classroom (Jacob: "*No, he didn't like it…. The teacher said, that he participated more in the physical class*"). Educational needs of those children posed difficulties in the process of remote learning. During the ERT process there were many difficulties even for students without similar weaknesses, but the level of difficulty was comparatively much higher for children with functional diversity. Therefore, difference in learning outcomes would grow and learning gaps would increase. (Niki: "*Of course, our child faces many difficulties…our child could not function like the other children. In other words, she had some additional difficulties compared to the rest*").

In particular, children diagnosed with Attention Deficit Hyperactivity Disorder (ADHD) faced many difficulties in the learning process. They could not concentrate in the online class and that is why they could not understand teacher's instructions and did not follow the pace of the class (John: *"…could not sit down and listen to the whole course"* Michael: *…he couldn't sit at the desk like the other children who were waiting* "). Also, they usually did not have enough time to finish the activities (Joseph: "*We had a very slow pace. Nothing like the other children. It is not that he did not understand what the teacher said, it is that he drew, wrote, spoke too late. His teacher told me that in the physical class he*

was doing better than at home". What usually distracted them was the inevitable noise made in the online classrooms due to the many open microphones (Niki: "*… what bothered her the most was the noise of the children who tried to talk all together, without an order. The teacher tried to do something about it, but she could not concentrate anyway* ").

Parents also underlined the important role of the parallel support teacher and they complained that, in remote teaching, cooperation between the children and their parallel support teachers was not effective, since teachers were far away from what was happening (Jacob: "*…the situation would be better if the parallel support teacher was able to help him in person, only him, to solve his questions or to deliver the course in more detail*").

In cases where problems were related to speech issues (student with stuttering), participation was even more limited, mainly due to insecurity and fear of being ridiculed by classmates (Alex: *"…what was difficult for him, was stuttering. He couldn't speak at all and he couldn't participate… where everything was recorded by cameras and microphones…he hesitated, he was afraid that his classmates would make fun of him and the problems we had in the beginning returned, even since he started school*"). Under these circumstances, the oral abstinence from the course was a given (Alex: "*He couldn't participate, he couldn't feel that he was a member of the class in any way*"). A student with vision problems also faced insurmountable difficulties (Mary: *"The vision problem she has was prohibitive for her full participation in the course"*). Also, some parents (4 out of 12) complained about the specific time of the day the courses were taking place (14.00-17.20). They considered younger children to be at those hours drowsy and more tired (Thomas: *"… the change of the course time… They are small children… every child performs better in the morning"*).

Parents took initiatives and implemented specific practices to help their children to adapt from physical classroom to ERT. Parents took over the role of the mediator from the very beginning. (Joseph: *"When we found out about remote teaching, we tried to explain to him that from now on we will do our homework and talk to the other children and the teacher from home via our computer. At first, he was excited. He wanted to be in his room, in order for his classmates to see his toys*"). Parents being teachers themselves said that in order to prepare their child they rehearsed in the educational environment of Webex (Robert: *"We explained to him how the classes will be held, we told him about the way he will participate. We also rehearsed in our Webex online room and he was excited*"). Results were positive for the child's psychology, indicating that whether there was proper preparation and training for the students they could work more efficiently.

Especially for the children at the first grades of primary school, skills required for remote learning were excessive for their age. Therefore, parents' assistance was considered as necessary, even in cases where there were no special educational needs (Robert: *"He had difficulty in concentrating, he could not wait for his turn to speak, he had difficulty with the microphones, he couldn't turn on and off the microphone. Of course, he could not upload the files of exercises or download files. We did all this for him, as I imagine that all parents did the same thing for their children. How can an eight-year-old child do all these things on his own? Regardless he faces learning difficulties. It is not possible."*

Parents' practices for a smoother transition from physical education to distance learning were limited and costly. Parents pointed out that children who were normally adapted to ERT were the ones who could acquire support by a private teacher or have physical sessions with specialists (psychologists, social workers, speech therapists) paid by the parents. Except that, not everyone could cover the cost of this extra private support for their children and it was difficult (Alex: *"Our child attends special sessions by a speech therapist and a psychologist. At school all this is not available for free. As much as we could, we supported him in our way, but it is a difficult and straining process in general* ", Michael:" *I wish we could get a teacher at home, so that he could explain to him and teach him everything in the right way, from the beginning. But we couldn't and that is why we rely on the personal support teacher from the school. They had to take care more of children with special needs and their families from the first moment. Everything became very rough* ").

