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D2.3 Guidelines for inclusive communication and dissemination

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Introduction

Learning disabilities (LD) present a complex challenge in the fields of education and cognitive psychology. Defined broadly as neurological conditions impacting the ability to process, store, or produce information, LDs manifest across various domains including reading, writing, math, and social skills (Fletcher et al., 2019; Burr et al., 2015). Despite numerous advancements, a definitive, universally accepted definition remains elusive. This review aims to explore the multifaceted landscape of LDs, focusing on their types, educational implications, and inclusive strategies.

The significance of this topic is underscored by the pervasive impact of LDs on academic achievement and social development, necessitating effective educational interventions. While much attention has been devoted to children with LDs, there is a growing recognition of the continuity of LD challenges into adulthood, a gap highlighted in current literature (Learning Disabilities Association of America, 2020). This review seeks to synthesise existing research, offering insights into understanding LDs, identifying effective educational strategies, and promoting collaboration among educators and support networks. By addressing these aspects comprehensively, this review aims to contribute to a deeper understanding and enhanced support system for individuals with LDs across their lifespan.

Most of the literature available focuses on younger individuals with learning disabilities which is identified in many studies as a gap that needs to be addressed in the future. However, there is a consensus in the scientific community that, in general, the same methods and findings that apply to younger individuals also apply to adult individuals. For instance, the American National Center for Learning Disabilities (NCLD) acknowledges that learning disabilities are lifelong conditions, implying that research findings in children are relevant across the lifespan (NCLD - Learning Disabilities in Adulthood). Similarly,

the International Dyslexia Association (IDA) points out that dyslexia, a common learning disability, affects individuals throughout their lives, including adulthood (IDA - Dyslexia in Adults). The American Psychological Association (APA) also emphasizes that learning disabilities continue to impact individuals in adulthood, affecting areas such as higher education and workplace performance (APA - Learning Disabilities in Adulthood). Furthermore, scholarly work by Gerber and Reiff (1991) discusses the persistence of learning disabilities into adulthood, supporting the relevance of childhood research in adult contexts (Gerber & Reiff, 1991). These sources collectively support the idea that although the current literature primarily addresses younger individuals, the insights gained are applicable to adults as well.

This document is based on a comprehensive literature review, supplemented by the valuable insights and experiences of educators. These insights were gathered through structured focus groups and a detailed survey. The focus groups provided a platform for educators to discuss their firsthand experiences and strategies in managing LDs, while the survey offered quantitative data on prevalent practices and challenges faced in educational settings. Combining these methods ensures a robust and holistic understanding of the current landscape of learning disabilities and the efficacy of various educational interventions.

1. Understanding Learning Disabilities

Inclusion in education

Inclusive education is often mistakenly seen as integrating individuals with disabilities into mainstream schools, but globally it is viewed more broadly as a reform welcoming all forms of diversity. It aims to eliminate social exclusion based on race, social class, ethnicity, religion, gender, and ability, rooted in the belief that education is a basic human right essential for a just society. The Salamanca Statement (UNESCO, 1994) has been a significant endorsement of inclusive education, advocating for schools that combat discrimination and provide effective education for all. Despite progress in many countries, there is still confusion and varying definitions of inclusion, making implementation challenging. Inclusion is increasingly embraced globally on social justice and human rights grounds, especially in the Global South, though it often starts by addressing marginalised groups. The field faces uncertainties and differing perspectives, but there is a global trend towards providing effective education for all within general education settings (Ainscow & Sandill, 2010).

Individuals with learning disabilities are entitled to the same opportunities as others to live fulfilling and respected lives. They should be able to have a home in their community, form and maintain relationships, and receive the support needed to live healthy, safe, and satisfying lives. The right of people with disabilities to an inclusive education in mainstream settings alongside their peers is upheld in several international rights frameworks. The most notable is the United Nations Convention on the Rights of Persons with Disabilities. Article 24 and General Comment 4 of the Convention (2016) clearly state that inclusive education is a fundamental human right for every child with a disability. This right to an inclusive education is at all levels of the educational system including

pre-school, primary, secondary, tertiary, vocational, as well as non-formal and informal life-long learning.

To gain a deeper understanding of the mechanisms of inclusion within the educational context, it is essential to consider the **various levels of inclusivity** as classified by Education Policy (2020).

- **Exclusion**: Occurs when learners are directly or indirectly prevented from or denied access to any form of education.
- **Segregation**: This happens when learners with disabilities are educated in separate environments, isolated from those without disabilities, often tailored to specific types of disabilities.
- **Integration**: Involves placing persons with disabilities in mainstream educational institutions with the expectation that they adapt to the standard requirements of these institutions.
- **Inclusion**: Involves a process of systemic reform, encompassing changes and modifications in content, teaching methods, approaches, structures, and strategies to overcome barriers. This approach aims to provide all learners with an equitable and participatory learning experience, tailored to their needs and preferences.

According to the United Nations Educational, Scientific and Cultural Organization (UNESCO) (2005), inclusive education encompasses the following **principles**:

- Inclusion is a process.
- Inclusion focuses on identifying and removing barriers.
- Inclusion is about the presence, participation, and achievement of all learners.
- Inclusion emphasizes supporting groups of learners at risk of marginalization, exclusion, or underachievement.

Removing barriers to learning can enhance social inclusion for individuals with learning disabilities, leading in improving their quality of life (Assembly, 2006).

The first crucial step towards accomplishing this objective through education involves identifying and overcoming the social barriers that have historically marginalised certain groups from accessing education. Across Europe, there has been a long history of segregated education for persons with learning disabilities meaning that these learners have not been offered the opportunity to receive an education in mainstream schools alongside their peers, despite the clear benefits of inclusive classrooms for both learners with and without disabilities (Ainscow & Sandill, 2010).

The concept of inclusive education, as advocated by Fuchs et al. (2015), emphasises a collaborative approach between general and special education to meet the individual needs of learners, irrespective of disability labels. This approach aims to foster successful learning outcomes for all learners, including those with learning disabilities (LDs). In contemporary societies, LDs are prevalent, particularly in areas like reading, writing, and arithmetic, which are crucial for daily life. Consequently, many educational systems have a significant proportion of learners with LDs enrolled in special education programs. However, research indicates that the most effective way to educate learners with mild or high-incidence disabilities is to integrate them into regular classrooms rather than placing them in segregated schools or special classes (Bulat et al., 2017).

The debate of definitions

Identifying a learning disability can be challenging; some are known or suspected during pregnancy or discovered at birth, while others are not identified until much later. When not detected at birth, diagnosing a child with a learning disability can take time. Most learning disabilities become evident by age five,

but moderate learning disabilities might only be recognized later in life, and some older adults may never receive a diagnosis.

Timely identification of learning disabilities is essential for individuals to receive the support necessary for them to enjoy inclusive and quality education.

Learning disabilities can be defined from medical, educational, and legal perspectives. Despite these different viewpoints, they all agree that a learning disability involves a dysfunction in one or more basic psychological processes, causing difficulties in specific learning areas such as reading, writing, or mathematics. **Although addressing the educational needs of learners with learning disabilities does not require a medical definition, including it can help clarify the concept for those who may be unfamiliar.**

The *Diagnostic and Statistical Manual of Mental Disorders* (DSM) of the APA includes the term "Specific Learning Disorder", the identification of which is based on the individual's family and medical history, observations, interviews, and educational and psychological assessments. The diagnostic criteria are as follows:

A. Difficulties learning and using academic skills, as indicated by the presence of at least one of the following experiences that have persisted for at least 6 months, despite the provision of interventions that target those difficulties:

    - Inaccurate or slow and effortful word reading (e.g., reading single words aloud incorrectly or slowly and hesitantly, frequently guessing words, having difficulty sounding out words).
    - Difficulty understanding the meaning of what is read (e.g., may read text accurately but not understand the sequence, relationship, inferences, or deeper meanings of what is read).

- Difficulties with spelling (e.g., may add, omit, or substitute vowels or consonants).
- Difficulties with written expression (e.g., makes multiple grammatical or punctuation errors within sentences; employs poor paragraph organisation; written expression of ideas lacks clarity).
- Difficulties mastering number sense, number facts, or calculations (e.g., has a poor understanding of numbers, their magnitude, and relationships; counts on fingers to add single-digit numbers instead of recalling the maths facts as peers do; gets lost amid arithmetic computation and may switch procedures).
- Difficulties with mathematical reasoning (e.g., severe difficulty applying mathematical concepts, facts, or procedures to solve quantitative problems).

B. The affected academic skills are substantially and quantifiably below those expected for the individual's chronological age, and cause significant interference with academic or occupational performance, or with activities of daily living, as confirmed by individually administered standardised achievement measures and comprehensive clinical assessment.

C. The learning difficulties begin during school-age years but may not fully manifest until the demands for those affected academic skills exceed the individual's capacities (e.g., as in timed tests, reading or writing lengthy complex reports for a tight deadline, excessively heavy academic loads).

D. The learning difficulties are not better accounted for by intellectual disabilities, uncorrected visual or auditory acuity, other mental or neurological conditions, psychosocial adversity, lack of proficiency in the language of academic instruction, or inadequate educational instruction.

In diagnosing specific learning disorders (SLD), it's essential to note that these difficulties are **"specific"** and not caused by intellectual disabilities, global developmental delays, sensory impairments, or neurological/motor disorders. Individuals with SLD exhibit normal intellectual functioning, often indicated by an IQ score above 70. The term **"unexpected academic underachievement"** characterizes SLD, highlighting that these difficulties are distinct from broader intellectual or developmental challenges and can occur even in intellectually gifted individuals. SLD is not due to external factors like socioeconomic status, educational quality, chronic absenteeism, or general environmental disadvantages. Furthermore, SLD is separate from learning difficulties caused by neurological or motor disorders. Finally, SLD may be limited to a particular academic area, such as reading, writing, or arithmetic (American Psychiatric Association, 2022).

An update that has been made by APA highlights that learning disabilities include learning problems that result from perceptual disabilities, traumatic brain injury, and minimal brain dysfunction but exclude those that result from visual impairment or hearing loss; intellectual developmental disorder; emotional disturbance; or environmental, cultural, or economic factors. For diagnostic purposes, a learning disability is a condition that exists when a person’s actual performance on achievement testing is substantially (typically 2 standard deviations) below that expected for their established intelligence, age, and grade.

Terminology clarification

"**Specific learning disorder**" is a clinical diagnosis often abbreviated as "**learning disorder**." However, in educational and legal contexts, the term "**learning disability**" is commonly used. Although the terms are not identical, someone diagnosed with a specific learning disorder generally meets the criteria for a learning disability and is therefore eligible for legal recognition and accommodations in school. Notably, the phrase "**learning difference**" has gained popularity, especially when speaking with children, as it avoids the negative connotations associated with being "disordered".

