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(REVIEW ARTICLE)

The use of ICT in the education of students with Dysorthographia

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Abstract

The use of special educational software for students with dysorthographia provides the possibility to develop tools, materials and teaching practices that can help students with special educational needs to access information, engage in the educational process, develop interaction with their peers and the teacher, to undertake tasks using multiple accessible methods and tools. All this contributes to the formation of a favorable learning climate in the classroom with various pedagogical and learning benefits for all students. Of course, the use of technology in special education is not a panacea in solving all educational problems, but it is possible to contribute to the all-round development of a child who faces learning difficulties, always in combination with the appropriate pedagogical method and support.

Keywords: Dysortografia; Learning Disabilities; Spelling; ICT

1. Introduction

A large number of children with learning disabilities have problems with spelling. There are cases where, while they are good readers, they have extremely low spelling performance. These students have problems with spelling. Dysortografia is a specific difficulty in learning to spell that is found in children with normal intelligence (Polomarkaki, 1989). Dysortografia is defined as a specific learning disability manifested by unusually persistent difficulty in acquiring the ability to spell. These children make many spelling mistakes both in the subject and in the endings of the words. Often children with dyslexia (difficulties in reading and writing) have problems with spelling at the same time, however dysortografia can exist on its own without being accompanied by disorders in reading ability.

2. Special learning difficulties

Over the years and especially in the last decades, the interest in Special Learning Difficulties became more intense, as the term was broader and was used for all learning difficulties, regardless of their causes. More specifically, Special Learning Difficulties as a scientific field of research, have caused both the interest of researchers and reactions, due to the multitude of parameters, which make it difficult to formulate a single commonly accepted definition and also to define them clearly. Over the years, the need to accurately describe the characteristics of students who fall under the category of special learning needs has become more intense, as these lead to unexpected school failure (Papadatos, 2010).

The introduction of the term "Specific Learning Difficulties" came from the need to separate them from learning problems that have as their origin environmental factors, which include economic and cultural conditions, medical reasons and emotional disorders (IDEA, 2004; Tzouriadou, 2011). Specific Learning Difficulties are difficulties of a primary nature and describe difficulties in learning, which have neurodevelopmental etiologies (Kenanidou, 2017).

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Neurodevelopmental impairments are inherent, not due to mental disability, emotional disorders, school gaps or environmental deprivations, while there is also a hereditary predisposition (Papadatos, 2010). They are therefore related to chromosomal abnormalities and malfunctions in the central nervous system. However, other causes of their appearance can be alcohol consumption or smoking and complications during childbirth, but also later some brain injury (Porpodas, 2003; Bania, 2014). Furthermore, the most recent research proves their frequency of occurrence in comorbidity with other developmental disorders, among which are attention disorders (Reid, 2016; Stanford & Delage, 2020).

The most prevalent international definition of Special Learning Disabilities is the revised IDEA definition. According to it, Specific Learning Difficulties are defined as a disorder found in one or more psychological processes, which are directly related to the understanding and use of language, whether spoken or written. Also, the disorder may manifest itself in the form of a deficiency in the ability to listen, think, speak, read, write, spell or perform mathematical calculations (IDEA, 2004). According to the DSM-5 of the American Psychiatric Association, it is a type of endogenous neurodevelopmental disorder that hinders specific academic skills, and can be reliably diagnosed after the start of compulsory education (American Psychiatric Association, 2013).

Individuals' underlying weaknesses are mainly found in working memory, executive functions, processing speed and phonological processing. In order to diagnose students' weaknesses in specific academic skills, according to the manual, they must be quantitatively below those expected based on the individual's chronological age (Kormos, 2017). In addition, Special Learning Difficulties may coexist with learning problems, which may be due either to sensory disabilities, or to cultural heterogeneity, or to emotional or behavioral disorders, but they are completely different from them (Kandararis, 2004).

Specific learning disabilities are one of the most commonly diagnosed developmental disorders. The areas in which lower performance is found are literacy with a percentage of 3-10% and numeracy with a percentage of 5-8% (Stanford & Delage, 2020). Also, as far as Greece is concerned, the rates of occurrence of these difficulties are quite high, with dyslexia occupying the first place with a rate of 7-13% (Tsitou, 2017) and being highlighted as the most vulnerable group for the occurrence and diagnosis of these difficulties with a rate of 60 -80% boys. Finally, it is reasonable to mention that in the literature the term "special learning difficulties", several times, is either identified with the term dyslexia, or its use is systematically avoided by some researchers. The two terms, specific learning disabilities and dyslexia, are used as synonyms, or else the first constitutes the broader group of learning disabilities and the second a subgroup of them (Vasiliadou, 2017).