For the better implementation of ERT for children with functional diversity, parents suggested significant improvements. At first, they wanted to have timely and satisfactory preparation for all the students, so as not to be surprised in such conditions, because they were ignorant of such practices. (Anna: *" …to be more organized from the beginning. We didn't know anything about remote teaching. We were blind"*). Parents of children with functional diversity are adamant that their children were not helped to cope with the difficult conditions of the ERT process (Michael: *"First of all, they should show all children how to log in to platform and attend the online classes, how to connect, how to do the exercises and everything else needed for the courses. To be trained and know what to do and how to do it. Especially for children with learning and other difficulties*."). In addition, in order to ensure better conditions, they emphasized that it was necessary that the number of students in the digital classrooms should be reduced (David: *"To have fewer students, because there were 25 children in the online class and it was very difficult for the teacher to deal with everything and students to concentrate and participate").*

Some parents pointed out that in order for the ERT process to be implemented properly, the state should provide them with suitable digital devices and internet connection, especially for the families who could not afford all these expenses Along with their own lack of digital skills, the situation became even more difficult (I-3: *"At first, I thought we should fix the internet connection problem. There were many problems with that. We faced many connection interruptions and this didn't help. The flow of the course was interrupted. I cannot easily operate a computer. There were problems that I couldn't fix"*).

For the children with ADHD, they suggested that the course should be implemented with open cameras (Anna: *"For a hyperactive or distracted child… everyone should have the cameras on to be more focused. It is better to know that the teacher watches her and for her to watch her teacher too. It's not the same to see a blank page or a page of a book"*). They also suggested the courses to be more interactive in order to attract students' interest and not to be easily distracted.

Parents of the children with SEND, especially for the youngest children, would prefer their children not be forced to attend online courses (Joseph: *"I think that remote teaching should not have concerned the very young children and certainly not those with learning difficulties. For those children schools should remain open*

allowing attendance physically by special education or parallel support teachers"). Otherwise, they considered presence of parallel support teachers next to each student as necessary (Joseph: *"At least the personal parallel support teacher should deal exclusively with each child, to go to his own place*", Robert: *"For children with educational needs, I believe that the parallel support teacher should not be far away from them. He had to be next to the child, this is the purpose of this type of teacher*").

They were outraged by the fact that the Ministry of Education did not ensure the parallel support teacher to be utilized in a more appropriate way during ERT (Mary: *"Not all children can be treated in the same way. Doesn't the Ministry know existing peculiarities? Is that why we do need the parallel support teacher?*", Alex: " *I believe that every child falls into a different category. For example, all the children who had stuttering and were students of the same class should have attended courses by special educators in order them to be able to face their specific and special problems"*, Anna:*"….at least for children with special educational needs I think each case must be considered separately and do the best for every student").*

Many parents (7 out of 12) suggested that children with functional diversity should never had been removed from school and should had been excluded from ERT, similar to students in Special schools (Mary: "*I think that cases with such special needs should be excluded and go to school physically with their parallel support teacher. To attend the class on Webex from their school with the help of their parallel support teacher. In that way the special teacher, who knew the Braille writing, could help my child to write and read. As the special schools' students were excluded, this is what needed to be done with those students who have issues of sight/vision or hearing* ", Some parents suggested that the parallel support teacher could go to their homes and their children could be taught at home. Parents strongly (10 out of 12) showed their refusal for ERT implementation in the future (Joseph: *"I hope remote teaching will not take place again"*, Anna: *"I hope it is not needed again"*, Robert: *"I hope not, third year in a row! A whole generation of students will be destroyed").*

5.2 AI-based linguistic analysis

5.2.1 Word frequency

Word Frequency queries list the most frequently occurring words or concepts in the dataset. Visual representation of the unstructured text data can be revealed through a wordcloud. Most frequent words in the interviews are presented in Fig. 3. It is obvious that "home" was the most common word used in the interviews. Secondly, "parallel support teacher" consists a key word for the parents. "ERT" was, as expected, a main concept. All these words are core concepts in ERT implementation.