Additional definitions

Valuing People, the 2001 White Paper (Martin, 2001) on the health and social care of people with learning disabilities, included the following definition of learning disabilities:

> "Learning disability includes the presence of a significantly reduced ability to understand new or complex information, to learn new skills, with a reduced ability to cope independently (difficulties in social functioning); which started before adulthood, with a lasting effect on development."

According to IDEA (Individuals With Disabilities Education Act), a specific learning disability means a condition in one or more of the basic psychological processes involved in understanding or in using language, spoken or written, that may manifest itself in the reduced ability to listen, think, speak, read, write, spell, or to do mathematical calculations, including conditions such as perceptual disabilities, brain injury, minimal brain dysfunction, dyslexia, and developmental aphasia. A specific learning disability does not include learning problems that are primarily the result of visual, hearing, or motor disabilities, intellectual

disability, emotional disturbance, or environmental, cultural, or economic disadvantage (Lipkin et.al, 2015)

Learning disabilities is a general term that refers to a heterogeneous group of conditions manifested by significant difficulties in the acquisition and use of listening, speaking, reading, writing, reasoning, or mathematical abilities and may occur across the lifespan. Problems in self-regulatory behaviours, social perception, and social interaction may exist with learning disabilities but do not constitute a learning disability. Although learning disabilities may occur concomitantly with other disabilities (for example, sensory impairment, intellectual disabilities, emotional disturbance), or with extrinsic influences (such as cultural or linguistic differences, insufficient or inappropriate instruction), they are not the result of those conditions or influences.

Note that this definition, as mentioned by Johns Hopkins Medicine Reports (2022) attributes learning disabilities to central nervous system dysfunction. The central nervous system comprises the brain and the spinal cord and helps regulate and coordinate the body's activities. The central nervous system can be damaged by trauma, infections, degeneration, structural defects, tumours, blood flow disruption, and autoimmune disorders that may result in language impairment.

Even though there are several definitions for learning disabilities, the **commonalities** that are evident among them include:

- Reduced academic skills: Encompassing difficulties in reading, writing, mathematics, language, and reasoning.
- Onset and duration: Learning disabilities typically manifest early in life and persist over time, affecting individuals across the lifespan.

- Neurological basis: There is acknowledgement across definitions of a neurological or central nervous system basis for learning disabilities, indicating that these conditions stem from underlying brain dysfunction.
- Impact on daily living activities and functioning.
- Exclusion criteria: Various factors are excluded from the definition of learning disabilities, such as sensory disabilities, intellectual disabilities, emotional disturbances, and environmental or cultural influences, highlighting the need to distinguish learning disabilities from other conditions.

Differences among the definitions:

Each definition approaches learning disabilities from a slightly different angle, with some focusing more on academic skills (IDEA, APA), while others also consider social functioning and development (Valuing People). The definitions differ in their explicit inclusion and exclusion criteria. For example, IDEA excludes learning problems resulting from visual, hearing, or motor disabilities, while APA specifically excludes various conditions such as intellectual disabilities, emotional disturbances, and environmental factors.

The difference in the British definition is noteworthy, as it uses the term "specific learning difficulty" to cover the neurological conditions that cause learning difficulties. In the UK, terms such as specific learning difficulty, developmental dyslexia, developmental coordination disorder, and dyscalculia are used to cover the range of learning difficulties referred to in the United States as "learning disabilities".

Based on this definition, there is an acknowledgement of "learning difficulty" in a structured manner, which does not preclude the capacity to learn through alternative methods, thereby ensuring equal opportunities for individuals with

learning difficulties or disabilities to attain the same level of proficiency as those without.

Recognising and understanding the diverse needs of individuals with learning disabilities is essential for fostering inclusive environments. While definitions help delineate the scope of learning disabilities, it's equally crucial to emphasise the **support** needed for individuals to thrive academically, socially, and emotionally. By prioritising support mechanisms tailored to everyone's unique requirements, we ensure that they have equitable access to education and opportunities for personal and professional growth. This approach not only empowers individuals with learning disabilities to reach their full potential but also enriches society by fostering diversity and inclusion. By embracing and accommodating differences, we create a more equitable and empathetic community where every individual feels valued and capable of contributing meaningfully.

2. Types and traits of learning disabilities

Types of learning disabilities

While learning disabilities can indeed impact how individuals process information and their ability to learn certain skills like reading, writing, or mathematics, it's essential to note that they're **not indicative of low intelligence.** Intelligence, as measured by IQ tests or other assessments, is a separate construct and can vary independently of a person's learning disability. Many individuals with learning disabilities demonstrate average or above-average intelligence in areas not affected by their specific learning disability. Therefore, it's vital to recognise that intelligence is multifaceted and cannot be fully captured by a single measure or test. **A learner may face challenges in acquiring and demonstrating knowledge due to a learning disability, but this does not necessarily imply below-average intelligence**; they may possess average or even above-average intelligence, albeit with difficulties in certain areas.

The fifth version of the Diagnostic and Statistical Manual of Mental Disorders (American Psychiatric Association & American Psychiatric Association, 2013) integrates three distinct learning disorders under the umbrella of Specific Learning Disorder (SLD) but uses specific identifiers to pinpoint areas of academic difficulty:

- With impairment in reading (dyslexia)
- With impairment in written expression (dysgraphia)
- With impairment in mathematics (dyscalculia)

Dyslexia

When an individual shows significant challenges in one or more reading subskills, such as word reading accuracy, reading fluency, or reading comprehension, the term “impairment in reading” is added to an SLD diagnosis.

Dyslexia is often used interchangeably to describe issues with word reading fluency or accuracy, decoding, and spelling (American Psychiatric Association & American Psychiatric Association, 2013).

Reading problems can emerge even before formal education begins. Children with dyslexia may struggle with breaking down spoken words into syllables or recognising rhyming words. They often find it difficult to link letters on a page with their corresponding sounds, making reading a slow and laborious process. Dyslexia can also impact writing accuracy and spelling. Adolescents and adults with dyslexia often avoid reading-related activities, such as reading for pleasure or following written instructions, preferring alternative media like pictures, videos, or audio.

Dyslexia manifests as challenges in precise and/or smooth word recognition alongside weak spelling and decoding skills. These struggles commonly stem from a deficiency in the phonological aspect of language, often presenting unexpectedly given other cognitive abilities and the quality of classroom teaching. Additional repercussions may involve difficulties in comprehending written text and limited exposure to reading, hindering the expansion of vocabulary and background understanding.

Dysgraphia

Individuals who face significant challenges in spelling and writing may be described “with impairment in written expression”. **This can include problems with accuracy, grammar, punctuation, and the clarity or organization of written work. Dysgraphia is the term for difficulties in translating thoughts**

onto paper. Young children with this difficulty may struggle to recognise and write letters compared to their peers.

Dysgraphia is a neurological disorder and learning disability that concerns impairments in written expression, affecting the ability to write (American Psychiatric Association, 2013). It is a specific learning disability (SLD) as well as a transcription disability, meaning that it is a writing disorder associated with impaired handwriting, orthographic coding, and finger sequencing (the movement of muscles required to write). It often overlaps with other learning disabilities and neurodevelopmental disorders such as speech impairment, attention deficit hyperactivity disorder (ADHD), or developmental coordination disorder (DCD).

Dyscalculia

Individuals who struggle with math, in number sense, arithmetic fact memorisation, accurate or fluent calculation, and mathematical reasoning are referred to as “with impairment in mathematics”.

Dyscalculia refers to difficulties with number-related concepts, processing numerical information, learning arithmetic facts, or using symbols and functions for accurate or fluent math calculations.

Dyscalculia (American Psychiatric Association, 2013) is a learning disorder that affects a person’s ability to do math. Much like dyslexia disrupt areas of the brain related to reading, dyscalculia affects brain areas responsible for mathematical and numerical skills and understanding. Symptoms of this condition usually appear in childhood, but adults may have dyscalculia without knowing it.

The Learning Disabilities Association of America (2024) classifies the following mentioned as learning disabilities as well:

Auditory Processing Disorder (APD)

Auditory Processing Disorder (APD) is a condition where the brain cannot understand and interpret auditory signals the way it should. People with APD can hear, but they may have trouble understanding certain sounds. There isn't a cure for APD, but treatment helps people manage the condition.

Visual Processing Disorder (VPD)

Visual Processing Disorder can cause issues with the way the brain processes visual information. There are many different types of processing disorders and many different symptoms, which can include trouble drawing or copying, inability to detect differences in shapes or letters, and letter reversals.

Attention-Deficit/Hyperactivity Disorder (ADHD)

Attention-Deficit/Hyperactivity Disorder (ADHD) is marked by an ongoing pattern of inattention and/or hyperactivity-impulsivity that interferes with functioning or development. People with ADHD experience an ongoing pattern of the following types of symptoms:

- Inattention means that a person may have difficulty staying on task, sustaining focus, and staying organised, and these problems are not due to defiance or lack of comprehension.
- Hyperactivity means a person may seem to move about constantly, including in situations when it is not appropriate, or excessively fidgets, taps, or talks. In adults, hyperactivity may mean extreme restlessness or talking too much.
- Impulsivity means a person may act without thinking or have difficulty with self-control. Impulsivity could also include a desire for immediate rewards or the inability to delay gratification. An impulsive person may

interrupt others or make important decisions without considering long-term consequences.

Non-Verbal Learning Disability (NVLD)

Non-verbal Learning Disability is a neurodevelopmental condition that is characterised by difficulties with visual-spatial processing, executive functioning, mathematical concepts, fine motor skills, and social skills. It is referred to as NVLD or NLD for short. People with nonverbal learning disabilities typically do not have difficulty in areas such as reading, decoding language, spelling, vocabulary, or factual recall; however, they may have trouble with visual, spatial, or tactile perception.

The Learning Disabilities Association of America acknowledges attention deficit hyperactivity disorder (ADHD) as related condition affecting learning, although not categorized as specific learning disorders. It is highly common for individuals with ADHD to have coexisting conditions, including learning disabilities. When comprehending the neurodiversity and varying learning capabilities of people with learning disabilities, inclusivity, empathy, and effectiveness in delivering training to diverse populations are being promoted.

However, pinpointing specific disabilities may not fully capture the diverse range of educational needs learners may have. By narrowly defining disabilities, there's a risk of overlooking certain learning challenges that may not fit neatly into predefined categories. This approach could potentially exclude individuals whose learning needs don't align with conventional disability definitions. Instead, focusing on identifying and addressing various educational needs allows for a more inclusive and comprehensive **support system**. It encourages a broader view that accommodates a spectrum of learning differences, ensuring that all learners, regardless of specific labels, receive the necessary resources and support to thrive academically.

