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Educating students with dyslexia through ICT during the COVID-19 pandemic

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Abstract: This study examines how the education of students with dyslexia was affected during the COVID-19 pandemic through the use of technology mandated by the adoption of distance education. The limited research concerning this group of students showed that they faced significant difficulties, more than the rest of the students. The use of technology did not ensure their learning results because it was not accompanied by the necessary adaptation of teaching but instead there was a lack of support and understanding of the specialized needs of these students. This has resulted in reduced learning outcomes and psychological burden for students with dyslexia and their families.

Keywords: education, dyslexia, ICT, pandemic.

1. Introduction

In Greece, as in other countries worldwide, one of the measures taken to limit the transmission of the pandemic was the closing of schools. This in turn led to the adoption of distance education in order to meet the needs of students. The Greek education system had not made the proper preparation for the adoption of distance education. This happened in other countries of the world. Thus, teachers worldwide very quickly forced themselves to use the platforms that were formed and received a quick training to be able to cope with the needs that arose. The teachers were under a lot of pressure but managed to use distance education to teach their students (Lapada et al., 2020).

Distance education is a process that has constantly occupied the educational and scientific community due to the perspectives it offers. Its important element is that in it the student learns autonomously (Giagli et al., 2010). This results from the fact that the student does not have a physical presence at school and is taught through specially designed procedures and educational materials (Lionarakis, 2006).

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2. Dyslexia

Dyslexia is expressed by the difficulty in reading. It is a neurological disorder that affects the way a person acquires and processes speech. The way it manifests varies, with different levels of severity, and can appear in reading, phonological processing, spelling, writing and, in some cases, arithmetic. If dyslexia is treated with appropriate interventions, then people suffering from it can have adequate treatment (Tzivinikou, 2015).

One form of dyslexia is acquired which manifests itself due to damage to the central nervous system as a result of some injury or disease. The other form of dyslexia is the special developmental dyslexia in which, while the student has normal levels of intelligence and can be higher, he has difficulty reading and writing (Metta & Skordialos, 2018). The student who has dyslexia makes mistakes in letters, syllables and words. He stutters or pauses while reading and even when copying a text he makes spelling mistakes. He still presents difficulties in organizing their written text, his written language is verbally limited and he also makes mistakes in syntax (Metta & Skordialos, 2018).

In recent years, a growing body of evidence suggests that children and adolescents with dyslexia are also at increased risk of experiencing mental health difficulties (Heiman & Olenik-Shemesh, 2020). The repeated experiences of failure faced by students with dyslexia appear to increase their vulnerability to internalizing disorders (eg, anxiety and depression) and lower views of their academic ability. Studies looking at psychological well-being for people with learning disabilities offer relevant data, because dyslexia is the most common. For example, the meta-analysis by Nelson & Harwood (2011) revealed that approximately 70% of students with dyslexia experience greater anxiety symptoms than students without. Also, a study by Panicker & Chelliah (2016) revealed that a relatively higher proportion of students with dyslexia had severe stress (16%), severe anxiety (23%) and/or severe depression (14%).

Nelson & Harwood (2011) also completed a meta-analysis of understanding depression among students with dyslexia and found higher scores on measures of depression than their peers, which was true regardless of who reported depression-related symptoms (ie themselves, parent or teacher). Similarly, the meta-analysis by Francis et al. (2019) found that poor readers were at moderate risk (at statistically significant levels) of experiencing anxiety and depression, and Mammarella et al. (2016) found that students with dyslexia have worse depressive symptoms than those with non-verbal learning disabilities.

Some studies (Lee & Zentall, 2012; Wolters et al., 2014; Soriano-Ferrer & Morte-Soriano, 2017) also looked specifically at the psychoeducational and more general well-being of children with disabilities and found that those with dyslexia presented more negative perceptions of themselves as they are less

motivated to read. Thus, students with dyslexia read less for pleasure and engage less in reading activities. Lee and Zentall (2017) also found that students with dyslexia maintained low reading motivation and decreased reading for school as they moved into middle school.

Dyslexia presents significant challenges for students and can also have a negative impact on their parents (Delany, 2017). Mothers, in particular, experience higher levels of stress and depression and report significant effects on the family and increased difficulties in daily life (Bonifacci et al., 2014). Snowling et al. (2007) observed that approximately 74% of parents reported that their child's difficulties had a mild to severe impact on family life and that mothers of children with dyslexia had higher levels of stress and depression.

3. Students with dyslexia during the pandemic

According to UNESCO (2020), school closures caused by the coronavirus pandemic affected over 1.5 billion students and their families. The disruption of interpersonal learning was unprecedented and, as highlighted in the report by Di Pietro et al. (2020), the transition to distance learning environments in many countries could have significant and negative effects on children's academic learning as well as their cognitive and non-cognitive skills. The burden is expected to be greater for students with disabilities and special educational needs (Vouglanis & Driga, 2023;

School closures – and therefore distance learning – created limited mobility and social isolation for students, and the overall conditions presented significant challenges for the psychological well-being of children and their families (Cachón-Zagalaz et al., 2020; Griffith Griffith , 2022). In Western countries, parents noticed emotional and behavioral changes in their children in the first weeks of the lockdown. For example, in the study by Orgilés et al. (2020), 86% of Spanish parents perceived changes in their children's emotional state and behavior during quarantine (eg, 77% had difficulty concentrating, 52% experienced significant boredom, 39 % showed irritability, 38% showed restlessness and 38% had marked nervousness).

Although all students' lives through the COVID-19 pandemic have created many challenges, students with neurodevelopmental disorders or special educational needs have struggled the most. Many of them struggled with online learning and were at high risk of dropping out or becoming depressed (Sibley et al., 2021). Similarly, students with special educational needs and disabilities have been shown to have difficulties, not only academically, but also socially, increasing the risk of dropping out and time spent in front of screens (Putri et al., 2020; Bachenis et al., 2021; Banerjee et al., 2021; Soriano-Ferrer et al., 2021). Specifically, students with dyslexia did not meet their reading goals and

experienced difficulties in reading, comprehension, and mathematics during online courses (Bachenis et al., 2021; Soriano-Ferrer et al., 2021). As reported by their parents, students with dyslexia were less motivated to establish reading routines and were negatively affected during the quarantine (Soriano-Ferrer et al., 2021).

