Contribution of ICT, in particular of Adapted Personal Learning Environments (adPLE), for the Improvement of Learning in Individuals with Special Educational Needs

Contributo delle TIC, in particolare degli Ambienti di Apprendimento Personalizzati Adattati (adPLE), per il Miglioramento dell'Apprendimento nelle Persone con Bisogni Educativi Speciali

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ABSTRACT

For students with Special Educational Needs (SEN), the utilization of Information and Communication Technologies (ICT) represents a unique opportunity to access the curriculum, which would otherwise be inaccessible. The emergence of Web 2.0 has ushered in the potential for flexibility and personalized learning, leading to the evolution of Virtual Learning Environments (VLE) into Personal Learning Environments (PLE). These PLEs offer student-centric, easily reachable, and adaptable learning experiences, especially beneficial to students with Intellectual and Developmental Disabilities (IDD). Considering the unique characteristics of this disability category, our aim is to explore the contribution of adapted Personal Learning Environment (adPLE) in enhancing educational outcomes for students with IDD.
Framed within a comparative matrix, this study takes the form of an empirical investigation aiming to describe the impact of ICT on the learning of individuals with SEN across the in the public, private and cooperative educational systems in Portugal.

Per gli studenti con Bisogni Educativi Speciali (BES), l'utilizzo delle Tecnologie dell'Informazione e della Comunicazione (TIC) rappresenta un'opportunità unica per accedere al curriculum, altrimenti inaccessibile. L'emergere del Web 2.0 ha introdotto il potenziale per la flessibilità e l'apprendimento personalizzato, portando all'evoluzione degli Ambienti di Apprendimento Virtuali (AAV) in Ambienti di Apprendimento Personali (AAP). Questi PLE offrono esperienze di apprendimento centrate sullo studente, facilmente accessibili e adattabili, particolarmente vantaggiose per gli studenti con Disabilità Intellettive e dello Sviluppo (DIS). Considerando le caratteristiche uniche di questa categoria di disabilità, il nostro obiettivo è esplorare il contributo dell'Ambiente di Apprendimento Personale adattato (AAPad) nel migliorare i risultati educativi degli studenti con DIS.
Inquadrato all'interno di una matrice comparativa, questo studio prende la forma di un'indagine empirica volta a descrivere l'impatto delle TIC sull'apprendimento delle persone con BES nei sistemi educativi pubblici, privati e cooperativi in Portogallo.

Keywords: Special Educational Needs (SEN) | Intellectual and Developmental Disabilities (IDD) | Information and Communication Technologies (ICT) | adapted Personal Learning Environment (adPLE) | Comparative Methodology

Parole chiave: Bisogni Educativi Speciali (BES) | Disabilità Intellettive e dello Sviluppo (DIS) | Tecnologie dell'Informazione e della Comunicazione (TIC) | Ambiente di Apprendimento Personale adattato (AAPad) | Metodologia Comparativa

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Introduction

The emergence of Web 2.0 and social media has not only generated expectations but also introduced opportunities for enhanced flexibility and customization in the learning process through ICT. For students who have SEN, ICT serve as a pivotal factor in normalizing their living conditions. In specific scenarios, these technologies can serve as the sole avenue through which these students can access the curriculum, which would otherwise be inaccessible (Vázquez, Montoya, & Pérez, 2006). This is the case that led to the transformation of Virtual Learning Environments into what are now known as Personal Learning Environments (Attwell, 2007). The development of an adapted Learning Environment offers a response to the challenge of delivering learning experiences that are tailored to individual students, easily accessible, personalized, and adaptable (Heath, Treviranus, & Nevile, 2005 as cited in Pearson, Gkatzidou, & Green, 2009).