3. Inclusive educational strategies

Universal Design for Learning

Most learners with learning disabilities struggle to grasp content in a traditional classroom setting. A significant issue for these learners is that most educational materials, such as textbooks, workbooks, worksheets, trade books, and tests, are presented in a standard print format that is not accessible to them and to learners at risk of academic failure.

McDonald and Riendeau (2003) argued that creating a classroom environment where all learners can learn is fundamentally a matter of "learning diversity", where individual differences are not just anticipated but also valued. While this perspective is undeniably optimistic, it encapsulates essential elements found in other widely recognized educational initiatives like UDL as proposed by the Center for Applied Special Technology (CAST, 2006).

What is Universal Design for Learning (UDL)?

UDL is a learning approach that addresses and mitigates the main obstacle to education: rigid, one-size-fits-all curricula that unintentionally create barriers. While learners with disabilities are most affected by these barriers, many learners without disabilities also struggle with inadequately designed learning activities. **UDL tackles the challenges of diversity by advocating for the use of flexible instructional materials, techniques, and strategies that enable educators to accommodate diverse learner needs**. Learning activities designed with UDL principles from the start aims to meet the needs of the widest range of learners, thus eliminating the need for costly and time-consuming adjustments later.

The UDL approach can be used to design technology-rich learning environments that are flexible and meet the needs of diverse learners (CAST, 2006). A universally designed learning activities are crafted to meet the needs of all

learners, encompassing various sensory, motor, cognitive, linguistic, and affective abilities and disabilities, rather than focusing on a narrow group of learners (Hitchcock & Stahl, 2003).

UDL recognises that there are different ways of learning and learners might benefit from different learning techniques. **There are three main principles: Engagement, Representation and Action and Expression (CAST, n.d.).**

- Multiple means of **engagement** based on the idea that different learners are motivated and engaged by different tasks (Rapp, 2014). For example, offering choices, fostering collaboration, and promoting relevance, helps to motivate learners and sustain their interest in (digital) learning environments. Multiple means of **representation**, based on which information should be delivered through multiple methods such as visual aids, auditory materials, and hands-on activities. In a language class, for instance, dialogues can be presented through reading, listening, role-playing, and visual aids, which also aids memory retention (Rapp, 2014). Multiple means of **action** and **expression,** where offering multiple output options, such as writing reports, creating podcasts, or compiling photo essays, can accommodate different strengths (Rapp, 2014).

UDL includes the use of various accommodations

- Presentation: such as repeating directions, read-aloud, large print.
- Equipment and materials: like calculators, amplification devices, manipulatives, and assistive and instructional technologies.
- Response: for example, marking answers in the book, having a scribe record response, or using a pointer.
- Setting: including study carrels, the learner's home, or separate rooms.
- Timing/scheduling: such as extended time or frequent breaks.

McLaughlin also noted that topics for **professional development** for educators should include:

- Understanding all aspects of Universal Design for Learning (UDL).
- Learning how to use assistive and instructional technology to provide accommodations.
- Developing effective methods for special educators to collaborate fully and co-teach with general educators.

Notably, UDL aligns well with other educational methods and practices, incorporating and supporting current **research-based approaches** to teaching and learning, such as:

- Cooperative learning (group work)
- Differentiated instruction
- Performance-based assessment
- Project-based learning
- Multisensory teaching
- Theory of multiple intelligences
- Principles of learner-cantered learning

Learners with learning disabilities and those considered at risk of failing are more likely to leave school without earning a diploma or certificate of completion. This increases their chances of encountering substantial challenges after finishing secondary education (Grumline & Brigham-Alden, 2006). By utilising UDL educators can ensure that all learners can access information by adjusting how it is presented to suit individual understanding.

Role of technology in supporting UDL

In learning activities that integrate UDL principles, technology is used to support all learners. UDL emphasizes "multiple means of expression, multiple means of

representation, and multiple means of engagement" (CAST, 2006), acknowledging that learners have diverse learning styles and promoting a **multi-modal** approach to ensure accessible information (Meyer & Rose, 2000). Although technology and access to it aids in providing materials in various formats it does not guarantee learning. Overall, the innovative use of technology, whether assistive technology or general educational technology, enhances learning for all learners.

Embracing UDL principles in the design and use of educational technologies can help address the paradox of educational technology and Assistive Technology (AT) by **reducing** the need for **disability-specific accommodations** (Strobel et al., 2007) and providing educational technology products that benefit not only all learners, including those with learning disabilities but also educators in terms of training and infrastructure.

Harnessing the power of digital technologies is a key point of UDL, as these tend to be flexible and can provide more efficient opportunities for individualisation and removing barriers for learners (OECD, 2023). Overall, integrating UDL principles in digital education fosters inclusivity, enhances accessibility, and promotes effective learning experiences for all learners.

Integration of technology in inclusive education strategies

Assistive technology

Assistive technology plays a vital role in fostering inclusiveness among individuals facing learning disabilities (Quenneville, 2001), while it also serves as a valuable support effectively alleviating educators' workload and stress (Adebisi et al., 2015). AT plays a crucial role in enhancing education and promoting inclusivity among learners with learning disabilities. These technologies encompass a diverse range of tools and devices designed to aid in learning, communication, and daily activities such as word processors, spell checkers, and calculators, as well as specialised technologies tailored exclusively or primarily for learners with disabilities, including voice recognition software, screen readers, word prediction software. By using assistive technology, individuals with learning disabilities gain access to educational materials, enhance their communication abilities, and participate more fully in daily life. Additionally, these technological aids serve to bridge gaps, ensuring equitable opportunities for education and engagement. The integration of assistive technology within educational environments promotes inclusivity, empowering individuals with learning disabilities, or not to excel.

Allan (2015) explored the **integration** of assistive technology in education for individuals with learning disabilities, identifying several key principles:

- Assistive technology supplements rather than replaces basic skills, integrating them into educational processes to facilitate learning.
- It serves as a vital tool akin to pencil and paper enabling individuals with disabilities to access standard tools and engage equally in educational settings. **However, the mere presence of assistive technology doesn't automatically ensure the accessibility of educational and commercial software.**

- Professional evaluation is crucial to determine the necessity and specifics of assistive technology in learners' instructional plans, including alternative communication needs.
- Continuous evaluation is necessary for effective implementation.

By adhering to these principles, assistive technology promotes independence among individuals with learning disabilities, reducing reliance on others for everyday tasks and enhancing **self-esteem** (Raskind, 2000).

Assistive tools encompass a diverse array of resources tailored to support individuals with various learning needs. **Graphic organisers**, such as mind maps and concept maps, serve as visual aids to organise ideas and information, facilitating comprehension and writing tasks. **Audiobooks and podcasts** offer alternative formats for accessing information, accommodating individuals with challenges in traditional reading methods. Mathematica manipulatives software provides interactive visual representations of mathematical concepts, aiding understanding and problem-solving for those with dyscalculia. **Multi-sensory learning tools** integrate auditory, visual, and tactile elements to enhance learning experiences, catering to diverse preferences. **Interactive whiteboards** engage learners in interactive learning activities, accommodating various learning styles. Concept-mapping **software** allows users to create visual diagrams to organise ideas and information, aiding comprehension and content retention. These tools collectively empower individuals with various learning needs to access and engage with educational content effectively.

Furthermore, assistive technology has emerged as a powerful resource, significantly enhancing academic engagement, performance, autonomy, participation, social skills, motivation, and attention among learners with disabilities. **The adoption of Web 2.0 tools and mobile learning**, including smartphones and iPads, is prevalent due to their accessibility, portability, and

capacity to facilitate inclusion in the classroom. However, challenges persist, including inadequate training of educators in AT usage and difficulties accessing these tools due to economic constraints or insufficient funding. Addressing these challenges is crucial for targeting inequities in technology access and usage, thereby fostering more inclusive educational environments.

Written Language Assistive Technologies

An emerging field within assistive technologies revolves around writing software, with many popular word processing programs incorporating features tailored for assistance. **These functionalities encompass grammar checkers, spell checkers, thesaurus options, dictionaries, outlining tools, templates for commonly used documents, and automatic correction functions for frequently occurring errors (e.g., QuickCorrect for WordPerfect and AutoCorrect for Microsoft Word**).

Additionally, there are specialised software programs designed to support writing tasks through word prediction and abbreviation expansion. Word prediction software collaborates with word processing programs to present a curated list of word suggestions when a letter or sequence of letters is inputted. For instance, if "ap" is typed, the software generates a list of words beginning with "ap" (e.g., apple, appendix, appropriate, apron) for the user to select from. Some of these programs only propose words that align with grammatical rules. Among the prominent word prediction software are **Telepathic and Cowriter 4000**, initially crafted to expedite typing for individuals facing physical disabilities that hinder typing and writing efforts. However, there is an increasing adoption of these tools by learners with learning disabilities.

Abbreviation expansion software, another facet of assistive technologies for writing, supplements word processing programs by enabling users to create their personalised set of 24 abbreviations for frequently used words and

phrases. For instance, an abbreviation like "at" can be expanded to "assistive technology." Telepathic, alongside KeyREP, Instant Text, and TypeIT4Me, provides functionalities for word expansion, enhancing efficiency and ease of writing tasks.

Supportive reading software programs

Assistive reading software applications offer a multitude of features aimed at aiding learners in comprehending text. These functionalities encompass options such as highlighting, providing definitions, facilitating notetaking, and converting text into speech through **Text-to-Speech (TTS) technology**. This conversion feature particularly benefits individuals with reading-related learning disabilities, enabling them to access written materials with greater ease.

Well-known supportive reading programs in this category include Authorware 5.0, eReader, Kurzweil 3000, WYNN, TextHELP!, WordSmith, ReadPlease 2002, and PlainTalk. Primarily, learners with visual impairments and learning disabilities constitute the primary users of such software. While certain features within these programs, notably text-to-speech conversion and screen reader functions, may pose challenges to the integrity of reading assessments, they can be scaffolded to provide support while still necessitating active reading engagement from the student. Given that reading proficiency is typically not a focus of most writing assessments, there is potential for utilising this type of software to aid learners in proofreading their essays.

Voice (speech) recognition

Voice recognition technology is experiencing rapid growth as an assistive tool. It functions by capturing individual voices, converting them into a digital format, and storing them as voice files, which can be retrieved as needed to translate speech into commands or written text. This includes the capability of speech-to-text conversion, enabling individuals to dictate spoken words that are then

transformed into written text. This technology proves invaluable for those with learning disabilities, aiding them in the process of writing or typing.

Prominent voice recognition programs in use include Dragon Dictate, Dragon Naturally Speaking, ViaVoice by IBM, and iListen. Despite significant advancements in voice recognition software over the past decade, users often encounter customization challenges, necessitating personalised adjustments to suit their specific requirements. Consequently, off-the-shelf voice recognition programs may not be as beneficial as a scribe or word processor during standardised testing for most learners at present. However, this landscape may evolve as software continues to progress. Presently, individuals with physical disabilities and certain learning disabilities such as dysgraphia and dyslexia constitute the primary user base of voice recognition software.