Distance education imposed by the COVID-19 pandemic has forced adjustments to teaching methods, especially for students with learning disabilities, who already needed special support and instruction tailored to their specific needs. Only a few studies have focused on the impact of distance education during the COVID-19 pandemic on students with learning disabilities, particularly dyslexia, examining the model adopted in some European countries such as Italy (Termine et al., 2021; Baschenis et al., 2021), Poland (Zawadka et al., 2021) and Spain (Soriano-Ferrer et al., 2021; Forteza-Forteza et al., 2021), considering personal and family emotional consequences (Soriano -Ferrer et al., 2021; Forteza-Forteza et al., 2021), perceptions of teaching quality (Zawadka et al., 2021; Soriano-Ferrer et al., 2021; Termine et al., 2021) and the consequences on academic performance (Baschenis et al., 2021; Zawadka et al., 2021). Similar to findings for the general population, when examining the emotional-behavioral consequences of distance education, the little existing evidence in students with learning disabilities highlighted a deterioration in psychological well-being, with an increase in stress, anxiety and depressive symptoms (Soriano -Ferrer et al., 2021; Forteza-Forteza et al., 2021).

The transition from interpersonal to interpersonal learning has also posed additional challenges for families. The available evidence generally documents that the experience of distance education is usually associated with negative consequences for parents (Soriano-Ferrer et al., 2021; Forteza-Forteza et al., 2021; Maggio et al., 2021; Moscardino et al. ., 2021). A possible reason for the increased stress of parents during distance education may lie in the absence of specialized care generally provided during school hours and the increased involvement of parents in the management of school activities. Also, parents of children and adolescents with learning disabilities often feel overwhelmed during distance education, with increased levels of stress, anxiety and frustration and also due to the children's reduced study autonomy (Soriano-Ferrer et al., 2021; Forteza -Forteza et al., 2021; Touloupis, 2021).

Taking into account the perceptions of the quality of teaching, students with learning disabilities appeared to have more difficulties in organizing and carrying out school activities during distance education, experiencing a decrease in learning opportunities, greater difficulties in organizing learning (e.g. e.g. adapting pace and working time to their own needs, ease of contact with lectures) and lack of support from teachers (Soriano-Ferrer et al., 2021; Forteza-Forteza et al., 2021; Zawadka et al., 2021; Termine et al., 2021).

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In terms of academic achievement, students with dyslexia have been shown to have more difficulty achieving their educational goals during distance education regardless of grade level. Specifically, the study by Baschenis et al. (2021) documented that approximately 61% of 65 Italian children and adolescents with dyslexia did not reach the level of reading speed generally achieved at the end of the school year. The availability of adequate infrastructure or support services and the presence of a teacher during distance education also did not positively affect the level of reading achieved. Similarly, the study by Zawadka et al (2021) found that more students with dyslexia or self-reported reading difficulties failed at least one test after the distance education period compared to typical readers. Similarly, although difficult to compare due to different parameters, studies in the general population showed a learning loss of about 3 percentage points or 0.08 standard deviations in reading, math, and writing during the COVID-19 pandemic in about 60% of students (Engzell et al., 2021; Haelermans et al., 2022).

Regarding the aspects that affected stress during distance education, students were more stressed in relation to online courses and oral exams than the other elements. Both students with dyslexia and their parents describe greater difficulties in attending online courses and deterioration in oral exposure compared to conventional learning (Baschenis et al., 2021). Similarly, students with dyslexia were found to struggle with online courses, believing that their educational needs were not adequately addressed by teachers (Soriano-Ferrer et al., 2021; Forteza-Forteza et al., 2021).

The research of Forteza-Forteza et al. (2021) also showed how the lockdown and school closures created additional difficulties in learning, but also how some educational processes have been enhanced with the support of technological resources that should serve as reference points for educational policy and classroom practice. However, the possession of computers, tablets or mobile phones does not guarantee learning when the educational material is standardized for everyone, inaccessible and quite attractive. ICT has a limited impact on learning, mainly due to its reduced potential, when the necessary skills have not been developed and are not utilized in an appropriate way (Vouglanis, 2020). The research of Forteza-Forteza et al. (2021) showed that most students had access to technology, but only a small percentage had used apps to help their reading, text comprehension, and writing, which can be highly effective. Also, students reported that they were better at home than at school, despite not being able to interact with their classmates in person. They also pointed out that time is still a significant barrier due, in particular, to the increase and lack of coordination in the tasks carried out through online teaching. They also pointed out that the syllabus is a barrier because of its reliance on standardization in activities meant to aid learning (Forteza-Forteza et al., 2021).

4. Conclusions

The COVID-19 pandemic has affected everyone's life to some extent. The students who saw their primary need, the school, being challenged, also had significant consequences. Prolonged school closures and the spread of distance education have highlighted critical issues and advantages of alternative and technology-based teaching methods. Given the uncertainty that still seems to characterize this phase of the pandemic, adopting appropriate strategies and planning teaching activities taking into account all students' needs could be a critical challenge for the future.

Last but not least, we emphasize the significance of all digital technologies in the field of education and in dyslexia training, which is very effective and productive and facilitates and improves the assessment, the intervention, and the educational procedures via mobile devices that bring educational activities anywhere [43-52], various ICTs applications that are the main supporters of education [53-89], and AI, STEM, and ROBOTICS that raise educational procedures to new performance levers [90-110] and friendly and enjoyable games [111-114]. Additionally, the improvement and blending of ICTs with theories and models of metacognition, mindfulness, meditation, and emotional intelligence cultivation [115-161], as well as with environmental factors and nutrition [39-42], accelerates and improves more than educational practices and results, especially in dyslexics' teaching.