Framed by a comparative matrix, this study aims to describe and explain, comparatively, the contribution of ICT, in particular the adPLE, for the Improvement of Learning in Individuals with Special Educational Needs in the different contexts considered, namely the public, private and cooperative educational systems in Portugal seeking to achieve an emancipatory nature, considering that the ultimate purpose of the study is to make the researchers knowledge and skills available to the study subjects, individuals with disabilities, so that they have access to them in the way that best suits them (Oliver, 1992 cited by Oliver, 1997).

1. Intellectual and Developmental Disabilities

In the 20th century, a clear definition of Intellectual and Developmental Disabilities (IDD) emerged, but controversies remained due to standardizing diversity (Albuquerque, 2000). IDD concepts evolved over three historical periods (Morato & Santos, 2002). From antiquity to the 19th century, disabilities were unexplored scientifically, undergoing pedagogical-therapeutic experiments like Itard's, challenging irreversibility. Between the late 19th century and World War II IDD was defined using academic criteria and IQ-based evaluation, advocating for rights and quality of life. Lastly, in the post-war period attitudes shifted, embracing an ecological developmental model for IDD individuals, accompanied by discoveries about its causes.

This study centres it s focus on IDD, which, as defined by the multidimensional framework of the American Association on Intellectual and Developmental Disabilities ([AAIDD], 2023) entail three essential elements:

> Significant limitations in intellectual functioning, which means a full scale IQ standard score of approximately 2 (or more) standard deviations below the mean as measured with an appropriately-normed, standardized test of intelligence.
> Significant limitations in adaptive behavior, which means a standard score of approximately 2 (or more) standard deviations below the mean measured with an appropriate and standardized test of adaptive behavior in one or more of the following domains: conceptual, social, or practical skills.
> Onset of both of the above limitations during the developmental period, which means that significant limitations in both intellectual functioning and adaptive behavior in the individual have manifested before the age of 22.

2. ICT and Education

The dawn of the 21st century is poised to be defined by a series of remarkably transformative initiatives within the realm of Education. These initiatives are forging a novel paradigm in which Inclusion has evolved beyond a mere ideology to become an educational model that schools are encouraged to align with.

Amidst the rapid shifts confronting contemporary society, schools continually find themselves in the

position of seeking solutions that cater to the needs and characteristics of an increasingly diverse population—a result of nearly two centuries of democratization and the ever-expanding reach of the school system.

Digital technology is becoming omnipresent in people's lives reaching the most distant corners of the world. Distinguishing between the tangible and the imaginary new universes generated by technology becomes very difficult. Education cannot remain immune to this transformation, despite calls to protect it from the negative influences of digital technology. However, this is a significant challenge, as technology emerges in multiple forms in education (UNESCO, 2023). The dynamic between Education and ICT has been the subject of numerous investigations aiming to describe and comprehend the impact of the former on the latter. Above all, this dynamic solidifies with the intention of improving the quality of teaching. It is anticipated that schools will take on a leading and innovative role in integrating ICT into activities fostering the cultivation of meaningful learning. This expectation stems from the belief that ICT holds the potential to alter «...the manner in which children are accustomed to learning and to magnify their cognitive development» (Baía, Brito & Duarte, 2004, p. 5). This alteration arises from the foundation of "...conventional systems of information processing and representation (which) necessitate new learning and augment the existing" (Miranda, 2007, p. 45).

According to Amante (2007, p. 52), it becomes "…challenging to overlook the contribution of these new media…" in learning contexts in diverse curriculum areas such as Language, Mathematics or Education for diversity. This author underscores that this contribution hinges on the extensive use of technology, where the possible solution lies not in technology itself but in people and institutions that face the challenge of creating ICT as agents of change, moving from a model of information reproduction to a model of collaborative construction of knowledge, open to social and cultural contexts, the diversity of students, and their knowledge, experiments, and interests (Silva, 2001). This transformation reshapes schools and educational experiences, as documented in the Organisation for Economic Co-operation and Development (OCDE) report «Learning to Change: ICT in Schools» from 2001. This report is cited by the European Agency for Development in Special Needs Education (AEDNEE, 2003) in their report «Special Educational Needs in Europe.»