Selecting appropriate assistive technology tools

Selecting appropriate AT involves considering the **specific needs** and **abilities** of learners with learning disabilities. To do so, several guidelines should be considered, as outlined by Raskind (2000):

- Identify specific challenges: AT should address the specific challenges faced by the learner
- Recognise strengths and utilise AT to recognise them. For example, a learner who struggles with reading printed text but comprehends spoken words well could benefit from OCR/speech synthesis systems.
- Involve the learner in selection: The learner's interest in and comfort with the AT tools can enhance the engagement and integration of AT tools into the learning process.
- Consider specific settings and ensure that the setting matches the intended use of the technology enhancing its effectiveness and utility.

- Ensure compatibility by selecting technologies that work well together and are compatible with existing systems.

The Web Accessibility

The Web Accessibility Directive (Directive (EU) 2016/2102), implemented in December 2016, aims to enhance access to public service websites and mobile apps in the EU for people with disabilities. It underscores the EU's commitment to inclusivity by mandating specific accessibility standards for public sector sites to ensure equal digital participation.

While improved accessibility benefits all categories of disability, mobile learning systems often experience learner attrition and reduced qualification levels, particularly for individuals with disabilities. It's crucial to acknowledge that users have different preferences and expectations based on their specific learning profiles. For instance, individuals with the same learning disability may prefer different ways of receiving information. Therefore, content should be designed to cater to **diverse user needs** rather than assuming preferences solely based on disability.

Most e-learning platforms typically adopt a "one-size-fits-all" approach and are not equipped to handle complex user profiles. **The Web Content Accessibility Guidelines (WCAG) outline four guiding principles: perceivable, operable, understandable, and robust, to ensure accessibility**.

Regarding text elements on webpages, several considerations are important:

- **Logical content structure**: Use headings, lists, and other structural elements to organise content, aiding screen readers in providing an overview of the page.
- **Forms**: Ensure online forms are logically organised, easy to complete, and clearly labelled. Provide intuitive instructions and navigation order.

- **Simple language**: Use clear, everyday language with active verb forms, avoiding jargon and slang, and focusing on a single main idea per paragraph.
- **Readability**: Opt for clear, easy-to-read fonts with adequate size, typically at least 11pt, to enhance readability. Avoid fonts smaller than 9pt (12px), with 11pt (15px) being a recommended standard according to WCAG.

Effective strategies for supporting individuals with learning disabilities

Inclusive education requires **tailored approaches** to support individuals with learning disabilities effectively. This compilation highlights essential strategies aimed at enhancing learning outcomes for individuals with learning disabilities.

- **Target phonological awareness and phonics.** Phonological awareness, which involves recognising and manipulating the sounds of language, and phonics, which focuses on the relationship between sounds and letters, are fundamental skills for reading. Teaching phonemes, graphemes, morphemes, and orthography can help improve learners' reading abilities (Department for Education, 2006).
- **Comprehensive writing policies.** Incorporate comprehensive writing programs to improve various aspects of writing skills, such as prewriting planning, narrative text structure, writing strategies, and the writing process itself for learners, in inclusive general education classrooms. A study (Bui et al., 2006) evaluated the effectiveness of a comprehensive writing program. The results showed significant improvements in the writing skills of learners who participated in the intervention, regardless of whether they had learning disabilities, compared to those who received traditional instruction.

- **Break down target skills.** Breaking tasks into smaller, more manageable components can help individuals with learning disabilities (Bulgren & Carta, 2002). For example, when writing essays, individuals can benefit from identifying key parts of the essay question before planning or writing.
- **Provide clear and explicit instructions.** Offering clear and specific instructions is crucial for individuals with learning difficulties. Breaking down tasks and explaining each step can help individuals understand and complete assignments more effectively (Mastropieri & Scruggs, 2010). In addition, demonstrating tasks and the underlying strategies or thought processes can aid individuals in learning how to approach problems (Mastropieri & Scruggs, 2010).
- **Use visual supports.** Visual aids such as concrete materials, semantic maps, and graphic organisers can enhance learning for individuals with specific learning disabilities. Visual representations help make abstract concepts more tangible and understandable. The **Video Reflection Technique** (VRT), designed for educators, utilises video recordings of interactions to enhance communication skills among educators and staff. Through this method, educators observe their own interactions and contemplate their performance, pinpointing areas for improvement and devising strategies for enhancement. In supporting individuals with learning disabilities, speech and language therapists commonly offer training to support networks. Given the intricate communication needs in this context, effective training approaches are pivotal for knowledge and skill transfer.
- **Provide opportunities for practice.** Repetition and practice are key for reinforcing learning. Offering individuals repeated opportunities to practise skills, such as reading decodable texts or solving mathematics

problems, helps improve accuracy and fluency (Swanson, Harris, & Graham, 2013).

- **Teach self-monitoring and meta-cognitive strategies.** According to Kay et al. (1995), it is essential to support individuals with learning disabilities in developing skills for self-care, personal control, and managing emotions like anger and anxiety. Moreover, meta-cognitive strategies, including rehearsal, elaboration, and reading comprehension techniques, equips individuals with valuable tools to improve their learning process.

Need for personalisation

The importance of comprehending individuals' perspectives on learning as education is evolving due to technological advancements has been emphasised significantly (Hocine & Sehaba, 2024). These perspectives significantly impact their approaches to learning, influencing their cognitive strategies and determining their academic success. Individual developmental trajectories, shaped by factors like intellectual, motor, and social abilities, along with cultural and environmental influences (Vygotsky, 1978), can differ greatly and are often non-linear. Adapting learning to these variations can improve skill development, motivation, and engagement (Worthen, 2016) among individuals with learning disabilities.

Personalisation approaches

Personalised systems generally have a positive impact on learning outcomes (Cinquin et al., 2021), motivation and engagement (Mazon et al., 2023), usability (Cardona-Reyes et al., 2021), cognitive load (Shaban & Pearson, 2019), as well as communication and social engagement (Roldan-Alvarez et al., 2021).

When focusing on learning disabilities research shows that from the existing personalisation approaches, **serious games** and **gamified learning**

environments (GLEs) as well **as adaptive systems** and **virtual agents** are the most common methods for enhancing learners' performance and engagement. These approaches are particularly recommended for learners with specific learning disorders and attention deficit/hyperactivity disorder.

Serious games and **gamified learning environments** (GLE) are commonly used to tailor learning for learners with learning disabilities using game design elements like mechanics, challenges, rules, scenarios, and feedback to create engaging and personalized learning experiences (Buzzi et al., 2019)

Adaptive systems, customise learning content, difficulty, feedback, and interfaces for individuals or groups. Examples include DyslexiaTypeTrain for dyslexic learners (Alghabban & Hendley, 2020), and MaTHiSiS, which adapts content based on users' engagement, frustration, and boredom (Standen et al., 2020).

Virtual agents are proposed to personalise e-learning for learners with learning disabilities. These agents act as intelligent tutors or assistants, offering individualized guidance to enhance skill development. For example, the "Emotional Agent" (Chatzara et al., 2016) helps learners with learning disabilities and attention disorders in their self-regulated training, providing cognitive support and improving social skills. However, standardised measurements of skills and large-scale studies are needed to better understand and generalise the effectiveness of virtual agents.

These approaches tailor learning materials, feedback, navigation, and visualisations to learners' abilities, prior knowledge, learning style, and preferences (Albo et al., 2022). In e-learning systems designed for individuals with specific learning disabilities personalisation targets primarily focus on feedback and difficulty levels of learning activities. **Adapting the difficulty level**

of learning activities is essential to match the cognitive capabilities of all learners (Hocine & Sehaba, 2024).

Some systems define difficulty levels during the design phase (general approach) based on expert recommendations and link each level to specific knowledge competencies or skills (Siti & Rabiah, 2011), while others dynamically adjust difficulty based on real-time assessments of the learner's performance and affective state (Standen et al., 2020).

Social and Emotional Learning (SEL)

The importance of social and emotional learning (SEL) in supporting individuals with learning disabilities is immense. **Although there is ongoing debate about the definition and diagnosis of learning disabilities, it is widely recognised that many individuals with these disabilities often face challenges in social relationships. This is due to educational obstacles they may encounter, including difficulties with peer acceptance, forming friendships, social isolation, reduced self-confidence, low self-esteem, and various behavioural issues, whether internalised or externalised.**

Universal Social and Emotional Learning (SEL) stands as a crucial component in the education of individuals with LD (Jones et al., 2019). While recognising the importance of tailored programming and targeted interventions, universal SEL nurtures social and emotional growth alongside academic learning within inclusive classroom environments (McDaniel et. Al, 2022). This approach helps mitigate the potential risks of labelling and stigmatisation often associated with interventions conducted outside the classroom. Furthermore, it fosters the integration of individuals with LD by fostering skills like effective work habits, collaboration, and healthy relationships, thereby promoting their equitable acceptance among peers in mainstream education (Payton et al., 2000).

Individuals with Specific Learning Disabilities (SLD) often have difficulty understanding and expressing emotions beyond basic ones like happiness, sadness, and anger (Elias, 2004). To improve their emotional literacy, they need to develop the ability to recognise and articulate complex emotions and their related vocabulary. Effective strategies include linking thoughts and physical sensations to emotions and using vocabulary lists with more nuanced emotional terms. Assignments that use "I feel... when..." statements help individuals make connections between emotions and specific situations. While it is normal to experience intense emotions such as anger, individuals need to learn how to regulate these emotions to avoid outbursts or internalization. Strategies like using visual aids, such as thermometers to gauge emotional intensity, and "If-then" statements to link behaviours with consequences, can help manage stressful situations. Jawary (2000) emphasises that for inclusion to be successful, learners need the social and emotional skills to manage various social interactions with their peers. She also points out that inclusive environments flourish when there is a supportive atmosphere, a clear value system, and sufficient resources, especially in terms of staff.

Developing empathy is crucial for individuals with learning disabilities who may find it challenging to understand others' perspectives. Practical approaches include identifying emotions in others through facial expressions, participating in role-playing exercises to explore emotions, and discussing various reactions to the same situation to foster empathy and appreciation for differences. Furthermore, people with SLD often struggle with social problem-solving. Teaching basic conflict resolution techniques and addressing negative thought patterns can help them effectively manage conflicts. To ensure continual growth and application of these skills, educators should help transfer learned abilities to different situations, proactively addressing potential obstacles, offering reminders, and consistently reinforcing skills over time.

SEL serves as a crucial element that helps bridge the gap between theory and practice in enhancing outcomes for individuals with learning disabilities. It addresses the intersection of individual skills and the ways in which the environment fosters the development and application of these skills.