5.2.2 Semantic analysis

Tree map (Fig. 4) revealed the three main concepts in the interviews («parallel support teacher», «home» and «ERT») and the resulting relationship with the others. This shows that in the home-based ERT, during the pandemic, parents strongly

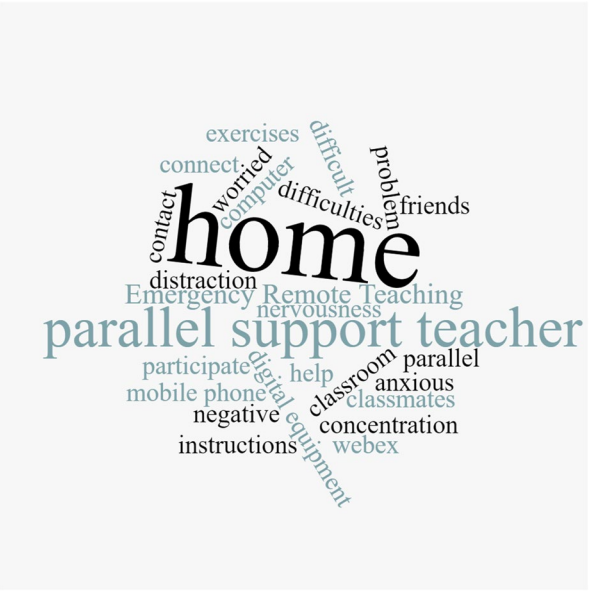

Fig. 3 Word frequency Word-cloud

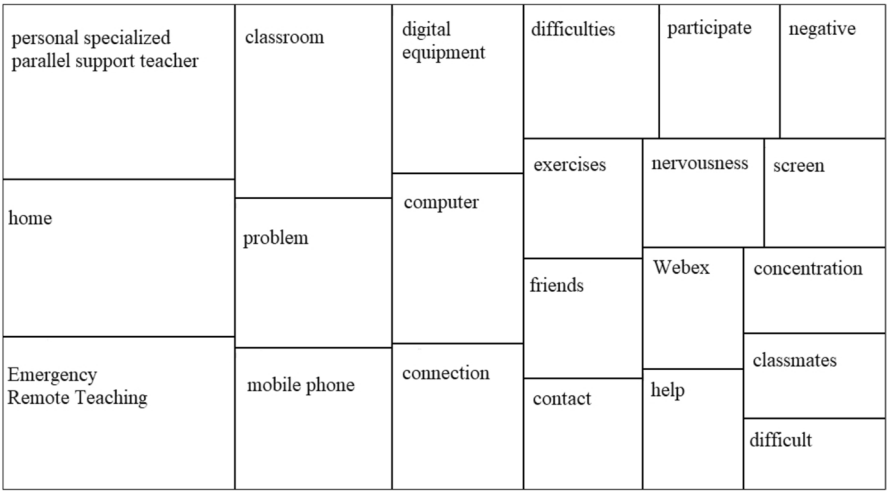

Fig. 4 Main concepts in the interviews

experienced a lack of direct contact between their children and the parallel support teachers, on whom the individualized treatment of their children's special needs was based. These words are directly related to the following: "class", "problem", and "mobile phone". Thus, they emphasized that moving away from the physical classroom made learning more difficult, while mobile phone use in ERT posed additional problems. These were also related to the following: "digital equipment", "computer" and "connection", showing that problems being identified by the parents were

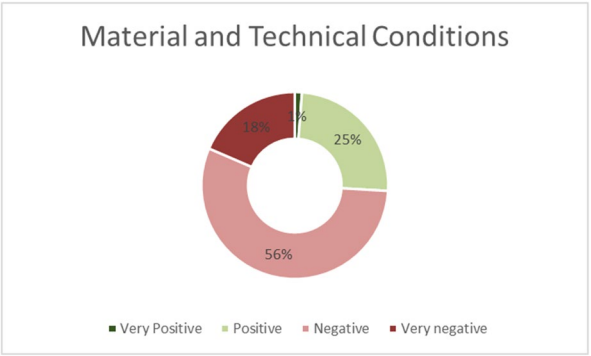

Fig. 5 Sentiment polarity regarding Technical Conditions

mainly related to technical issues. Immediately after those concepts, the most common were: "difficulties", "exercises", "friends" and "communication". This reveals that, in addition to the problems related to the courses and the exercises, what matters is the interpersonal contact and communication loss of their children with their friends. In addition, parents often repeated the words: "involvement", "nervousness", "Webex" and "help". Especially for those having children with difficulty in concentrating, it was difficult to participate in online courses and this caused intense nervousness. Also, the Webex platform required skills that neither the children nor their parents had, so they needed help. Finally, the words that appear on the tree map were: "negative", "screen", "concentration", "classmates" and "difficult". By those words, parents emphasized the difficulties of ERT process and showed how it negatively affected their children's learning. Being in front of a screen, away from their classmates, experiencing direct and daily interpersonal contact loss were some of the factors that made children with functional diversity unable to concentrate and attend classes.