3. The Contribution of ICT and the Promotion of Inclusion for Individuals with Disabilities

Enabling access to education continues to pose a notable obstacle for individuals who have typically been susceptible to exclusion from conventional educational institutions and require tailored approaches to accommodate their specific circumstances. Provisions such as distance learning, ICT training, access to suitable technology, and essential infrastructure have the potential to "…cultivate a conducive learning environment within homes, conflict zones, and remote areas, particularly for marginalized communities" (UNESCO, 2023).

In such a scenario of change where, as noted by Lloyd, Moni, and Jobling (2006), children and young individuals are immersed in technology and where technology alters the environment in which learning takes place, ICT plays a crucial role in normalizing the living conditions of students with SEN. In certain situations, ICT provides the only path through which these students can access the curriculum, which would otherwise be inaccessible. Moreover, technology aids in fostering their autonomy, empowerment, and integration into society (UNESCO, 2023) enabling tailored learning experiences, enabling personalized interaction and communication with peers and educators, while also fostering stronger social competencies and connections (UNESCO, 2023).

Given the above-mentioned premise that ICT have a positive impact on students with SEN, it's evident that many of the proposed ICT strategies for these users, as identified by Feng, Lazar, Kumin, and Ozok (2008), involve providing resources that mitigate these students' challenges, emphasizing their potential. These resources are generally aimed at individuals with sensory and motor disabilities or involve adapting applications (and corresponding interfaces) for a group of individuals with specific common characteristics (such as Braille keyboards for visually impaired individuals). The goal is to tailor these resources to their characteristics, needs, and special interests, thus showcasing their potential as assistive technology.

Quelhas and Mesquita (2013) suggest that ICT-supported activities facilitate communication, and

consequently learning without requiring specific adaptations in hardware usage. These authors also highlight the potential of ICT in developing teaching/learning activities for students with SEN, promoting autonomy, motivation, and interest among these students.

The report «Special Educational Needs in Europe» by the European Agency for Development in Special Needs Education (AEDNEE, 2003) suggests that ICT can be used in the educational processes of students with SEN, as teaching and learning instruments, learning contexts, communication instruments, therapeutic aids, and diagnostic assistants as well as tools for administrative tasks.

The same document suggests that can be understood (and indeed act) as a promoter of inequality among students, particularly those with SEN highlighting the need, of fostering educational inclusion in policies, projects, and programs related to ICT to promote research, innovation, and information sharing and raising awareness among the educational community and society at large about the advantages of ICT in the education of students with SEN.

In a society undergoing transformation, the influence of ICT on Education can translate into the creation of scenarios that generate new opportunities for students with SEN (Pérez & Montesinos, 2007). Although ICT is not the sole factor of educational innovation, it is likely to be an essential instrument for the crucial transformations in Education to adapt to an inclusive social reality promoting equality, accessibility, and respect for diversity (Vázquez, Montoya & Pérez, 2006).

However, it's vital to remember that technology should not be seen as the ultimate remedy, but rather as a supplementary resource to tackle specific barriers to education access. The most influential interventions prioritize learners' requirements and foster human interaction, merging appropriate in-person support, thorough teacher training, and technology tailored to the context. Successful learning systems never hinge solely on technology (UNESCO, 2023).

4. Personal Learning Environments and adapted Personal Learning Environment

Assuming the premise that the introduction of new technological means in education produces positive effects on learning changing the methods of teaching for educators and the approaches to learning for students (Miranda, 2007), we give relevance to the set of tools commonly referred to as Web 2.0, also known as social software, that allow collaborative activities and social interaction with significant gains in connectivity enabling the creation of environments where learning promotes flexibility and personalization in learning (Attwell, 2007).