It is necessary to note that in Greece, based on the latest law on the Special Education and Training of Persons with Disabilities or with Special Educational Needs (Law 3699/2008), Special Learning Difficulties include the following subcategories: dyslexia, dysgraphia,dysortografia and dyscalculia (Tsitou, 2017). Apart from the last one, the previous ones are related to the subject of language.

3. Specific Learning Difficulties in Language

Language constitutes a particularly important worldwide scientific field, the teaching of which needs immediate reinforcement in the existing educational systems, as it equips people with skills necessary for the later course of their lives. This is necessary for the inclusion for all people with disorders and disabilities (Tsombanoglou et al., 2003). The importance of Language, and not in the narrow sense of a cognitive object, can be seen in its definition as a means to ensure communication between living beings. Communication, beyond the formulation of thoughts, through spoken and written language (Papadatos, 2011), has other aspects, among which are facial expressions, gestures, posture and body movements, but also voice fluctuations. This ability of man to represent reality with written symbols and to receive and communicate information and knowledge is unique, as it distinguishes him from the rest of the species of the animal kingdom. Mastering reading and writing "requires abstract functions" and simultaneous "coordination of complex cognitive functions", which makes them necessary and decisive for human development and progress (Porpodas, 2003).

Although a large percentage of children learn to write and read independently of the educational process, there is a percentage of 10-15% who show difficulties in these processes and require a different specialized teaching (Snowling et al., 2000). Difficulties in reading and writing skills lead to low performance in several subjects, and therefore children experience school failure, which leads to school dropout and future social failure. Therefore, intervention in this group of children for the early acquisition of the above skills marks their academic success.

The categories of Specific Learning Difficulties related to the subject of Language according to the revised version of the Diagnostic and Statistical Manual of Mental Disorders of the American Psychiatric Association (DSM-5), are dyslexia and

difficulty in written expression. Their origin is biological and their effects are evident in the academic course of the student, while they coexist with problems in behavior, self-regulation, social perception and social interaction (Hammil, 1990). This area receives a lot of attention from the educational community because it is necessary to ensure quality education and integration into school life.

4. Dysortografia

Dysortografia is the difficulty of mastering spelling skills, while, on the other hand, the ability to read works effectively and goes hand in hand with the age and mental capacity of each student (Metta & Skordialos, 2020). This category also includes illiteracy, i.e. the loss of the skill of writing that had previously been mastered or its incomplete mastery, but also bad handwriting, i.e. "the disturbed external expression of writing" (Michelogiannis & Tzenaki, 2000).

The student with dysortografia is characterized by a weakness in visual memory, word recall and, by extension, in the assimilation of grammatical rules (Triga-Mertika, 2010). According to Polychroni (2011), spelling errors inform us, on the one hand, about the mental processes that were not performed correctly and, on the other hand, they are indications of the existence of difficulties in processing orthographic information. The errors concern both the spelling of words, suffixes and thematics, as well as punctuation, syntax, omission of tones or pre-stressing of words, alternation of lowercase and capital letters, inversion of syllables, absence of spaces between words. More generally, difficulty is observed in the assimilation and application of phonological, morphological, syntactic and grammatical rules (Polychroni, 2011; Metta & Skordialos, 2020). Dysortografia can also coexist with other specific learning difficulties, but it can also be found individually, without severe disturbances in other cognitive areas (Michelogiannis & Tzenaki, 2000; Bekou, 2020).

5. The role of ICT in education

The electronic writing environment, known as a word processor, is a tool that can be used quite often in the classroom (Manola et al., 2023; Vouglanis & Driga, 2023; Vouglanis & Drigas, 2022), especially when producing continuous writing. It favors individual but mainly group production, since the produced text ceases to be completely personal, since it can be seen by anyone, which favors cooperation, allows the exchange of opinions, connects reading with writing and discussion. one should not overlook that the co-production of the written word familiarizes the students with new ways of writing, widely spread in the contemporary research and professional communities. In addition, the text editor as a medium shows the writing of a text as a gradual and exploratory process, speeds it up, reduces the memory requirement and helps the teacher to change roles: from evaluating the final written product, it can now support writing and production process. The above arguments meet several of the criteria set regarding the pedagogical use of the software. After all, the text editor is an "open" environment and as such favors the construction of knowledge. It can also support as a means any teaching approach regardless of whether the teacher follows it (Avramidis, 2010).