5.2.3 Sentiment analysis

Sentiment analysis with the Nvivo software revealed that the parents were dissatisfied with ERT. Their comments regarding ERT were collected and isolated so as to extract the sentiment polarity of their opinions. Parents' views about each topic were analyzed according to their sentiment polarity. Analysis findings a represented by the respective topic below. The ring chart was used to visualize sentiment polarity (Fig. 5).

For the topic *"Material and Technical Conditions"*, opinions of the parents were mainly negative (74%) (Fig. 6).

Regarding the *"Educational Dimension"* topic, parents' views were negative (79%) (Fig. 7).

Parents' comments regarding the *"Psychological/Emotional Dimension*" topic, were negative at a 76% rate (Fig. 8).

As for the topic *"Learning Difficulties and ERT"*, views of the parents were also negative (79%), the majority of their comments (77%) regarding ERT were negative.

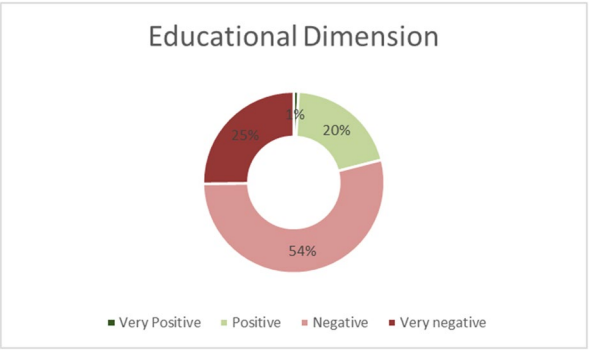

Fig. 6 Sentiment polarity regarding Educational Dimension topic

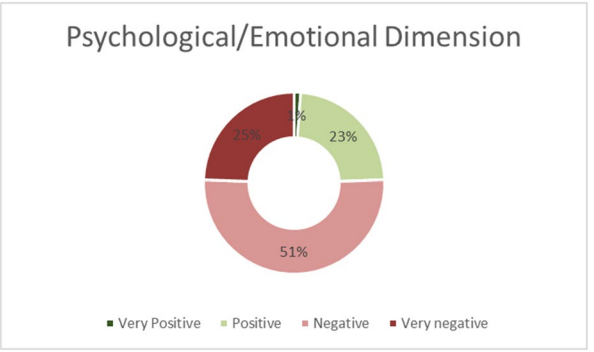

Fig. 7 Sentiment polarity regarding Psychological/Emotional Dimension

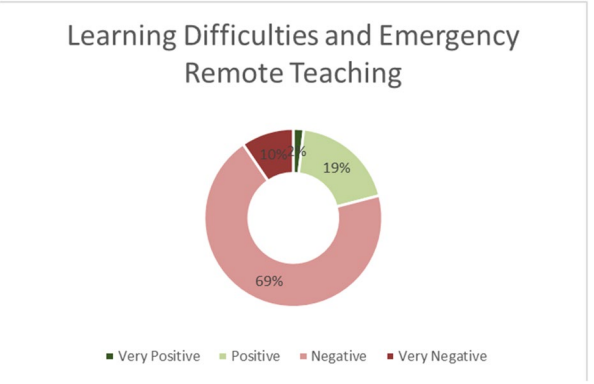

Fig. 8 Sentiment polarity regarding Learning Difficulties and ERT

However, even the positive comments (23%) did not concern the ERT process, but the guiding and effective attitude of the teachers and the parallel support teachers.

5.2.4 Text analysis

On the transcribed interviews, all points where the parents referred to each of the four topics, identified and a set of codes created. This resulted in the exact number

of words used by each parent to answer every topic. The questions that the parents focused on and gave the most comprehensive answers were identified and divided by topic. Counting the number of words per answer was used for this reason. This technique revealed the importance of every topic depending on the number of words used by the parents to answer the questions.