5. References

[1] Banerjee, T., Khan, A., & Kesavan, P. (2021). Impact of lockdown and school closure on children in special schools: A single-centre survey. BMJ Paediatrics Open, 5(1).
[2] Baschenis, I. M. C., Farinotti, L., Zavani, E., Grumi, S., Bernasconi, P., Rosso, E., ... & Chiappedi, M. (2021). Reading skills of children with dyslexia improved less than expected during the COVID-19 lockdown in Italy. Children, 8(7), 560.
[3] Bonifacci, P., Montuschi, M., Lami, L., & Snowling, M. J. (2014). Parents of children with dyslexia: Cognitive, emotional and behavioural profile. Dyslexia, 20(2), 175-190.
[4] Cachón-Zagalaz, J., Sánchez-Zafra, M., Sanabrias-Moreno, D., González-Valero, G., Lara-Sánchez, A. J., & Zagalaz-Sánchez, M. L. (2020). Systematic review of the literature about the effects of the COVID-19 pandemic on the lives of school children. Frontiers in Psychology, 11, 569348.
[5] Delany, K. (2017). The experience of parenting a child with dyslexia: An Australian perspective. Journal of Student Engagement: Education Matters, 7(1), 97-123.
[6] Di Pietro, G., Biagi, F., Costa, P., Karpinski, Z., & Mazza, J. (2020). The Likely Impact of COVID-19 on Education: Reflections Based on the Existing Literature and Recent International Databases. JRC Technical Report. Luxembourg: European Commission
[7] Engzell, P., Frey, A., & Verhagen, M. D. (2021). Learning loss due to school closures during the COVID-19 pandemic. Proceedings of the National Academy of Sciences, 118(17), e2022376118.
[8] Forteza-Forteza, D., Rodríguez-Martín, A., Álvarez-Arregui, E., & Menéndez Álvarez-Hevia, D. (2021). Inclusion, dyslexia, emotional state and learning: Perceptions of Ibero-American children with dyslexia and their parents during the COVID-19 lockdown. Sustainability, 13(5), 2739.

[9] Francis, D. A., Caruana, N., Hudson, J. L., & McArthur, G. M. (2019). The association between poor reading and internalising problems: A systematic review and meta-analysis. Clinical Psychology Review, 67, 45-60.
[10] Giagli, S., Giaglis, G., & Koutsoumba, M. (2010). Autonomy in learning in the context of distance education. Open Education: the journal for Open and Distance Education and Educational Technology, 6(1,2), 92-105.
[11] Griffith, A. K. (2022). Parental burnout and child maltreatment during the COVID-19 pandemic. Journal of family violence, 37(5), 725-731.
[12] Haelermans, C., Korthals, R., Jacobs, M., de Leeuw, S., Vermeulen, S., van Vugt, L., ... & de Wolf, I. (2022). Sharp increase in inequality in education in times of the COVID-19-pandemic. PLoS One, 17(2), e0261114.
[13] Heiman, T., & Olenik-Shemesh, D. (2020). Social-emotional profile of children with and without learning disabilities: The relationships with perceived loneliness, self-efficacy and well-being. International Journal of Environmental Research and Public Health, 17(20), 7358.
[14] Lapada, A. A., Miguel, F. F., Robledo, D. A. R., & Alam, Z. F. (2020). Teachers' Covid-19 Awareness, Distance Learning Education Experiences and Perceptions towards Institutional Readiness and Challenges. International Journal of Learning, Teaching and Educational Research, 19(6), 127-144.
[15] Lee, J., & Zentall, S. S. (2012). Reading motivational differences among groups: Reading disability (RD), attention deficit hyperactivity disorder (ADHD), RD+ ADHD, and typical comparison. Learning and individual Differences, 22(6), 778-785.
[16] Lee, J., & Zentall, S. S. (2017). Reading motivation and later reading achievement for students with reading disabilities and comparison groups (ADHD and typical): A 3-year longitudinal study. Contemporary Educational Psychology, 50, 60-71.
[17] Lionarakis, A. (2006). The theory of distance education and the complexity of its polymorphic dimension. In A. Lionarakis (Ed.), Open and distance education - Elements of theory and practice (pp. 11-41). Athens: Propompos.
[18] Maggio, M. G., Stagnitti, M. C., Calatozzo, P., Cannavò, A., Bruschetta, D., Foti Cuzzola, M., ... & Calabrò, R. S. (2021). What about the consequences of the use of distance learning during the COVID-19 pandemic? A survey on the psychological effects in both children and parents. International Journal of Environmental Research and Public Health, 18(23), 12641.
[19] Mammarella, I. C., Ghisi, M., Bomba, M., Bottesi, G., Caviola, S., Broggi, F., & Nacinovich, R. (2016). Anxiety and depression in children with nonverbal learning disabilities, reading disabilities, or typical development. Journal of learning disabilities, 49(2), 130-139.
[20] Metta G., & Skordialos E. (2020). Learning Difficulties, types and Educational Intervention. Panhellenic Conference of Education Sciences, 8, 707–720.
[21] Moscardino, U., Dicataldo, R., Roch, M., Carbone, M., & Mammarella, I. C. (2021). Parental stress during COVID-19: A brief report on the role of distance education and family resources in an Italian sample. Current Psychology, 40, 5749-5752.
[22] Nelson, J. M., & Harwood, H. (2011). Learning disabilities and anxiety: A meta-analysis. Journal of learning disabilities, 44(1), 3-17.
[23] Nelson, J. M., & Harwood, H. R. (2011). A meta-analysis of parent and teacher reports of depression among students with learning disabilities: Evidence for the importance of multi-informant assessment. Psychology in the Schools, 48(4), 371-384.
[24] Orgilés, M., Morales, A., Delvecchio, E., Mazzeschi, C., & Espada, J. P. (2020). Immediate psychological effects of the COVID-19 quarantine in youth from Italy and Spain. Frontiers in psychology, 2986.
[25] Panicker, A. S., & Chelliah, A. (2016). Resilience and stress in children and adolescents with specific learning disability. Journal of the Canadian Academy of Child and Adolescent Psychiatry, 25(1), 17-23.