Among those, Personal Learning Environments (PLEs) are particularly well-suited for students with disabilities when we consider the factors that characterize them: on one hand, the considerable gain in student autonomy and self-regulation, shifting the management of learning to the student and converging towards student-centered teaching models (Attwell, 2007); on the other hand, the accessibility that these learning environments offer, understood as the ability of the learning environment to adapt to the student's needs (Pearson, Gkatzidou & Green, 2009).

Given that the research revolves around PLEs, it is important to characterize this object of study. Its origin is linked to the technological development and proliferation of a set of tools that, through a network, allow collaborative activities and social interaction, bringing about significant transformations in domains beyond just the technological, with a special emphasis on the field of Education where this form of technology is gaining importance through a growing use of of wikis and blogs, for example, but also in the creation and development of PLEs. These transformations, have resulted in the ability to introduction of flexibility and personalization in learning, allowing students to use diverse sources in various contexts, offering the opportunity to engage at their cognitive development level and creative resources.

The importance and benefits of multimedia interfaces in systems directed at students with disabilities and communication and learning problems have been widely exposed through the work of various researchers, including Schlosser, Belfiore, Nigam, Blischak, and Hetzroni (1995 cited by Maguire, Elton, Osman, & Nicolle, 2006), who demonstrated how communication output devices facilitate the learning of graphic-based symbolic languages.

An adaptation factor of an PLE aimed at students with disabilities is the assistive technologies that these individuals may require to access network access equipment and therefore the PLE such as adapting

data input devices, which may have specific and customizable configurations based on the user's characteristics and needs and adapting data output devices, such as voice synthesizers associated with configurable concept keyboards.

It should also be noted, in generating adPLE, the importance of observing the common or specific curriculum of students in choosing and creating tools, resources, and learning activities suitable for their characteristics and preferences should not be overlooked.

5. Methodological Approach

The creation of an Adapted Virtual Learning Environment can address the challenge of providing student-centered, accessible, personalized, and flexible learning, particularly for students with Intellectual and Developmental Disabilities (IDD). Considering the specific characteristics of this type of disability we aim to identify the focus of our research more clearly and define our initial problem: Can adaptable Personal Learning Environments (adPLE) contribute to the improvement of academic learning outcomes in students with IDD?

Considering the alignment between the public education system for students with SEN and the private and cooperative system, this research also aims to be guided from a comparative perspective between the two systems.

Framed within a comparative matrix, this study thus configures as an empirical investigation, with a non-experimental character since there is no manipulation of variables, and cross-sectional as data collection will be carried out using techniques from a synchronous perspective, not involving the follow-up of reality in an evolutionary focus (Arnal, Rincón, & Latorre, 1992).

The Inquiry method will be employed, using interview and questionnaire techniques, as well as Observation with the use of non-participant observation. Through this methodological approach, applying what Stake (2007) refers to as methodological triangulation – incorporating different methodological approaches, including case studies, observation, interviews, and document analysis – aims to provide a better scientific understanding of the reality being studied.

Furthermore, this research seeks an emancipatory nature, considering that the ultimate purpose of this study is to make the researchers' knowledge and capabilities available to the study subjects, individuals with disabilities, so that they can use them in the way that suits them best (Oliver, 1992 cited by Oliver, 1997).

This study aims to describe and explain, comparatively, the contribution of ICT, particularly adPLE, to the improvement of learning outcomes in individuals with Special Educational Needs in different considered contexts, specifically the public and private or cooperative systems. To better understand the choice of a comparative perspective, it is necessary to frame the role that comparative education has for educational research. Given that education research, relying on the requirement of objectivity in scientific knowledge, while seeking to determine universally applicable principles in a global context, revealed the theoretical and methodological fragility of some traditional comparative research, which aimed to establish linear cause-and-effect relationships and comparisons between aspects or parts of educational systems, without considering the specificities of the structural condition in which their roots lie and their possible explanations (Puiggrós s.d. cited by Franco, 2000). Comparison is a process of perceiving differences and similarities and assuming values in this relationship of recognizing oneself and the other. It is about understanding the other from their perspective and, by exclusion, recognizing oneself in difference (Franco, 2000). As Ferreira (2008) points out, the study of problematics or realities should consider different contexts in order to establish what is different and similar, what differentiates and brings closer, in an attempt to understand the reasons that determine the situations encountered. According to Nóvoa, (2005 cited by Canário, 2006) it is possible to highlight specificities and similarities, but facts – events, countries, systems, etc. – are incomparable.