In the *Material and Technical Conditions* topic (Table 3), consisting of 6 questions, parents answered in relatively fewer words than all the other axes (average of 37.67 words per question). They mainly focused on the difficulties faced by their children during the online courses and the technical problems in connecting to the Webex platform (average of 68 words), as well as on the concerns they had about the time their children spent in front of a screen (average of 49 words). Instead, they responded with an average of 8 words about the digital device they used and they seemed not to particularly worry about the leakage of their children's personal data (average of 21 words).

For the *Educational Dimension* topic (Table 4), seven questions formulated and parents answered in more detail than all the other axes (average of 72.71 words per question). They mainly focused on online courses attendance and their children's participation in the learning process (average of 100 words), as well as their own role during ERT (average of 90 words). Instead, they responded with fewer words when comparing ERT with the face-to-face learning (average of 44 words) and the supportive role of classroom teachers or parallel support teachers (average of 59 words).

In the *Psychological / Emotional Dimension topic* (Table 5), which consisted of four questions, parents responded relatively shortly (average of 64.5 words per question). They mainly focused on the influence of ERT on their emotional relationship with their children (average: 87 words), as well as on the effects on their children and children's reactions (average: 82 words). On the other hand, they answered more briefly regarding influence of ERT on children's relationship with school (average of 40 words) and about friends and interpersonal communication loss (average of 49 words).

Parents answered with an average of 49 words per one of the five questions for the *Learning Difficulties and ERT* topic (Table 6) that concerned parents' proposals for ERT improvement. Especially the answer to the question regarding improving of conditions, their answers were detailed (average of 99 words), approaching the highest average of all the answers (100 words). Next, they focused on the participation in the online courses (average of 47 words). In contrast, they responded more shortly regarding the conditions during the initial adjustment period (average of 20 words) and the peculiarities that prevented their children from smoothly adapting (average of 34 words).

Based on the average word usage per topic results, parents used more words to answer the questions in the Educational Dimension and the Psychological/Emotional Dimension topics. This might reveal that the educational process and the difficulties faced by their children combined with the psychological and emotional problems created by the quarantine were the most important issues that parents worried about. Their children developed regression, fatigue, nervousness, communication and social problems, headaches and psychosomatic problems. For this reason, they

Table 3 Word count for Material and Technical Conditions

Topic/questions	Words per answer												Average	Min	Max
Material and Technical Conditions	I-1	I-2	I-3	I-4	I-5	I-6	I-7	I-8	I-9	I-10	I-11	I-12			
Q1* (school help)	22	18	38	23	26	60	18	60	97	36	131	46	48	18	131
Q2 (electronic media and internet connection)	30	37	29	34	14	10	50	61	22	59	19	18	32	10	61
Q3 (use of device)	12	3	6	12	5	6	2	2	27	2	11	6	8	2	27
Q4 (difficulties handling device-internet connection)	38	83	32	24	40	24	66	154	147	51	89	64	68	24	154
Q5 (worry about the duration using electonic devices)	30	33	45	100	78	15	40	52	30	69	51	42	49	15	100
Q6 (leak of personal data)	2	22	10	2	3	41	8	30	35	11	22	63	21	2	63
Total	**134**	**196**	**160**	**195**	**166**	**156**	**184**	**359**	**358**	**228**	**323**	**239**	**226**	**134**	**359**

Word count for Material and Technical Conditions

* The list of questions is presented in the Appendix 1. The general idea of the question is explained in the bracket

Table 4 Word count for Educational Dimension

Topic/questions	Words per answer												Average	Min	Max
Educational Dimension	I-1	I-2	I-3	I-4	I-5	I-6	I-7	I-8	I-9	I-10	I-11	I-12			
Q1* (participation in lesson)	113	74	90	11	139	39	167	218	84	57	8	80	90	8	218
Q2 (paying attention to the teacher)	65	210	220	95	58	110	42	123	118	34	66	53	100	34	220
Q3 (general behavior and concentration)	19	29	87	56	105	34	67	26	70	121	231	77	77	19	231
Q4 (satisfaction about ERT)	10	57	104	72	229	34	57	37	6	136	112	59	76	6	229
Q5 (benefits of ERT)	3	54	97	58	91	81	3	60	78	51	142	40	63	3	142
Q6 (satisfaction compared to face-to-face lesson)	10	62	25	58	100	24	11	72	36	52	41	41	44	10	100
Q7 (teachers' assist and obstacles)	106	16	31	97	35	89	81	62	16	102	33	44	59	16	106
Total	**326**	**502**	**654**	**447**	**757**	**411**	**428**	**598**	**408**	**553**	**633**	**394**	**509**	**326**	**757**