[26] Putri, R. S., Purwanto, A., Pramono, R., Asbari, M., Wijayanti, L. M., & Hyun, C. C. (2020). Impact of the COVID-19 pandemic on online home learning: An explorative study of primary schools in Indonesia. International Journal of Advanced Science and Technology, 29(5), 4809-4818.
[27] Sibley, M. H., Ortiz, M., Gaias, L. M., Reyes, R., Joshi, M., Alexander, D., & Graziano, P. (2021). Top problems of adolescents and young adults with ADHD during the COVID-19 pandemic. Journal of psychiatric research, 136, 190-197.
[28] Snowling, M. J., Muter, V., & Carroll, J. (2007). Children at family risk of dyslexia: a follow-up in early adolescence. Journal of child psychology and psychiatry, 48(6), 609-618.
[29] Soriano-Ferrer, M., & Morte-Soriano, M. (2017). Teacher perceptions of reading motivation in children with developmental dyslexia and average readers. Procedia-Social and Behavioral Sciences, 237, 50-56.
[30] Soriano-Ferrer, M., Morte-Soriano, M. R., Begeny, J., & Piedra-Martínez, E. (2021). Psychoeducational challenges in Spanish children with dyslexia and their parents' stress during the COVID-19 pandemic. Frontiers in Psychology, 12, 648000.
[31] Termine, C., Dui, L. G., Borzaga, L., Galli, V., Lipari, R., Vergani, M., ... & Ferrante, S. (2021). Investigating the effects of COVID-19 lockdown on Italian children and adolescents with and without neurodevelopmental disorders: a cross-sectional study. Current Psychology, 1-17.
[32] Touloupis, T. (2021). Parental involvement in homework of children with learning disabilities during distance learning: Relations with fear of COVID-19 and resilience. Psychology in the Schools, 58(12), 2345-2360.
[33] Tzivinikou, S. (2015). Learning difficulties - teaching interventions. Kallipos, Open Academic Publications.
[34] UNESCO (2020). Learning Never Stops – Tell UNESCO How You are Coping with COVID-19 School Closures. In https://www.unesco.org/en/articles/learning-never-stops-tell-unesco-how-you-are-coping-covid-19-school-closures
[35] Vouglanis, T. (2020). Teachers' attitudes towards the use of ICT in the educational process of people with special educational needs. International Journal of Educational Innovation, 2(1), 90-99.
[36] Vouglanis, T., & Driga, A. M. (2023). Risks, inequalities, and problems of people with Disabilities in the COVID-19 pandemic and the role of ICTs. TechHub Journal, 4, 45-58.
[37] Wolters, C. A., Denton, C. A., York, M. J., & Francis, D. J. (2014). Adolescents' motivation for reading: Group differences and relation to standardized achievement. Reading and Writing, 27, 503-533.
[38] Zawadka, J., Miękisz, A., Nowakowska, I., Plewko, J., Kochańska, M., & Haman, E. (2021). Remote learning among students with and without reading difficulties during the initial stages of the COVID-19 pandemic. Education and Information Technologies, 26(6), 6973-6994.
[39] Stavridou Th., Driga, A.M., Drigas, A.S., 2021. Blood Markers in Detection of Autism, International Journal of Recent Contributions from Engineering Science & IT (iJES) 9(2):79-86.
[40] Zavitsanou, A., & Drigas, A. (2021). Nutrition in mental and physical health. Technium Soc. Sci. J., 23, 67.
[41] Driga, A.M., Drigas, A.S. 2019 "Climate Change 101: How Everyday Activities Contribute to the Ever-Growing Issue", International Journal of Recent Contributions from Engineering, Science & IT, vol. 7(1), pp. 22-31. https://doi.org/10.3991/ijes.v7i1.10031
[42] Driga, A.M., and Drigas, A.S. 2019 "ADHD in the Early Years: Pre-Natal and Early Causes and Alternative Ways of Dealing." International Journal of Online and Biomedical Engineering (IJOE), vol. 15, no. 13, p. 95., doi:10.3991/ijoe.v15i13.11203
[43] Stathopoulou A., Loukeris D., Karabatzaki Z., Politi E., Salapata Y., and Drigas, A. S., 2020 "Evaluation of Mobile Apps Effectiveness in Children with Autism Social Training via Digital Social Stories," Int. J. Interact. Mob. Technol. (iJIM); Vol 14, No 03,
[44] Drigas AS, Pappas MA, 2015 A review of mobile learning applications for mathematics. International Journal of Interactive Mobile Technologies 9 (3)