From a social and emotional learning perspective, it is essential for both regular and special educators to focus on developing skills and creating an environment and opportunities that enable these skills to thrive while also highlighting individuals' strengths (Zins et.al, 2002).

4. Collaboration between educators and support networks

Necessity of coordinated support and educators' expectation effect

Individuals with learning disabilities may face unique challenges while growing up. Besides the usual stresses of adolescence, they deal with additional obstacles such lack of information, and negative experiences like stigma and social isolation. distress (Pelleboer-Gunnink et al., 2019).

Research shows that individuals with learning disabilities are twice as likely to experience **mental health conditions** compared to the general population (NICE, 2016). While each person's experience is unique, those with learning disabilities may be particularly vulnerable to adverse life events. The accumulation of negative life experiences over time can lead to elevated stress levels, increasing the risk of developing mental health problems (Bond et al., 2019). This stress can manifest in behavioural changes such as distress, irritability, and agitation (NICE, 2016).

Transitioning from school to post-secondary education or employment is particularly difficult for school-leavers with learning disabilities, as they often encounter limited opportunities and support. This transition to adulthood and adult services is a stressful period for both the young people and their families. The lack of coordination and planning between children's and adult services adds to the stress and uncertainty faced by these individuals and their families. Furthermore, there is insufficient information available to guide young people and their families in exploring post-school options. These challenges are compounded by socio-economic factors which increase the risk of mental health conditions among young people with learning disabilities.

To fully understand the impact of these challenges on individuals with learning disabilities, it's essential to consider the **role of educators** and their expectations. Educators' perceptions and attitudes towards learners with learning disabilities can significantly influence these learners' educational experiences and outcomes. According to Kashikar et al. (2024), educators' expectations act as forecasts of learners' future behaviour or academic achievement, based on their current understanding of the learners (Good, 1987). These expectations are crucial because they can greatly impact learners' performance, with high expectations often leading to better results and low expectations leading to poorer outcomes. The simplified model of the **expectation effect** process includes four steps illustrating how educators' expectations influence learning outcomes:

- Educators form expectations.
- These expectations lead educators to treat learners differently.
- Learners respond to educators' behaviour.
- Learners' performance improves or deteriorates as a result (Johnston et al., 2019).

Educators generally form expectations about learners' future academic performance based on their past achievements (de Boer et al., 2010). However, these expectations are also shaped by perceived group affiliations of the learners. Research indicates that these expectations are frequently biased and tend to be lower for learners diagnosed with learning disabilities. Dual-process models propose that implicit and explicit attitudes influence different types of behaviour: implicit attitudes are associated with automatic behaviours, while explicit attitudes correspond to controlled behaviours, with the potential for mixed processes (Olson & Fazio, 2009).

Research by Fuchs et al. (2004) revealed that special education professionals tend to have **lower performance expectations** than regular education educators. The

label of learning disabilities affects explicit attitudes differently as special education professionals have more positive explicit attitudes towards including learners with LD than regular education educators.

Support needs approach

Individuals with learning disabilities face academic difficulties such as problems with word reading, processing speed, and working memory, as well as higher levels of academic procrastination and stress. They often struggle with time management, task attention, and communicating their needs to educators. **Factors such as perceived stigma, awareness of their disability, and the availability of transitional support services heavily influence individuals' decisions to seek accommodations**. Research shows that individuals with learning disabilities who receive accommodations are more likely to overcome academic challenges and succeed. However, the responsibility for seeking and advocating for these services primarily falls on learners, who may lack the self-awareness, resilience, and advocacy skills necessary for these transitions. Therefore, a comprehensive support needs approach is necessary to address these challenges effectively, including **proactive** identification and intervention, **personalised** learning plans, and accessible resources tailored to individual needs.

A learning disability affects how a person learns, understands, and communicates information, leading to difficulties in learning new skills, coping independently, and handling complex information. People with learning disabilities often need additional support or care as their condition might affect everyday activities like household tasks, socializing, or managing money.

It is important to note that the variation in **severity** influences the level of support required within the educational context (McDonough et.al, 2017):

- **Mild:** Some learning difficulties in one or two academic areas, which can be managed with appropriate accommodations or support services. Individuals in a situation of mild learning disabilities can usually communicate effectively and manage daily tasks independently but may need help with complex tasks like budgeting or completing important documents.
- **Moderate:** Significant learning challenges requiring specialized teaching and accommodations in school, the workplace, or home to complete tasks efficiently. Individuals with moderate learning disability levels can communicate their needs but may take longer than those with mild disabilities. They may need some support with self-care but can handle many daily tasks independently.
- **Severe:** Profound learning difficulties across several academic areas, necessitating ongoing intensive specialized teaching throughout most of the school years. Even with accommodations, individuals with severe specific learning disabilities may struggle to perform academic tasks efficiently. Individuals with severe learning disabilities can use basic words or gestures to communicate and may require assistance with daily tasks.

To adhere to the support needs approach, the **educator should first evaluate the overall progress of the team, ensuring that the instruction is culturally, pedagogically, and linguistically suitable for all learners** (Farnsworth, 2018). If most learners are struggling with a task or subject, the issue likely lies with the instruction rather than the latter. Conversely, if most learners are performing well but a few are having difficulties, the educator should closely assess these struggling individuals and provide additional support as needed (Klingner, 2009).

Although educators may not become experts on learning disabilities, they can support individuals with learning disabilities by adopting methods that benefit all learners, regardless of their learning needs. Essentially, this

involves planning and instructing in ways that help all learners, thereby assisting those with learning disabilities such as the **Universal Design for Learning**. The educator should address the learning needs of **all learners**, including those with disabilities or other learning challenges (Bulat et al., 2017). This approach has dual benefit as the inclusion of learners with learning disabilities positively impacts those without.

Since the support needs approach accommodates all learners, no specialised disability testing or identification beyond standard educator practices is needed (Bulat et al., 2017). However, learners with severe learning disabilities may require more individualised support than what can be provided in a mainstream learning environment (Rapp & Arndt, 2012).

Collaboration between educators and support networks

Collaboration between educators and support networks for individuals with learning disabilities is essential for fostering an inclusive learning environment that recognises and addresses the diverse needs of all individuals. Support networks can include families, caregivers, special education professionals, speech and language therapists, occupational therapists, psychologists, and other relevant professionals who can provide specialised support. This collaborative approach aims to create a supportive ecosystem around individuals, enabling them to achieve their full potential. At the core of collaboration between educators and support networks, it is the imperative for educational settings, both formal and informal to broaden their traditional focus to include a greater commitment to positive social change in the field of learning disabilities. Stakeholders in the field of education should dedicate consider serving communities, measuring their success by the tangible differences they make in people's lives.

To enhance such a social mission educational bodies and stakeholders, should partner with individuals with learning disabilities and their families, as well as with public authorities and other agencies responsible for providing opportunities and support to help people lead fulfilling lives. This involves actively involving individuals with learning disabilities and their families in shaping educational initiatives, contributing to some of the work, and utilizing the outcomes practically (Towell & Hollins, 2000).

Effective collaboration can be achieved through the establishment of regular communication between all parties involved (Dettmer et al., 2005). Building on this, **integrated planning** is a foundational strategy where Individualised Education Plans (IEPs) are developed collaboratively. This approach ensures that educational strategies are tailored to the individual's needs, strengths, and challenges. IEPs created in a collaborative setting draw on the expertise of various professionals, including educators, special education staff, therapists, and family members, to create a holistic and effective plan for the student (Friend & Cook, 2010). In addition, **resource sharing** which involves the exchange of training aids, therapeutic tools, and access to specialized services among educators and support staff can support in creating a more integrated support system for the individual, making a wider array of resources available to address specific needs (Mastropieri & Scruggs, 2010).

Similarly, collaboration **within the education ecosystem** is instrumental for uniting educators, specialists, administrators, and staff to effectively address the diverse needs of learners. This collective effort supports learners' academic, behavioural, and social-emotional growth, fostering a conducive learning environment. The National Center for Learning Disabilities underscores that such collaboration facilitates the identification and sharing of effective practices, ensuring consistency in educational approaches that benefit all learners (Darshini et al., 2024).

Conclusion of the literature review

Inclusive education guided by human rights principles aims at dismantling barriers and ensuring equitable access to quality education for all. Inclusive educational methodologies have evolved alongside societal shifts towards diversity acceptance, as seen in updated definitions and legal frameworks like the UNCRPD and IDEA. Despite progress, challenges persist in achieving universal implementation due to differing interpretations of inclusion, inadequate support systems, and systemic barriers that perpetuate segregation.

Inclusive education not only empowers individuals with learning disabilities to achieve academic and professional success but also fosters their social inclusion and acceptance in society. It recognises the varied **spectrum** of learning strengths and challenges, necessitating personalised interventions beyond standardised methods, acknowledging the **multifaceted nature** of intelligence. Moreover, the intersectionality of learning disabilities with other conditions underscores the need for integrated support strategies and comprehensive assessments to address diverse aspects of a person's learning profile.

Universal Design for Learning (UDL) emerges as a crucial framework, advocating flexible learning environments that cater to diverse learners' needs through **multiple means** of engagement, representation, and expression. Technology, and particularly assistive technologies (AT), can also enhance accessibility and learning experiences across various styles.

Personalised learning approaches and the integration of **social-emotional learning** enhance engagement and outcomes for learners with disabilities, emphasizing holistic development. To promote the **support needs approach**, collaboration among educators and support networks is essential and helps in addressing academic, social, and emotional challenges comprehensively. This collaborative approach empowers individuals and families to advocate for their

educational needs, fostering ownership and engagement in their educational journey.

Training needs analysis for educators

The objective of the training needs analysis for educators conducted within the framework of ADEDU project, centers on understanding the impact of learning disabilities on education methodologies for trainers and educators. By conducting a thorough training needs analysis involving focus groups and questionnaires, the project directly targets the goal of supporting educators and trainers in upskilling and innovating their offerings to include individuals affected by learning disabilities. **This analysis informs the development of tailored outputs such as training courses and guidelines on inclusive communication and digital learning environments, aligning with the project's objective of facilitating digital transition and overall inclusion.** Through addressing the specific challenges and needs identified among educators, the project contributes to driving change across Europe by promoting inclusivity, innovation, and forward-looking strategies in education and digital transformation.

Training needs analysis results

For the Training Needs Analysis, a mixed methods survey was undertaken. **Focus groups**, as qualitative research methods, were utilised where a small group of individuals gathered to discuss a specific topic under the guidance of a moderator. The purpose of the focus groups was to explore participants' attitudes, perceptions, and experiences related to their training needs when working with people with learning disabilities. These focus groups served as a valuable tool for gathering qualitative data and exploring the issues surrounding learning disabilities in education methodologies. This thorough approach ensured that the ADEDU training course will be tailored to address the specific challenges faced by educators working with individuals with learning disabilities.