Word count for Educational Dimension

*The list of questions is presented in the Appendix 1. The general idea of the question is explained in the bracket

Table 5 Word count for Psychological and Emotional Dimension

Topic/questions	Words per answer												Average	Min	Max
Psychological and Emotional Dimension	I-1	I-2	I-3	I-4	I-5	I-6	I-7	I-8	I-9	I-10	I-11	I-12			
Q1* (psychological and emotional affect of the transition to ERT)	78	84	72	104	135	89	93	38	63	99	75	50	82	38	135
Q2 (child's relationship with the school)	14	29	52	22	126	35	20	56	12	24	53	36	40	12	126
Q3 (if he/she missed his/her friends or his/her teacher)	18	56	40	95	146	15	26	70	6	26	67	17	49	6	146
Q4 (effect on parent-child relationship)	49	180	161	157	77	32	42	54	30	89	104	70	87	30	180
Total	**159**	**349**	**325**	**378**	**484**	**171**	**181**	**218**	**111**	**238**	**299**	**173**	**258**	**111**	**484**

*The list of questions is presented in the Appendix 1. The general idea of the question is explained in the bracket

Table 6 Word count on Suggestions for ERT improvement

Topic/questions	Words per answer												Average	Min	Max
Suggestions for ERT improvement on students with functional diversity	I-1	I-2	I-3	I-4	I-5	I-6	I-7	I-8	I-9	I-10	I-11	I-12			
Q1* (response/acceptance of ERT from your child)	7	11	18	25	84	40	10	4	5	23	5	8	20	4	84
Q2 (difficulties during the procedure)	42	28	43	25	60	27	21	30	14	57	19	40	34	14	60
Q3 (functional diversiity and ERT)	40	64	28	36	111	82	69	35	17	15	30	40	47	15	111
Q4 (practices to attend ERT lessons)	34	36	49	16	174	38	53	56	2	34	25	20	45	2	174
Q5 (suggestions for better implementation of ERT)	67	168	195	34	142	69	102	148	32	55	77	93	99	32	195
Total	**190**	**307**	**333**	**136**	**571**	**256**	**255**	**273**	**70**	**184**	**156**	**201**	**245**	**70**	**571**

*The list of questions is presented in the Appendix 1. The general idea of the question is explained in the bracket

expressed their opinion on the specific issues using more words. Furthermore, the technical issues as well as their proposals for ERT improvement in the future, were something that concerned them less for the specific period of time.

The list of interview questions by topic is presented in the Appendix 1.

6 Discussion

Research findings reveal that the technological readiness, i.e., the digital infrastructure, the appropriate and specially designed digital educational material, the improvement of digital skills and the familiarity with the educational platform (Webex) was a necessary condition for ERT effectiveness. This is in accordance with previous research: ERT required free provision of digital equipment, internet access, and digital skills (Adnan & Anwar, 2020; Aliyyah et al., 2020; Özer, 2020; Pollock, 2020; Zhang et al., 2020). In all cases where those conditions were met, results of ERT were positively evaluated (Battistin et al., 2020; Schwartz et al., 2020; Tomaino et al., 2022). On the other hand, whenever there was a lack of resources and insufficient access to digital equipment, internet access etc., ERT was negatively evaluated (Adnan & Anwar, 2020; Zhang et al., 2020).

Interviewed parents of children with functional diversity mainly focused on the problems created due to the lack of digital skills of both the children and themselves, because they themselves needed to participate actively in the process, especially for children who were at an early age or they were unable to manage electronic devices or connect to the Webex platform on their own. The forced presence of parents next to their children during online courses has also been previously reported on the disadvantages of ERT (Tomaino et al., 2022).

Parents reported Covid-19 to have a negative impact on students with functional diversities, because it deepened educational inequalities to the detriment of those with learning disabilities, behavioral and psychological problems, communication difficulties (both in speech and hearing), hearing and vision problems. Similar findings were presented by Ngubane-Mokiwa and Zongozzi (2021). It is obvious that the present study is in line with previous research regarding the problems encountered in ERT process during the Covid-19pandemic.Those problems are attributed to the fact that educational systems were not properly prepared.