Writing for a student with learning disabilities is a painstaking and time-consuming task. To write a text on paper means that he has to combine the difficult processes of writing (by hand), spelling and selecting content. A student with poor handwriting and spelling difficulties may have many interesting ideas, but these ideas are lost as he tries to overcome his writing difficulties. The result on the paper usually does not represent the real potential of the student (Crivelli, 2000).

Within these contexts the help of the computer word processor can be invaluable:

- First, because the student can concentrate on a small piece of work at a time (Thomson & Watkins, 1998).
- Second, because a student with dyslexia finds the correct letter from the keyboard is easier than having to recall it from memory (McKeown, 2000).
- In addition, the editor enables him to make changes to his writing, to transfer words and sentences, without smudging and deletions. In this way he can express his thoughts, reveal his real ideas and develop them, without the fear of the bad appearance of the writing (Detheridge, 1996).

For students with more severe writing difficulties, there are programs that can predict the next word, as well as programs called "word banks." Such programs can prove very useful and help the student to express his thoughts more fully without leaving gaps and half words. Text editors can be just as useful as tools. Although many argue that with correctors the student will not learn spelling and can be completely dependent on them, the literature provides arguments in favor of using such programs. It is a fact that they offer students more of this. Of course, traditional correctors cannot predict all "dyslexic errors". However, they can recognize and indicate to the student the words that

need correction. Another textual tool that can be useful is the Thesaurus, which gives synonyms and can enhance the understanding of new words by relating them to already known words (Detheridge, 1996). The only difficulty with these tools is that they take time and effort to teach students how to use them. Thanks to the above capabilities of a copywriter, the result of the work is "clean", free of incomprehensible words and bad appearance. It is organized and presentable and makes the student, who is used to failure until now, proud of his work. law, while at the same time improving spelling (McKeown, 2000).

Another important area where computers can help children with special learning difficulties is with spelling and writing skills. Practice programs through play or exercises can motivate these children to practice and improve their spelling. In addition, computers are a multisensory learning environment since students see the word, hear it, and then have to write it (Crivelli, 2000). Fingering a word seems to be beneficial, as, firstly, students learn exemplary finger movements, which help them remember the correct spelling, while secondly, it helps the sound-graph connection (Thomson & Watkins, 1998).

The "learn the articles" software developed includes activities for learning how to write homophonic articles correctly. When starting the application, each student has the opportunity to decide which articles they wish to engage with. However, he is considered responsible for the time he will consume, but also for the type and number of exercises he wishes to engage in. Through this software system, you can choose the category:

- "Learning". According to this category follows a series of activities that offer him the possibility to distinguish, investigate and discover his knowledge. Along the way, he follows a series of activities where he can apply the new knowledge, pay attention to his answers and structure them in case of mistakes.
- "I check". Regarding the specific option, the student follows a series of activities that give him the advantage of checking his performance on a specific pair of homophones. The student can determine the order in which he wishes to learn the homonymous articles and repeat the same pair of homonymous articles. For each pair there are five groups of exercises.

According to the above activities of both "learn" and "check" categories, it is observed that they have a similar structure and order. In the activities of the "check" module the student does not have the advantage of self-correction and is not given any help. On the contrary, in the activities of the "learn" section there is a relative help and the advantage to check each activity and proceed with corrections as many times as desired.

Finally, we must highlight the productive and effective role of all digital technologies in the field of education. These technologies, which include mobile devices (50–53), a variety of ICTs (54–73), AI & STEM ROBOTICS (74–78), and games (79-81), facilitate and improve educational procedures such as assessment, intervention, and instruction. In addition, the use of ICTs in conjunction with theories and models of metacognition, mindfulness, meditation, and emotional intelligence cultivation [82-108], accelerates and enhances educational practices and outcomes, particularly for students with dyslexia and dysorthographia.

6. Conclusions

The utilization of special educational software in Special Education and Education provides the possibility to develop tools, materials and teaching practices that can help students with special educational needs to access information, to be involved in the educational process, to develop interaction with their peers and the teacher, to undertake tasks using multiple accessible methods and tools [35-49]. All this contributes to the formation of a favorable learning climate in the classroom with various pedagogical and learning benefits for all students, including those who suffer from Dysorthographia.

Compliance with ethical standards

Disclosure of conflict of interest

The Authors proclaim no conflict of interest.

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