For the circulation of the **questionnaire**, we designed a comprehensive instrument that captured insights into the challenges and needs faced by educators in addressing learning disabilities in education methodologies. The questionnaire encompassed a diverse range of topics, including the identification of specific learning disabilities, the impact on teaching practices, and the efficacy of existing support systems. By incorporating a mix of closed-ended and open-ended questions, we allowed for both quantitative data analysis and qualitative exploration of educators' experiences and perspectives. The design of the questionnaire prioritised clarity and accessibility to ensure accurate responses from participants.

To ensure a comprehensive dataset, we gathered 12 qualitative responses and 52 quantitative responses. This target allowed to capture a diverse range of viewpoints and experiences from educators engaged with individuals affected by learning disabilities. We aimed for diversity among respondents, including educators from various educational levels, disciplines, and geographical regions. Additionally, efforts were directed towards including educators with varying degrees of experience in working with individuals with learning disabilities. This approach facilitated a comprehensive understanding of training needs across different contexts. To maximise response rates and achieve the target number of responses, we employed efficient distribution methods, provided clear instructions, and shared follow-up reminders.

Analysis of qualitative data

In May 2024, IASIS NGO and the Hellenic Open University (HOU) conducted two focus group discussions involving various stakeholders to gather information on educational practices for learners with learning disabilities. The focus group conducted by IASIS NGO, held on Friday, May 24, 2024, lasted 70 minutes and included three secondary school educators, two psychologists, and a researcher. The focus group conducted by HOU took place on Wednesday, May 22, 2024,

lasting 90 minutes, with participants comprising a chemist, two special education educators, two general education educators, and a kindergarten educator

These discussions aimed to collect insights on participants' personal experiences, successful strategies for supporting learning disabilities, views on training needs and opportunities, and creative ideas for inclusive education.

The focus groups revealed several key findings:

a) The importance of collaboration among various stakeholders, including educators, parents, and specialists.

b) The necessity for differentiated instruction to cater to the individual needs and interests of learners.

c) The integration of technology, utilising tools like interactive whiteboards, specialised software, and virtual reality to enhance learning experiences.

d) The need for comprehensive training for educators working with individuals with learning disabilities.

e) The importance of applying inclusive practices in education, such as collaborative programs integrating special and general education, promoting physical and social accessibility in schools, and fostering a culture of inclusion through art, music, and cultural engagement.

Results retrieved from Focus Group A

Question 1: How do participants perceive current educational methodologies in addressing the needs of people with learning disabilities?

- Inclusive education and differentiation: Participants emphasise the **importance of inclusive education, individualised teaching, and technology to support learning for learners with learning disabilities**.

They stress developing cognitive and life skills and ensuring social integration.

- Technology's role: Technology is seen as crucial, particularly for learners with sensory disabilities, offering tools like e-books, interactive presentations, and specialised software. For example, one participant states: "Differentiated teaching, whereby the lesson can be adapted to the needs of each learner, and the use of technology provides each learner with what they need. E.g. using e-books, photo tree, wordwall, PowerPoint presentations, videos from the internet".
- Collaboration: Effective collaboration between special and general education educators, and with parents, is highlighted as vital for success.
- Challenges: Challenges include implementing personalised teaching in general educational settings, and the importance of understanding a child's needs without necessarily labelling their disability. For instance, one participant reported that: "The learners in high school could not understand the situation of the child with learning difficulties. In fact, the principal of the school in an online meeting avoided naming the disability of this child. She may have done so to avoid putting a label on him in front of the other learners. I think it's important to learn (the learners and educators of general education) the needs of the child with a learning disability and it is not necessary to know the diagnosis".

Question 2: What are some of the challenges you face when working with people with learning disabilities in an educational setting?

- Family dynamics: Families often present challenges such as denial, aggression, and lack of acceptance. In fact, some of the participants stress that: " the learner's family is the biggest problem. I come across denial, aggression, depression and even stalking in my classroom from a parent".

In addition, it was stated that “There is a need to cooperate with parents … it is a social challenge because many of the parents have not accepted their child's situation and there is still the stigma”.

- Educator training and emotional burden: Insufficient training and emotional stress on educators are significant issues. educators need more comprehensive training and support from specialists.
- Resource shortages: Lack of resources and infrastructure, and insufficient collaboration between special and general education educators, hinder effective teaching. For example, one participant commented in this regard that: "the lack of resources in schools such as anti-stress balls for learners with autism, relaxation cushions or some technological equipment, is a major challenge for educators".
- Behavioural issues: Addressing behavioural problems, especially in adolescents, is a common challenge.

Question 3: What is the participants' opinion of possible strategies or approaches that have been found effective in supporting the learning needs of people with learning disabilities?

- Differentiated instruction: Tailoring teaching to each learner's interests and prior experiences is effective. "By recognising each learner's interests and existing knowledge, the educator can find a way to deliver the teaching in a specific way that the particular learner will understand." says one of the educators in the group.
- Collaboration and communication: Strong communication between educators, parents, and specialists, along with cooperation between special and general education educators, is crucial.
- Creative and flexible teaching: Using creative methods like dramatic play and cooperative learning helps to make lessons more engaging and comprehensible.

- Positive reinforcement: Reward systems and building trust with learners are essential strategies. For example, one educator mentions: “I spend a lot of time getting to know the learners and developing a relationship. We need to develop a trusting relationship between learner and educator so that the educator knows how to manage the learner with the learning disability”

Question 4: What is the participants' perspective on how educator training programmes can be improved to better equip professionals to work with people with learning disabilities?

- Comprehensive training: Programs should offer both general education principles and specific training on learning disabilities, including practical sessions.
- Digital skills development: Training should include the use of modern technological tools.
- Conflict and behaviour management: educators need training in managing classroom conflicts and learner behaviour.
- Continuous professional development: Lifelong learning and sharing good practices among educators are important for ongoing improvement. For example: “It is necessary for the educator to engage in personal research, training on the principles of general education and on learning problems and syndromes, in a face-to-face training environment. More general training is needed. It would be better if training programmes were to take place in the form of lectures and then followed by practical training”.

Question 5: What are some innovative ideas or solutions envisioned by the participants to enhance inclusive education for people with learning disabilities?

- Collaborative programs: Integrating special and general education through co-education programs. "It is fundamental to have collaborative and co-education programmes with general education schools. This will bring together general and special education learners and allow them to understand the diversity of one another."
- Technological innovations: Using interactive whiteboards, new software, and virtual reality to enhance learning. One participant mentioned: "I envision large, spacious classrooms equipped with interactive whiteboards and Internet access with the necessary teaching materials to meet the needs of all learners".
- Art and Culture: Engaging learners in art, theatre, and music to foster inclusion and understanding.

Results retrieved from Focus Group B

Question 1: How do participants perceive current educational methodologies in addressing the needs of people with learning disabilities?

- Limited availability of tools tailored for learning disabilities.
- The importance of early intervention.
- Digital tools exist, but educators often lack the support to use them effectively.
- Referrals to developmental specialists are essential.
- Educators' sensitivity is crucial in addressing learning difficulties.
- The curriculum is often too pressurised for learners with learning disabilities.
- Learners with learning disabilities require proper guidance.

Question 2: What are some of the challenges you face when working with people with learning disabilities in an educational setting?

- Lack of parental involvement.
- Undiagnosed learning difficulties in learners causing issues.
- Traditional books and texts are often unhelpful.
- Classroom competition can be detrimental.
- Disabilities slow down teaching, causing time pressure to cover the curriculum.
- The fast pace of teaching to complete the curriculum is problematic.

Question 3: What is the participants' opinion of possible strategies or approaches that have been found effective in supporting the learning needs of people with learning disabilities?

- educators providing their own notes to learners.
- Using educational toys like LEGO and Playmobil.
- Utilising blueprints and concept maps.
- Incorporating instructional videos.
- Teaching through music and movement.

Question 4: What is the participants' perspective on how educator training programmes can be improved to better equip professionals to work with people with learning disabilities?

- Specialised training in MSC special education.
- Avoiding embarrassing, cancelling, or frustrating learners.
- Implementing individualised assessment criteria.
- Integrating art into education.

Question 5: What are some innovative ideas or solutions envisioned by the participants to enhance inclusive education for people with learning disabilities?

- Creating a teaching environment where educators are happy, enabling them to perform their best.
- Enhancing communication between parents and educators.
- Forming interdisciplinary teams to support inclusive education.

Conclusions

Overall, the general view is that while there are commendable efforts and methodologies in place to support learners with learning disabilities, there is still a need for improved educators training, better resource allocation and innovative-holistic approaches to fully address the diverse needs of these learners and pave the way for a more inclusive and supportive educational environment.

Analysis of Quantitative Data

The survey was conducted to gather information about the challenges and needs educators face when addressing learning difficulties in the context of educational methodologies. The number of participants reached 52 with a wide age range.

The questionnaire was designed to gather information about the educator's demographics, experiences, and perspectives on working with learners with learning disabilities. It covered a wide range of topics, from identifying specific learning difficulties to understanding their impact on teaching practices and evaluating the effectiveness of existing support systems. The questionnaire included a blend of closed and open-ended questions to ensure a comprehensive understanding of the topic.

The objective is to provide better support both for educators and learners and through this survey we were able to comprehend the current educational landscape and devise strategies.

The feedback gathered from the survey significantly contributed to the development of appropriate and targeted strategies and resources for enhancing inclusive education practices. Regarding the General Data Protection Regulation (GDPR) and the protection of personal data, all 52 participants were fully informed and understood that the survey was confidential. They were assured that all data collected would be used solely for the purposes outlined in the survey.