Thus, urgent need to make transition to ERT caused many problems: sloppiness and lack of organizational strategies. Similar findings are reported by Aliyyah et al., 2020; Amorgianioti, 2020; Marek et al., 2021; Ngubane-Mokiwa & Zongozzi, 2021). No such preparation was preceded. This was critical, especially for the students with functional diversity who required an educational environment properly adapted to their needs. This is why parents complained that the educational-teaching material and the whole teaching process were not adapted to the needs of their children, agreeing with the Tomaino et al. (2022) research, which revealed that children with functional diversity can only benefit when the program is tailored to their needs. In addition, in order to properly respond, they needed to have more time at their disposal than children of normal development (Ngubane-Mokiwa & Zongozzi, 2021).

In order to evaluate ERT implementation during the same period in Greece, system shortcomings due to lack of adequate preparation were identified in related research by teachers, who recognized that the online course could not replace face to face courses (Stachteas & Stachteas, 2020). Teachers agreed with the view expressed by the parents of children with functional diversity that ERT is a *"backstop solution"*, so that students are not cut off from school. But it cannot replace face-to-face teaching, learning and pedagogical work of the school. Additionally, Reed (2020), pointed out that teachers were also aware of the increased difficulties faced by students in attending theoretical courses and creative courses in Art and Music, while they did not identify similar difficulties in online science courses. The present research came to similar conclusions, since according to the views of parents, students with functional diversity found difficulties to concentrate mainly on theoretical courses and they attended more easily on science courses. Therefore, parents' concerns about slowing down their developmental improvement were strong, as also shown in the research of Battistin et al. (2020) and Courtenay and Perera (2020).

During the online courses social interaction was lost leading to isolation and psychological burden. Children with functional diversities were strongly affected (Adnan & Anwar, 2020). After all, their psychological state was more vulnerable and regressions were frequent when their daily routine changed (Courtenay & Perera, 2020). Parents felt that their children throughout the pandemic experienced very strong incarceration and social isolation. This is in accordance to Frankova's (2020) research, in which parents argued that it was difficult to manage their children during the pandemic. The face-to-face contact, both with their classmates and the teachers, especially with the parallel support teacher, had a decisive effect on their psychic world and they showed nervousness, anxiety and various psychosomatic problems. That is why they suggested that special care should be taken for the psychological effects of ERT and for the pandemic period in general, because the incarceration burdened everyone's psychology and negatively affected their relationships with their children. Therefore, according to the research, the needs of vulnerable students and their families need to be given priority, also reported by McAleavy et al. (2020).

Research results are in full agreement with scientific literature and demonstrated the choice of direct and compulsory ERT during the Covid-19 period as the most appropriate solution, on the one hand to protect public health (Aliyyah et al., 2020; Habler et al., 2020; Özer, 2020) and on the other hand to maintain contact with the school process (Courtenay & Perera, 2020; Frankova, 2020; Tomaino et al., 2022). That is why they recognized in ERT the comparative result it offered as long as schools remained compulsorily closed (Baytiyeh, 2019), as a complementary tool that must always be on hand. In order to optimize the quality of learning provided for children with functional diversities, specialized support was needed in the context of inclusive education and strengthening their participation in educational environments that meet their specialized needs, in order to actively participate in the learning process (Fernandez et al., 2016; Lindner et al., 2021).

Sentiment analysis results showed the dissatisfaction of the parents regarding ERT. NLP techniques and text analysis revealed the importance of every topic.

7 Conclusion

Results of both ways of analysis appeared to be in agreement leading to the same conclusions. ERT implementation posed many challenges for both the students with functional diversity and their parents. Despite it was identified as an urgent solution, ERT was considered to negatively affect students' learning performance, as well as more importantly their mental health. As parents aptly observed, ERT was not tailored to the needs of the students with functional diversity. On the contrary, in many cases it proved to cause additional problems. Parents' dissatisfaction of ERT implementation reflected students' difficulties to move from physical to virtual learning environment. They highlighted, as also stated in other researches, that additional support and encouragement on those students can be beneficial in order to have equal opportunities in an inclusive school (Averett, 2021; Kim & Fienup, 2022; Tremmel et al., 2020).

The contribution of the current research lies on (i) authentic data use, concerning students with functional diversity during the ERT period and (ii) the method of analysis carried out in an innovative two-fold way.