[45] Drigas, A. S., and Angelidakis P., 'Mobile Applications within Education: An Overview of Application Paradigms in Specific Categories', International Journal of Interactive Mobile Technologies(iJIM), vol. 11, no. 4, p. 17, May 2017. https://doi.org/10.3991/ijim.v11i4. 6589
[46] Stathopoulou, et all 2018, Mobile assessment procedures for mental health and literacy skills in education. International Journal of Interactive Mobile Technologies, 12(3), 21-37,
[47] Drigas, A., Kokkalia, G. & Lytras, M. D. (2015). Mobile and Multimedia Learning in Preschool Education. J. Mobile Multimedia, 11(1-2), 119–133.
[48] Kokkalia G, AS Drigas, A Economou 2016 Mobile learning for preschool education. International Journal of Interactive Mobile Technologies 10 (4)
[49] Stathopoulou A, Karabatzaki Z, Tsiros D, Katsantoni S, Drigas A, 2019 Mobile apps the educational solution for autistic students in secondary education Journal of Interactive Mobile Technologies 13 (2), 89-101
[50] Drigas A, DE Dede, S Dedes 2020 Mobile and other applications for mental imagery to improve learning disabilities and mental health International Journal of Computer Science Issues (IJCSI) 17 (4), 18-23
[51] Drigas, A.S., Ioannidou, R.E., Kokkalia, G. and Lytras, M. (2014), "ICTs, mobile learning and social media to enhance learning for attention difficulties", Journal of Universal Computer Science, Vol. 20 No. 10, pp. 1499-1510.
[52] Alexopoulou A, Batsou A, Drigas A, 2020 Mobiles and cognition: The associations between mobile technology and cognitive flexibility iJIM 14(3) 146-156
[53] Drigas, A. S., & Ioannidou, R. E. (2011, September). ICTs in special education: A review. In World Summit on Knowledge Society (pp. 357-364). Springer, Berlin, Heidelberg.
[54] Drigas, A. S., J.Vrettaros, L.Stavrou, D.Kouremenos, 2004. E-learning Environment for Deaf people in the E-Commerce and New Technologies Sector, WSEAS Transactions on Information Science and Applications, Issue 5, Volume 1, November
[55] Drigas, A.S., Vrettaros, J. and Kouremenos, D. (2004) 'Teleeducation and e-learning services for teaching English as a second language to deaf people, whose first language is the sign language', WSEAS Transactions on Information Science and Applications, Vol. 1, No. 3, pp.834–842.
[56] Drigas, A., Koukianakis, L., Papagerasimou, Y., 2011, Towards an ICT-based psychology: Epsychology, Computers in Human Behavior, 27:1416–1423. https://doi.org/10.1016/j.chb.2010.07.045
[57] Drigas A., Pappas M, and Lytras M., 2016. "Emerging technologies for ict based education for dyscalculia: Implications for computer engineering education," International Journal of Engineering Education, vol. 32, no. 4, pp. 1604–1610,
[58] Drigas, A., Kokkalia, G., & Lytras, M. D. (2015). ICT and collaborative co-learning in preschool children who face memory difficulties. Computers in Human Behavior, 51, 645–651.
[59] Drigas, A. & Kokkalia, G. 2017. ICTs and Special Education in Kindergarten. International Journal of Emerging Technologies in Learning 9 (4), 35–42.
[60] Drigas, A. S., Stavridis, G., & Koukianakis, L. (2004). A Modular Environment for E-learning and E-psychology Applications. WSEAS Transactions on Computers, 3(6), 2062-2067.
[61] A Drigas, L Koukianakis, Y Papagerasimou 2011Towards an ICT-based psychology: E-psychology Computers in Human Behavior 27 (4), 1416-1423
[62] Drigas, A., Leliopoulos, P.: Business to consumer (B2C) e-commerce decade evolution. Int. J. Knowl. Soc. Res. (IJKSR) 4(4), 1–10 (2013)
[63] Pappas M, Drigas A, Papagerasimou Y, Dimitriou H, Katsanou N, Papakonstantinou S, et al. 2018; Female Entrepreneurship and Employability in the Digital Era: The Case of Greece. Journal of Open Innovation: Technology, Market, and Complexity. 4(2): 15.
[64] Papanastasiou G., Drigas, A. S., Skianis Ch., M. Lytras & E. Papanastasiou, 2018. "Patient-Centric ICTs based Healthcare for students with learning, physical and/or sensory disabilities," Telemat Inform, vol. 35, no. 4, pp. 654–664, 2018. https://doi. org/10.1016/j.tele.2017.09.002

[65] Drigas, A., & Kontopoulou, M. T. L. (2016). ICTs based Physics Learning. International Journal of Engineering Pedagogy (iJEP), 6(3), 53-59. https://doi.org/10.3991/ijep.v6i3. 53-59
[66] Papanastasiou, G., Drigas, A., Skianis, C., and Lytras, M. (2020). Brain computer interface based applications for training and rehabilitation of students with neurodevelopmental disorders. A literature review. Heliyon 6:e04250. doi: 10.1016/j.heliyon.2020.e04250
[67] Drigas, A. S., John Vrettaros, and Dimitris Kouremenos, 2005. "An e-learning management system for the deaf people," AIKED '05: Proceedings of the Fourth WSEAS International Conference on Artificial Intelligence, Knowledge Engineering Data Bases, article number 28.
[68] Pappas, M., Demertzi, E., Papagerasimou, Y., Koukianakis, L., Kouremenos, D., Loukidis, I. and Drigas, A. 2018. E-Learning for deaf adults from a user-centered perspective. Education Sciences 8(4)206:
[69] Pappas, M., Eleftheria Demertzi, Yannis Papagerasimou, Lefteris Koukianakis, Nikitas Voukelatos, and Drigas, A. S., 2019. Cognitive Based E-Learning Design for Older Adults. Social Sciences 8, 1 (Jan. 2019), 6. https://doi.org/10.3390/socsci801000
[70] Drigas, A. S., Lefteris Koukianakis 2009: Government online: An e-government platform to improve public administration operations and services delivery to the citizen. WSKS (1), volume 5736 de Lecture Notes in Computer Science, 523–532. Springer,
[71] Theodorou, P.; Drigas, A. 2017, ICTs and Music in Generic Learning Disabilities. Int. J. Emerg. Technol. Learn. 12(4), 101–110
[72] Pappas, M.A., & Drigas, A.S. (2015). ICT based screening tools and etiology of dyscalculia. International Journal of Engineering Pedagogy, (5)3, 61-66.
[73] Drigas, A., & Kostas, I. (2014). On Line and other ICTs Applications for teaching math in Special Education. International Journal of Recent Contributions from Engineering, Science & IT (iJES), 2(4), pp-46. http://dx.doi.org/10.3991/ijes.v2i4.4204
[74] Alexopoulou, A, Batsou, A, Drigas, A. (2019). Resilience and academic underachievement in gifted students: causes, consequences and strategic methods of prevention and intervention. International Journal of Online and Biomedical Engineering (iJOE), vol. 15, no. 14, pp. 78.
[75] Drigas, A. & Ioannidou, R. E. (2013). Special education and ICT's. International Journal of Emerging Technologies in Learning 8(2), 41– 47.
[76] Drigas, A., & Papanastasiou, G. (2014). Interactive White Boards in Preschool and Primary Education. International Journal of Online and Biomedical Engineering (iJOE), 10(4), 46–51. https://doi.org/10.3991/ijoe.v10i4.3754
[77] Drigas, A. S. and Politi-Georgousi, S. (2019). Icts as a distinct detection approach for dyslexia screening: A contemporary view. International Journal of Online and Biomedical Engineering (iJOE), 15(13):46–60.
[78] Lizeta N. Bakola, Nikolaos D. Rizos, Drigas, A. S., 2019 "ICTs for Emotional and Social Skills Development for Children with ADHD and ASD Co-existence" International Int. J. Emerg. Technol. Learn., 14(5), 122-131.
[79] Kontostavlou, E.Z., & Drigas, A.S. (2019). The Use of Information and Communications Technology (ICT) in Gifted Students. International Journal of Recent Contributions from Engineering, Science and IT, 7(2), 60-67. doi:10.3991/ijes.v7i2.10815
[80] Drigas, A. S., and Vlachou J. A., 2016. "Information and communication technologies (ICTs) and autistic spectrum disorders (ASD)," Int. J. Recent Contrib. Eng. Sci. IT (iJES), vol. 4, no. 1, p. 4, https://doi.org/10.3991/ijes.v4i1.5352
[81] Drigas, A. S., Koukianakis, L, Papagerasimou, Y. (2006) "An elearning environment for nontraditional students with sight disabilities.", Frontiers in Education Conference, 36th Annual. IEEE, p. 23-27.
[82] Drigas A., and Koukianakis L. 2006 An open distance learning e-system to support SMEs e-enterprising. In proceeding of 5th WSEAS Internationalconference on Artificial intelligence, knowledge engineering, data bases (AIKED 2006). Spain