Demographics

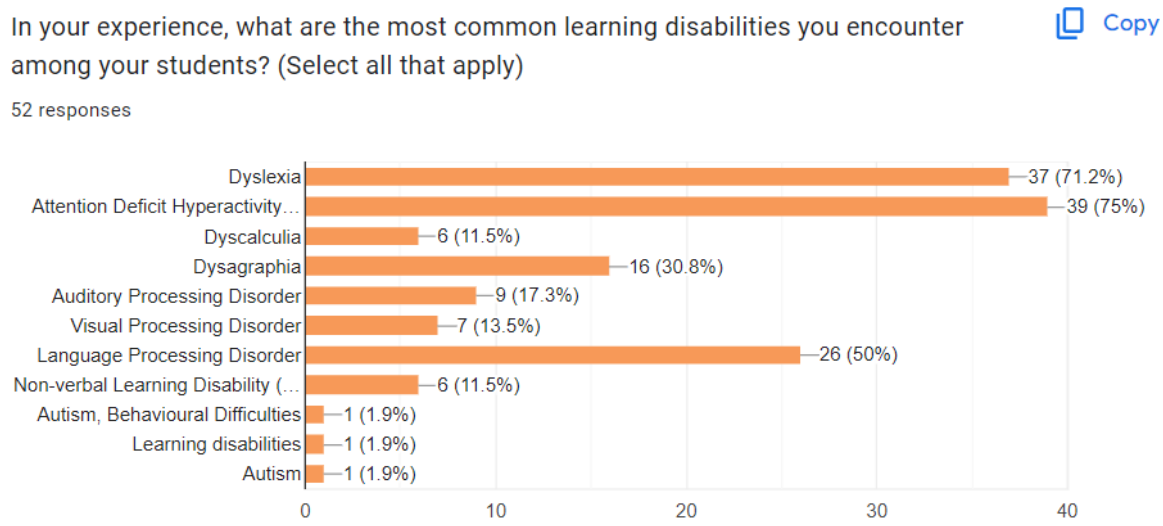
Most participants fell within the age range of 35-54 years, comprising 36.5% of the total. Participants aged 18-24, 25-34, and 55-64 each represented 7.7%, while those aged 65 and over constituted the smallest group at 3.8%. In terms of gender distribution, women predominated in the survey, accounting for 78.8%, followed by men at 21.2%. Most participants (50 out of 52) resided in Greece, with the remaining two participants from Serbia and Italy. Regarding educational attainment, the highest proportion of participants (86.5%) reported completing education at the postgraduate level. Undergraduate education was cited by 11.5% of participants, while 1.9% indicated schooling as their highest level of education. Regarding employment status, most participants were employed (88.5%), while 7.7% were unemployed. Self-employed individuals and learners each constituted 1.9% of the participants. The primary fields of work reported by participants included education (13.5%) and teaching (5.8%). Other fields represented included art education, chemistry education, special therapies, educational advising, elementary education, Greek language instruction, mathematics, physiotherapy (special education), secondary education

administration, psychology, dance, social work, and vocational education and training, each representing 1.9% of participants.

Training Needs

Regarding how confident the participants feel in their ability to identify different types of learning disabilities among their learners, 9 out of 52 stated to be “very confident”, 27 were “pretty confident”, 11 “somewhat confident”, 3 were “unsure” and 2 were “not confident at all”. It is encouraging to see a spectrum of confidence levels among participants regarding their ability to identify different types of learning disabilities among learners. The diversity in responses—ranging from 'very confident' to 'not confident at all'—highlights the varying levels of preparedness and underscores the importance of continued training and support in this critical area of education.

When the participants were asked according to their experience, what was the most common learning disability they have encountered among their learners, attention deficit hyperactivity disorder (ADHD) emerged as the most encountered disability, cited by 39 respondents, closely followed by Dyslexia, which was mentioned by 37 participants. Language Processing Disorder was noted by 26 respondents, while Dysgraphia was identified by 16. Auditory Processing Disorder received 9 mentions, Visual Processing Disorder 7, and both Dyscalculia and Non-Verbal Learning Disability (NVLD) were mentioned by 6 participants each. Additionally, individual responses included autism, behavioural difficulties, learning disabilities, each cited once. These findings underscore the diverse spectrum of learning challenges educators encounter and highlight areas where targeted support and resources are crucial.

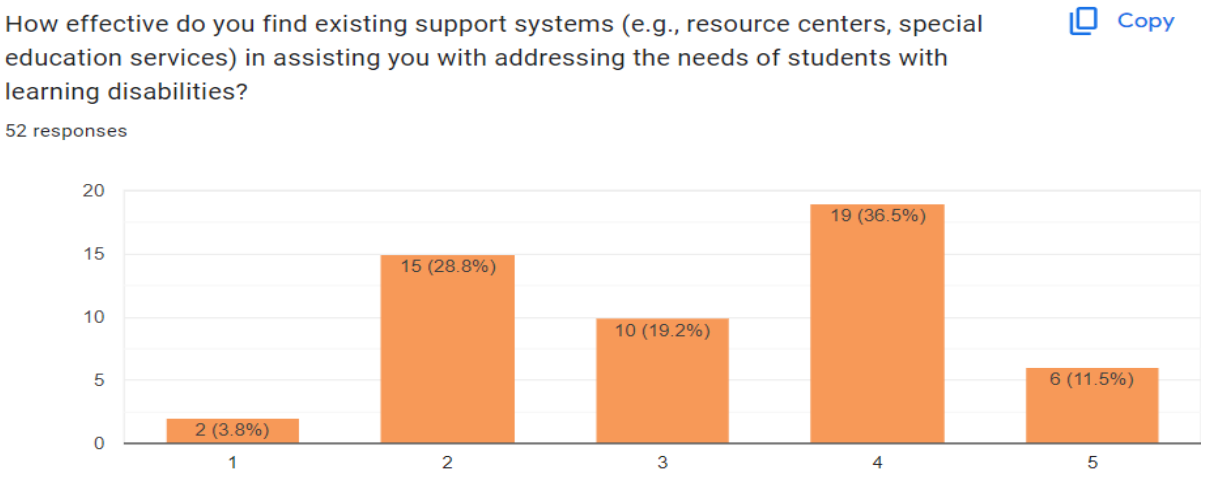


In the question of how they currently adapt their teaching methods to accommodate learners with learning disabilities, we had the following responses:

Participants highlighted a comprehensive and proactive approach. They emphasised effective accommodation strategies, such as ongoing collaboration with specialists, continuous professional development, and soliciting feedback from learners and parents to ensure inclusivity and foster learner progress. Recognising the uniqueness of each learner, educators emphasised offering choices throughout the teaching process and adapting content, methods, and means of instruction. They utilise diverse resources including pictures, videos, digital tools, interactive games, songs, and varied activities to engage learners. Importantly, educators prioritize empathy and individualized attention, allowing learners sufficient time to process information and tailoring their approach to meet specific needs.

Regarding the question of how effective they find the existing support systems (e.g., resource centers, special education services) in assisting them in addressing the needs of learners with learning disabilities, most of the participants were positive, with 6 out of 52 claiming to find the existing

support systems “very effective”, 19 “pretty effective”, 10 “somewhat effective”, 15 “unsure” and 2 “not effective at all”.



For the question of receiving formal training or professional development specifically focused on teaching individuals with learning disabilities, the participants were divided with 48.1% saying “no” and 46,2% saying “yes”. The 3 remaining responses were: “Some lessons which are included in postgraduate diplomas”, “Seminar” and “Yes, but not enough” with 1.9% each.

For the ones who answered that they had received formal training or professional development specifically focused on teaching individuals with learning disabilities, they were asked to mention the most beneficial aspects of the training they received.

The responses regarding formal training or professional development focused on teaching individuals with learning disabilities reveal a mixed landscape among participants. Nearly half, 48.1%, indicated they had not received specific training in this area, while a significant 46.2% reported having received such training. The remaining responses highlighted varied experiences, with 1.9% mentioning occasional lessons included in postgraduate diplomas, seminars, and a belief that although some training had been received, it was insufficient. This diversity underscores the ongoing need for accessible and comprehensive

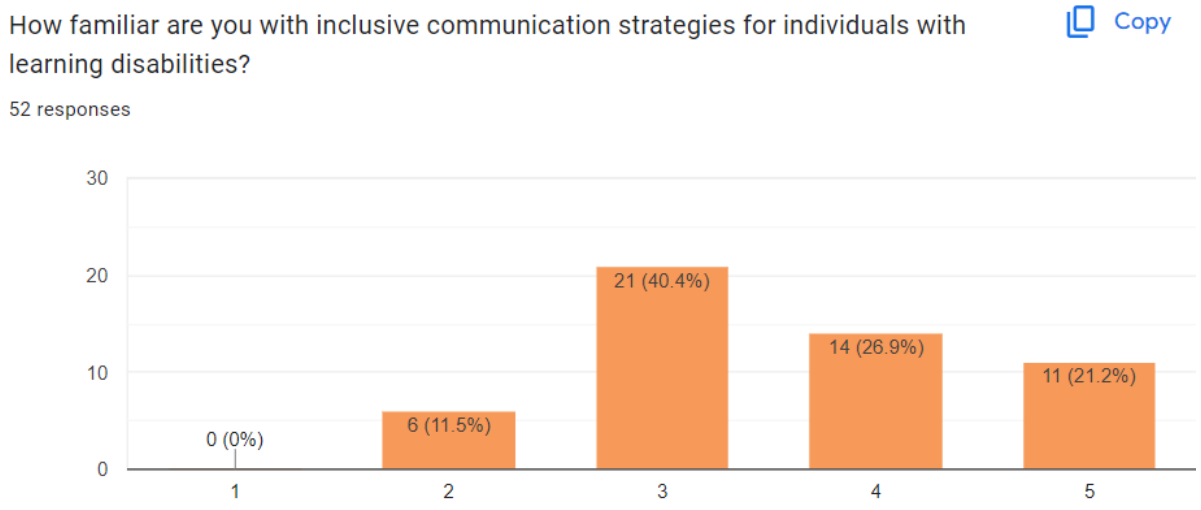
training opportunities to better equip educators in supporting learners with diverse needs effectively.

Following, the participants were asked to identify and select all the additional resources they were provided, that they believed could enhance their ability to effectively teach individuals with learning disabilities.

Participants expressed clear preferences for additional resources they believe would enhance their effectiveness in teaching individuals with learning disabilities. The majority, 41 respondents, advocated for professional development workshops or training sessions focused on teaching strategies tailored to learners with learning disabilities. Close behind, 39 participants highlighted the importance of access to educational technology specifically designed for these learners. Additionally, 38 respondents emphasised the need for increased funding to acquire specialized materials and resources, such as adaptive learning tools and assistive technology. Collaborative planning time with special education professionals or learning specialists was valued by 36 participants, while 31 stressed the importance of more specialized teaching assistants or support staff in classrooms. Furthermore, 30 participants identified access to professional networks or online communities for sharing best practices as crucial. Lastly, one respondent emphasized the need for comprehensive in-school training encompassing various modes and methods like action research, peer observation, and peer-to-peer training. These insights underscore the diverse needs educators face and highlight the importance of targeted resources and support to enhance educational outcomes for learners with learning disabilities.