Corresponding data for the specific research field are limited. Therefore, the data collected for our research are considered as an important contribution in the field. In addition, due to the recent general application of ERT to students' education, highlighting of all the aspects of their daily life is deemed necessary. It should be studied more extensively and taken into account and used for future planning and development of educational policy practices for students with functional diversity.

8 Limitations and future work

We acknowledge that our study, despite the contribution and the fact that highlights many aspects of the difficulties and challenges that children with functional diversity faced during the transition to e-learning procedure, must be viewed within the several limitations. At first, the small sample size limits the generalizability of our findings. Sample size also limited any potential subgroup analyses (autism, ADHD, dyslexia etc.) or any further possible analysis. A more detailed semantic and sentiment analysis could also contribute to pattern identification of the parents' personalities.

More research must be conducted on the field of special education with a larger and more diverse group of special education teachers, parents or students during COVID-19 pandemic. In order to maximize the validity and reliability of the present research, it is necessary to triangulate (cross-checking and validation) its results. Our findings could be combined with a large-scale quantitative research, which will study this uncharted field, revealing the practices were applied in order to integrate students with functional diversity. A more detailed in-depth linguistic analysis on the interview's dataset could reveal additional aspects of ERT impact on students with functional diversity.

Appendix 1

List of interview questions by topic.

A. Material and Technical Conditions

Question 1: Did you receive any help from the school (clarifications, instruc tions for logging in to the Webex platform, passwords etc.)?

Question 2: Did you have the required electronic media and internet connection? If not, how did you manage to acquire them?

Question 3: What device did you use to connect for the class? A computer, a tablet or a mobile phone?

Question 4: Did your child have any difficulties handling the device or connecting to the platform? If yes, how did you deal with those difficulties?

Question 5: Were you worried about the duration your child used electronic devices?

Question 6: Were you concerned about the leak of students' personal data?

B. Educational Dimension

Question 1: Did your child participate in the course every day? In case he/she didn't attend, did you encourage him/her to attend? What was your reaction?

Question 2: Was he/she paying attention to his/her teacher? Did he/she actively participate in the educational process? Did he/she do his/her homework? Did he/she answer to the teacher's questions?

Question 3: What was his/her behavior during ERT? Was he/she concentrated? Was he/she worried/anxious etc.?

Question 4: Were you satisfied with the ERT schedule?

Question 5: Do you think your child was benefited from ERT? How and to what extent?

Question 6: Do you think that the level of education provided in ERT was as satisfactory as in the physical classroom?

Question 7: Were the teachers willing to assist the child? Did you encounter any resistance-obstacles from the teaching staff? What was their attitude?

C. Psychological/Emotional Dimension

Question 1: How did the transition to ERT affect your child psychologically and emotionally? Were there any unusual or unexpected behaviors during ERT?

Question 2: Do you think that the ERT process affected the child's relationship with the school? If yes, in what way?

Question 3: Did he/she tell you if he/she missed his/her friends or his/her teacher or any other person from the school?

Question 4: Do you think that the ERT process affected your relationship with your child? If yes, in what way?

D. Learning difficulties and ERT

Question 1: Was there a quick response/acceptance of ERT from your child? How long did it take to move to ERT?

Question 2: Which procedures made it more difficult e.g., was he connecting on his own?

Question 3: Do you think that any characteristic of your child's learning difficulties, made it particularly difficult for him/her to follow the process of ERT?

Question 4: Have you implemented any specific practices for your child in order to accept the transition from physical classroom to ERT? Did you help it in any way?

Question 5: What improvements would you suggest for the better implementation of ERT for children with functional diversity?

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Data availability The datasets generated during and/or analyzed during the current study are not publicly available due to privacy reasons but are available from the corresponding author on reasonable request.

Declarations

Financial interest The authors declare they have no relevant financial or non-financial interests to disclose.

Ethical approval All procedures performed in the study involving human participants were in accordance with the ethical standards.

Conflict of interest None.

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Authors and Affiliations

Spyridon Tzimiris[1] · Stefanos Nikiforos[1] · Katia Lida Kermanidis[1]

✉ Spyridon Tzimiris
c20tzim@ionio.gr

Stefanos Nikiforos
nikiforos@ionio.gr

Katia Lida Kermanidis
kerman@ionio.gr

[1] Humanistic and Social Informatics Laboratory (HILab), Department of Informatics, Ionian University, 7 Tsirigoti Square, Corfu, Greece