[83] Drigas A, Petrova A 2014 ICTs in speech and language therapy International Journal of Engineering Pedagogy (iJEP) 4 (1), 49-54
[84] Bravou V, Oikonomidou D, Drigas A, 2022 Applications of Virtual Reality for Autism Inclusion. A review Retos 45, 779-785
[85] Chaidi I, Drigas A, 2022 "Parents' views Questionnaire for the education of emotions in Autism Spectrum Disorder" in a Greek context and the role of ICTs Technium Social Sciences Journal 33, 73-91
[86] Bravou V, Drigas A, 2019 A contemporary view on online and web tools for students with sensory & learning disabilities iJOE 15(12) 97
[87] Drigas A, Vrettaros J, Tagoulis A, Kouremenos D, 2010 Teaching a foreign language to deaf people via vodcasting & web 2.0 tools World Summit on Knowledge Society, 514-521
[88] Chaidi I, Drigas A, C Karagiannidis 2021 ICT in special education Technium Soc. Sci. J. 23, 187
[89] Xanthopoulou M, Kokalia G, Drigas A, 2019, Applications for Children with Autism in Preschool and Primary Education. Int. J. Recent Contributions Eng. Sci. IT 7 (2), 4-16
[90] Drigas, A., Vrettaros, J. (2004): An Intelligent Tool for Building e-Learning Contend-Material Using Natural Language in Digital Libraries. WSEAS Transactions on Information Science and Applications 5(1) 1197–1205
[91] Drigas A, et all 2004 An expert system for job matching of the unemployed Expert Systems with Applications 26 (2), 217-224
[92] Kefalis C and Drigas A. (2019) Web Based and Online Applications in STEM Education. International Journal of Engineering Pedagogy (iJEP) 9, 4 (2019), 76– 85.
[93] Chaidi E, Kefalis C, Papagerasimou Y, Drigas, 2021, Educational robotics in Primary Education. A case in Greece, Research, Society and Development 10 (9), e17110916371-e17110916371
[94] Drigas, A.S., Vrettaros, J., Koukianakis, L.G. and Glentzes, J.G. (2005). A Virtual Lab and e-learning system for renewable energy sources. Int. Conf. on Educational Tech.
[95] Drigas AS, Argyri K, Vrettaros J (2009) Decade review (1999-2009): artificial intelligence techniques in student modeling. In: World Summit on Knowledge Society. Springer, pp 552–564
[96] Vrettaros, J., Tagoulis, A., Giannopoulou, N., & Drigas, A. (2009). An empirical study on the use of Web 2.0 by Greek adult instructors in educational procedures. World Summit on Knowledge System (WSKS), 49, 164-170. http://dx.doi.org/10.1007/978-3-642-04757-2_18
[97] Drigas, A., Dourou, A. (2013). A Review on ICTs, E-Learning and Artificial Intelligence for Dyslexic's Assistance. iJet, 8(4), 63-67.
[98] Anagnostopoulou, P., Alexandropoulou, V., Lorentzou, G., Lykothanasi, A., Ntaountaki, P., & Drigas, A. (2020). Artificial intelligence in autism assessment. International Journal of Emerging Technologies in Learning, 15(6), 95-107. https://doi.org/10.3991/ijet.v15i06.11231
[99] Pappas, M., & Drigas, A. (2016). Incorporation of artificial intelligence tutoring techniques in mathematics. International Journal of Engineering Pedagogy, 6(4), 12–16. https://doi.org/10.3991/ijep.v6i4.6063
[100] Lytra N, Drigas A 2021 STEAM education-metacognition–Specific Learning Disabilities Scientific Electronic Archives 14 (10)
[101] Mitsea E, Lytra N, A Akrivopoulou, A Drigas 2020 Metacognition, Mindfulness and Robots for Autism Inclusion. Int. J. Recent Contributions Eng. Sci. IT 8 (2), 4-20
[102] Stavridis S, D Papageorgiou, Z Doulgeri 2017 Dynamical system based robotic motion generation with obstacle avoidance, IEEE Robotics and Automation Letters 2 (2), 712-718
[103] Kastritsi T, D Papageorgiou, I Sarantopoulos, S Stavridis, Z Doulgeri, 2019 Guaranteed active constraints enforcement on point cloud-approximated regions for surgical applications 2019 International Conference on Robotics and Automation (ICRA), 8346-8352