Considering the methodological focus of this study it became pivotal to determine, among educational institutions seeking to address the needs of children and young people with limitations, public and private, which schools have comparable conditions and dimensions. In the selection of study units, an effort was made to identify schools that shared common characteristics based on the recent data about the Portuguese

population in 2017, collected by the Instituto Nacional de Estatística (INE), and available in the Base de Dados de Portugal Contemporâneo (PORDATA) of the Francisco Manuel dos Santos Foundation, as well as data from the Direção-Geral dos Estabelecimentos Escolares (DGEstE) regarding the student population attending Private Institutions of Social Solidarity (PISS), Special Education Schools, and Inclusion Resource Centres with educational functions.

Through the analysis of data related to various socio-economic dimensions, such as the resident population, population density, educational establishments at different levels, the number of students attending these establishments, and some support structures for the population such as Museums and Hospitals, the geographic asymmetry of the Portuguese regions, coastal and inland, northern, central, and southern, became very evident. This allowed for an immediate determination of the central region - municipalities of Castelo Branco and Guarda - as a geographical quadrant for the selection of schools as units in this study. Also, based on the definition of common characteristics in this study, such as the presence of students with IID, the level of education attended, and the presence of resources and methodologies based on ICT, it was possible to better select the schools in accordance with the comparative approach, in order to compare their differences in a meaningful way.

In the search for instruments developed in other research and projects with compatible objectives with those of this study two surveys were identified: the «2nd Survey of Schools: ICT in Education» (European Commission, 2019) aimed to characterize the ICT framework in schools and to define a conceptual model of a «Highly Equipped and Connected Classroom» and the «Teaching and Learning International Survey, TALIS» (OECD, 2018) an international survey on teaching and learning that aims to reflect on learning environments in schools and the working conditions of educators.

This resulted in two surveys, one directed at school personnel in leadership and management positions, and another directed at teachers of classes with students with Intellectual and Developmental Disabilities (IDD) in the 1st Cycle of Basic Education (Primary School), Special Education (intervening with students in the 1st Cycle of Basic Education), Information and Communication Technology (ICT, involved in activities in the 1st Cycle of Basic Education). These surveys are structured into two common sections, related to the characterization of the surveyed individuals, and concerning the access and use of digital technologies. These surveys also aim to collect indicators of Inclusion based on the Index for Inclusion (Booth & Ainscow, 2002).

6. Development and Expected Results

Data collection will commence in the fourth quarter of 2023 and will involve the surveys developed and previously described in this article.

The study anticipates several key findings that contribute to the understanding of the impact of adPLEs on students with IDD:

- Personalization and Inclusivity: analyzing teacher responses, it aims to establish whether adPLEs facilitate personalized learning experiences for students with IDD and uncover the extent to which these environments promote inclusivity, allowing students to engage effectively with their peers.
- Barriers and Challenges: The data collected will provide insights faced by both administrators and teachers in implementing adPLEs helping to understand the obstacles that may hinder the effective integration of technology in inclusive educational settings.
- Influence on Teaching Practices: we aim to reveal how adPLEs influences teaching methods and pedagogical practices exploring how teachers adapt to adjust the unique learning needs of students with IDD in technology-supported environments.

The data collected and the expected results will contribute to the academic discourse on the integration of adPLEs in inclusive education for students with IDD and can provide insights into best practices, challenges, and potential strategies for leveraging ICT and develop learning experiences serving as a basis for educational policies and practices and fostering inclusivity and innovation in special education contexts.

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