[104] Stavridis S, Z Doulgeri 2018 Bimanual assembly of two parts with relative motion generation and task related optimization 2018 IEEE/RSJ International Conference on Intelligent Robots and Systems …
[105] Stavridis S, P Falco, Z Doulgeri 2020 Pick-and-place in dynamic environments with a mobile dual-arm robot equipped with distributed distance sensors IEEE-RAS 20th International Conference on Humanoid Robots (Humanoids)
[106] Papageorgiou D, S Stavridis, C Papakonstantinou, Z Doulgeri 2021Task geometry aware assistance for kinesthetic teaching of redundant robots IEEE/RSJ International Conference on Intelligent Robots and Systems …
[107] Kastritsi T, I Sarantopoulos, S Stavridis, D Papageorgiou, Z Doulgeri Manipulation of a Whole Surgical Tool Within Safe Regions Utilizing Barrier Artificial Potentials Mediterranean Conference on Medical and Biological Engineering and Computing …
[108] Stavridis S, D Papageorgiou, L Droukas, Z Doulgeri 2022 Bimanual crop manipulation for human-inspired robotic harvesting arXiv preprint arXiv:2209.06074
[109] Ntaountaki P, et all 2019 Robotics in Autism Intervention. Int. J. Recent Contributions Eng. Sci. IT 7 (4), 4-17
[110] Demertzi E, Voukelatos N, Papagerasimou Y, Drigas A, 2018 Online learning facilities to support coding and robotics courses for youth International Journal of Engineering Pedagogy (iJEP) 8 (3), 69-80
[111] Chaidi I, Drigas A 2022 Digital games & special education Technium Social Sciences Journal 34, 214-236
[112] Doulou A, Drigas A 2022 Electronic, VR & Augmented Reality Games for Intervention in ADHD Technium Social Sciences Journal, 28, 159.
[113] Kokkalia, G., Drigas, A., & Economou, A. (2016). The role of games in special preschool education. International Journal of Emerging Technologies in Learning (iJET), 11(12), 30-35.
[114] Kefalis C, Kontostavlou EZ, Drigas A, 2020 The Effects of Video Games in Memory and Attention. Int. J. Eng. Pedagog. 10 (1), 51-61
[115] Drigas, A., & Mitsea, E. (2020). The 8 Pillars of Metacognition. International Journal of Emerging Technologies in Learning (iJET), 15(21), 162-178. https://doi.org/10.3991/ijet.v15i21.14907
[116] Drigas, A. S., and M. Pappas, 2017. "The Consciousness-Intelligence-Knowledge Pyramid: An 8x8 Layer Model," International Journal of Recent Contributions from Engineering, Science & IT (iJES), vol. 5, no.3, pp 14-25, https://doi.org/10.3991/ijes.v5i3.7680
[117] Drigas A, Karyotaki M (2017) Attentional control and other executive functions. Int J Emerg Technol Learn iJET 12(03):219–233
[118] Drigas A, Karyotaki M 2014. Learning Tools and Application for Cognitive Improvement. International Journal of Engineering Pedagogy, 4(3): 71-77. From (Retrieved on 13 May 2016)
[119] Drigas, A., & Mitsea, E. (2021). 8 Pillars X 8 Layers Model of Metacognition: Educational Strategies, Exercises &Trainings. International Journal of Online & Biomedical Engineering, 17(8). https://doi.org/10.3991/ijoe.v17i08.23563
[120] Drigas A., Papoutsi C. (2020). The Need for Emotional Intelligence Training Education in Critical and Stressful Situations: The Case of COVID-19. Int. J. Recent Contrib. Eng. Sci. IT 8(3), 20–35. 10.3991/ijes.v8i3.17235
[121] Drigas, A., & Mitsea, E. (2020). The Triangle of Spiritual Intelligence, Metacognition and Consciousness. International Journal of Recent Contributions from Engineering, Science & IT (iJES), 8(1), 4-23. https://doi.org/10.3991/ijes.v8i1.12503
[122] Kokkalia, G., Drigas, A. Economou, A., & Roussos, P. (2019). School readiness from kindergarten to primary school. International Journal of Emerging Technologies in Learning, 14(11), 4-18.

[123] Drigas, A., & Mitsea, E. (2021). Metacognition, stress-relaxation balance & related hormones. International Journal of Recent Contributions from Engineering, Science & IT (iJES), 9(1), 4–16. https://doi.org/10.3991/ijes.v9i1.19623
[124] Pappas M, Drigas A. 2019; Computerized Training for Neuroplasticity and Cognitive Improvement. International Journal of Engineering Pedagogy.9(4):50-62
[125] Papoutsi, C. and Drigas, A. (2017) Empathy and Mobile Applications. International Journal of Interactive Mobile Technologies 11(3). 57. https://doi.org/10.3991/ijim.v11i3.6385
[126] Papoutsi, C. & Drigas, A. (2016). Games for Empathy for Social Impact. International Journal of Engineering Pedagogy 6(4), 36-40.
[127] Karyotaki, M., & Drigas, A. (2015). Online and other ICT Applications for Cognitive Training and Assessment. International Journal of Online and Biomedical Engineering. 11(2), 36-42.
[128] Papoutsi, C., Drigas, A., & Skianis, C. (2019). Emotional intelligence as an important asset for HR in organizations: Attitudes and working variables. International Journal of Advanced Corporate Learning, 12(2), 21–35. https://doi.org/10.3991/ijac.v12i2.9620
[129] Chaidi I. Drigas, A. S., 2020. "Autism, Expression, and Understanding of Emotions: Literature Review," Int. J. Online Biomed. Eng., vol. 16, no. 02, pp. 94–111, https://doi.org/ 10.3991/ijoe.v16i02.11991
[130] Drigas, A. S., & Karyotaki, M. (2019). A Layered Model of Human Consciousness. International Journal of Recent Contributions from Engineering, Science & IT (iJES), 7(3), 41- 50. https://doi.org/10.3991/ijes.v7i3.11117
[131] Drigas, A. S., Karyotaki, M., & Skianis, C. (2018). An Integrated Approach to Neuro-development, Neuroplasticity and Cognitive Improvement. International Journal of Recent Contributions from Engineering, Science & IT (iJES), 6(3), 4-18.
[132] Karyotaki M. and Drigas, A. S., 2016. "Latest trends in problem solving assessment," International Journal of Recent contributions from Engineering, Science & IT (iJES), vol. 4, no. 2, 4-10.
[133] Mitsea E., Drigas, A. S., and Mantas P., 2021. Soft Skills & Metacognition as Inclusion Amplifiers in the 21st Century," Int. J. Online Biomed. Eng. IJOE, vol. 17, no. 04, Art. no. 04, https://doi.org/10.3991/ijoe.v17i04.20567
[134] Angelopoulou, E. Drigas, A. (2021). Working Memory, Attention and their Relationship: A theoretical Overview. Research. Society and Development, 10(5), 1-8. https://doi.org/10.33448/rsd-v10i5.15288
[135] Tourimpampa, A., Drigas, A., Economou, A., & Roussos, P. (2018). Perception and text comprehension. It'sa matter of perception! International Journal of Emerging Technologies in Learning (iJET). 13(7)
[136] Drigas A, Mitsea E 2020 A metacognition based 8 pillars mindfulness model and training strategies. International Journal of Recent Contributions from Engineering, Science & IT 8(4), 4-17.
[137] Papoutsi C, Drigas A, C Skianis 2021 Virtual and augmented reality for developing emotional intelligence skills Int. J. Recent Contrib. Eng. Sci. IT (IJES) 9 (3), 35-53
[138] Kapsi S, Katsantoni S, Drigas A 2020 The Role of Sleep and Impact on Brain and Learning. Int. J. Recent Contributions Eng. Sci. IT 8 (3), 59-68
[139] Drigas A, Mitsea E, Skianis C 2021 The Role of Clinical Hypnosis and VR in Special Education International Journal of Recent Contributions from Engineering Science & IT 9(4), 4-17.
[140] V Galitskaya, A Drigas 2021 The importance of working memory in children with Dyscalculia and Ageometria Scientific Electronic Archives 14 (10)
[141] Chaidi I, Drigas A 2020 Parents' Involvement in the Education of their Children with Autism: Related Research and its Results International Journal Of Emerging Technologies In Learning (Ijet) 15 (14), 194-203.
[142] Drigas A, Mitsea E 2021 Neuro-Linguistic Programming & VR via the 8 Pillars of Metacognition X 8 Layers of Consciousness X 8 Intelligences Technium Soc. Sci. J. 26, 159

[143] Drigas A, Mitsea E 2022 Conscious Breathing: a Powerful Tool for Physical & Neuropsychological Regulation. The role of Mobile Apps Technium Social Sciences Journal 28, 135-158
[144] Drigas A, Mitsea E, C Skianis 2022 Clinical Hypnosis & VR, Subconscious Restructuring-Brain Rewiring & the Entanglement with the 8 Pillars of Metacognition X 8 Layers of Consciousness X 8 Intelligences. International Journal of Online & Biomedical Engineering 18 (1)
[145] Drigas A, Karyotaki M 2019 Attention and its Role: Theories and Models. International Journal of Emerging Technologies in Learning 14 (12), 169-182
[146] Drigas A, Karyotaki M 2019 Executive Functioning and Problem Solving: A Bidirectional Relation. International Journal of Engineering Pedagogy (iJEP) 9 (3)
[147] Bamicha V, Drigas A 2022 ToM & ASD: The interconnection of Theory of Mind with the social-emotional, cognitive development of children with Autism Spectrum Disorder. The use of ICTs as an alternative … Technium Social Sciences Journal 33, 42-72
[148] Drigas A, Mitsea E, C Skianis 2022 Neuro-Linguistic Programming, Positive Psychology & VR in Special Education. Scientific Electronic Archives 15 (1)
[149] Drigas A, Mitsea E, Skianis C. 2022 Virtual Reality and Metacognition Training Techniques for Learning Disabilities SUSTAINABILITY 14(16), 10170
[150] Drigas A,. Sideraki A. 2021 Emotional Intelligence in Autism Technium Soc. Sci. J. 26, 80
[151] Drigas A, Mitsea E, Skianis C.. 2022 Subliminal Training Techniques for Cognitive, Emotional and Behavioural Balance. The role of Emerging Technologies Technium Social Sciences Journal 33, 164-186
[152] Bakola L, Drigas A, 2020 Technological development process of emotional Intelligence as a therapeutic recovery implement in children with ADHD and ASD comorbidity. . International Journal of Online & Biomedical Engineering, 16(3), 75-85
[153] Bamicha V, Drigas A, 2022 The Evolutionary Course of Theory of Mind - Factors that facilitate or inhibit its operation & the role of ICTs Technium Social Sciences Journal 30, 138-158
[154] Karyotaki M, Bakola L, Drigas A, Skianis C, 2022 Women's Leadership via Digital Technology and Entrepreneurship in business and society Technium Social Sciences Journal. 28(1), 246–252.
[155] Drigas A, Bakola L, 2021The 8x8 Layer Model Consciousness-Intelligence-Knowledge Pyramid, and the Platonic Perspectives International Journal of Recent Contributions from Engineering, Science & IT (iJES) 9(2) 57-72
[156] Karyotaki M, Drigas A, 2016 Online and Other ICT-based Training Tools for Problem-solving Skills. International Journal of Emerging Technologies in Learning 11 (6)
[157] Mitsea E, Drigas A,, Skianis C, 2022 Breathing, Attention & Consciousness in Sync: The role of Breathing Training, Metacognition & Virtual Reality Technium Social Sciences Journal 29, 79-97
[158] Mitsea E, Drigas A, Skianis C, 2022 ICTs and Speed Learning in Special Education: High-Consciousness Training Strategies for High-Capacity Learners through Metacognition Lens Technium Soc. Sci. J. 27, 230
[159] Drigas A, Karyotaki M, Skianis C, 2017 Success: A 9 layered-based model of giftedness International Journal of Recent Contributions from Engineering, Science & IT 5(4) 4-18
[160] Drigas A, Papoutsi C, 2021,Nine Layer Pyramid Model Questionnaire for Emotional Intelligence, International Journal of Online & Biomedical Engineering 17 (7)
[161] Drigas A, Papoutsi C, Skianis, 2021, Metacognitive and Metaemotional Training Strategies through the Nine-layer Pyramid Model of Emotional Intelligence, International Journal of Recent Contributions from Engineering, Science & IT (iJES) 9.4 58-76