Regarding the participant's familiarity with inclusive communication strategies for individuals with learning disabilities, the responses regarding participants' familiarity with inclusive communication strategies for individuals

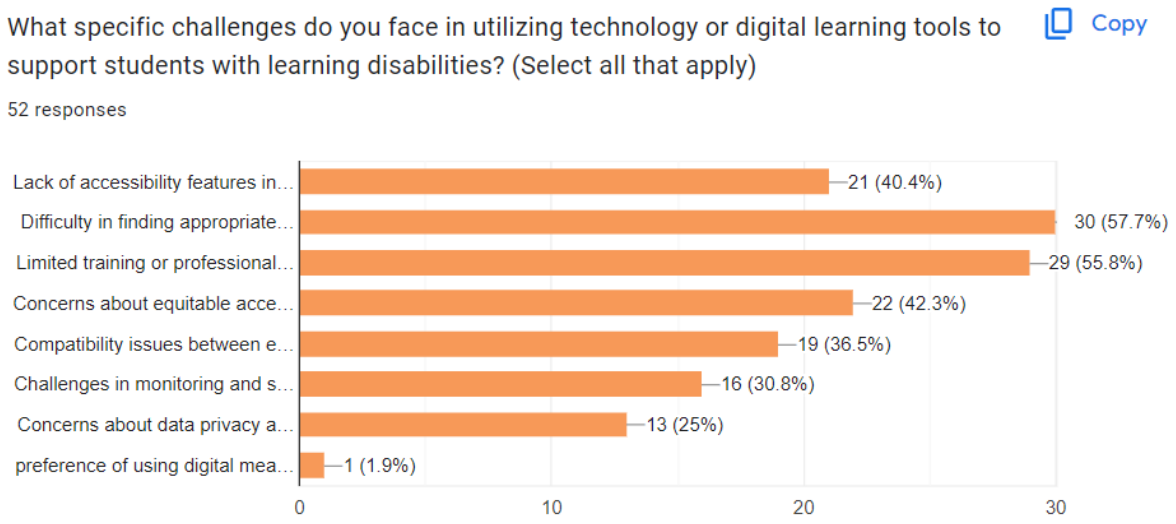
with learning disabilities paint a varied picture. A notable portion, totalling 21 respondents, indicated a moderate level of familiarity. Among them, 11 expressed feeling 'very familiar' with these strategies, while 14 stated they were 'pretty familiar'. Conversely, 6 participants admitted uncertainty about their familiarity in this area. These findings underscore both the awareness and the room for growth among educators regarding inclusive communication techniques. Continued training and resources could further empower educators to effectively support learners with diverse needs.



The participants on the aspect of incorporating technology or digital learning tools in their teaching practices to support learners with learning disabilities, revealed a predominantly positive inclination. A significant 44.2% reported using these tools 'frequently', indicating a proactive approach to leveraging technology in their teaching practices. Following closely, 38.5% acknowledged using such tools 'occasionally', highlighting a widespread adoption albeit with varying frequency. A smaller group of 13.5% indicated they use these tools 'rarely', while a mere 3.8% reported 'never' incorporating them. These responses reflect a recognition among educators of the benefits technology can offer in accommodating diverse learning needs, though there

remains room for further exploration and utilization of digital resources in enhancing educational outcomes for learners with disabilities.

Finally, the participants were asked to identify specific challenges they face in utilising technology or digital learning tools to support learners with learning disabilities. Participants highlighted several significant challenges they encounter when utilising technology or digital learning tools to support learners with learning disabilities. The most prevalent concern, expressed by 30 respondents, is **the difficulty in finding appropriate digital tools tailored to diverse learning disabilities**. Close behind, 29 participants cited **limited training or professional development on effectively integrating technology for these learners**, underscoring a critical need for targeted educational support in this area. Additionally, 22 respondents expressed concerns about equitable access to technology for all learners, including those with learning disabilities, while 21 mentioned the lack of accessibility features in digital tools designed for specific learning needs. Compatibility issues between existing assistive technologies and digital learning platforms were noted by 19 participants, and 16 mentioned challenges in monitoring and supporting learners' engagement and progress in digital environments. Furthermore, 13 participants raised concerns about data privacy and security when using digital tools with learners with learning disabilities. Lastly, only one respondent indicated a preference for using digital means of learning, highlighting the broader challenges and considerations educators face in effectively leveraging technology to support inclusive learning environments.



Conclusion

The focus groups conducted provided valuable insights into the challenges and effective strategies for supporting learners with learning disabilities in educational settings. Key findings from the discussions emphasise the critical importance of collaboration among stakeholders, including educators, parents, and specialists, to foster a supportive learning environment. Differentiated instruction emerged as essential for addressing individual learning needs, complemented by the integration of technology such as interactive whiteboards and specialized software to enhance educational experiences. Furthermore, there was a unanimous call for comprehensive training for educators, particularly in understanding and accommodating the diverse needs of learners with disabilities.

Moreover, participants highlighted the significance of applying inclusive practices in education, promoting collaborative programs that integrate special and general education, and ensuring physical and social accessibility in school environments. These findings underscore the ongoing need for improved educator training, better resource allocation, and the implementation of

innovative, holistic approaches to meet the diverse needs of learners with learning disabilities. Overall, educators demonstrate a commitment to addressing diverse learning needs in their educational settings.

References

About universal design for learning. (n.d). CAST. Retrieved on 6th June 2024 from https://www.cast.org/impact/universal-design-for-learning-udl

Adebisi, R. O., Liman, N. A., & Longpoe, P. K. (2015). Using assistive technology in teaching children with learning disabilities in the 21st century. *Journal of Education and Practice*, *6*(24), 14–20. https://eric.ed.gov/?id=EJ1078825

Ainscow, M., & Sandill, A. (2010). Developing inclusive education systems: The role of organisational cultures and leadership. *International Journal of Inclusive Education*, *14*(4), 401–416. https://doi.org/10.1080/13603110802504903

Albó, L., Barria-Pineda, J., Brusilovsky, P., & Hernández-Leo, D. (2022). Knowledge-based design analytics for authoring courses with smart learning content. *International Journal of Artificial Intelligence in Education*, *32*(1), 4–27. https://doi.org/10.1007/s40593-021-00253-3

Alghabban, W. G., & Hendley, R. (2020). Adapting e-learning to dyslexia type: An experimental study to evaluate learning gain and perceived usability. In Proceedings of the 22nd hci international conference (p. 519–537). Berlin, Heidelberg: Springer-Verlag.

Allan, J. (2012). Principles of assistive technology for learners with visual impairments Texas school for the blind and visually impaired. Retrieved on 6th June 2024 from http://www.tsbvi.edu/math/72- general/1076-principles-of-assistive-technology-for-learners-with-visualimpairments?layoutMode=full-access.

American Psychiatric Association. (2022). *Diagnostic and statistical manual of mental disorders* (DSM-5-TR). American Psychiatric Association Publishing. https://doi.org/10.1176/appi.books.9780890425787

American Psychiatric Association & American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders: DSM-5* (5th ed). American Psychiatric Association.

Assembly, U. G. (2006). Convention on the rights of persons with disabilities. Ga Res. Retrieved June 2023, from https://www.un.org/en/development/desa/population/migration/generalassembly/docs/globalcompact/A_RES_61_106.pdf

Bond, L., Carroll, R., Mulryan, N., O'Dwyer, M., O'Connell, J., Monaghan, R., Sheerin, F., McCallion, P., & McCarron, M. (2019). The association of life events and mental ill health in older adults with intellectual disability: Results of the wave 3 Intellectual Disability Supplement to The Irish Longitudinal Study on Ageing. *Journal of Intellectual Disability Research*, *63*(5), 454–465. https://doi.org/10.1111/jir.12595

Bui, Y. N., Schumaker, J. B., & Deshler, D. D. (2006). The effects of a strategic writing program for learners with and without learning disabilities in inclusive fifth-grade classes. *Learning Disabilities Research & Practice*, *21*(4), 244–260. https://doi.org/10.1111/j.1540-5826.2006.00221.x

Burr, E., Haas, E., & Ferriere, K. (2015). Identifying and supporting English learner learners with learning disabilities: Key issues in the literature and state practice. Washington, DC: U.S. Department of Education, Institute of Education Sciences, National Center for Education Evaluation and Regional Assistance, Regional Educational Laboratory West.

Bulgren, J. A., & Carta, J. J. (2002). Breaking down the task: Identifying components of effective mathematics instruction for learners with learning disabilities. *Learning Disabilities Research & Practice, 17*(1), 51-58.

Buzzi, M. C., Buzzi, M., Perrone, E., & Senette, C. (2019). Personalized technology-enhanced training for people with cognitive impairment. *Universal Access in the Information Society*, *18*(4), 891–907. https://doi.org/10.1007/s10209-018-0619-3

Cardona-Reyes, H., Ortiz-Aguinaga, G., Barba-Gonzalez, M. L., & Munoz-Arteaga, J. (2021). User-centered virtual reality environments to support the educational needs of children with adhd in the covid-19 pandemic. *IEEE Revista*

Iberoamericana de Tecnologias del Aprendizaje, *16*(4), 400–409. https://doi.org/10.1109/RITA.2021.3135194

Center for Applied Special Technology. (CAST). (2006). What is universal design for learning? Retrieved June 8, 2024, from http://www.cast.org/research/udl/index.html

Chatzara, K., Karagiannidis, C., & Stamatis, D. (2016). Cognitive support embedded in self-regulated e-learning systems for learners with special learning needs. *Education and Information Technologies*, *21*(2), 283–299. https://doi.org/10.1007/s10639-014-9320-1

Cinquin, P.-A., Guitton, P., & Sauzéon, H. (2021). Designing accessible MOOCs to expand educational opportunities for persons with cognitive impairments. *Behaviour & Information Technology*, *40*(11), 1101–1119. https://doi.org/10.1080/0144929X.2020.1742381

Crouch, A. L., & Jakubecy, J. J. (2007). Dysgraphia: How it affects a student's performance and what can be done about it. TEACHING Exceptional Children Plus, 3(3) Article 5. Retrieved 10 June 2024 from http://escholarship.bc.edu/education/tecplus/vol3/iss3/art5

Darshini, P., Sr, A., Jasper, Jesu Jacob, P, G., & Ab, B. (2024). Vision based rehabilitation system for learning disabilities. *2024 International Conference on Science Technology Engineering and Management (ICSTEM)*, 1–8. https://doi.org/10.1109/ICSTEM61137.2024.10561109

De Boer, A., Pijl, S. J., & Minnaert, A. (2011). Regular primary school educators' attitudes towards inclusive education: A review of the literature. *International Journal of Inclusive Education*, *15*(3), 331–353. https://doi.org/10.1080/13603110903030089

Department of Health (2001) Valuing People: a new strategy for learning disability for the 21st century - a White Paper. London: Department of Health.

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/250877/5086.pdf

Department for Education. (2006). *Independent review of the teaching of early reading: Final report.* Retrieved on 6th of June 2024 from https://dera.ioe.ac.uk/id/eprint/5551/2/report.pdf

Dettmer, P., & Dettmer, P. (2009). *Collaboration, consultation, and teamwork for learners with special needs* (6th ed). Pearson/Merrill.

Education policy. (2020). *European Disability Forum*. https://www.edf-feph.org/education-policy/

Edyburn, D. (2002). Cognitive rescaling strategies. Retrieved on 10th June 2024 from http://www.paec.org/fdlrstech/Summer Institute/fdlrs2004/Edyburn/PDFs/Cognitiverescaling.pdf

Elias, M. J. (2004). The connection between social-emotional learning and learning disabilities: Implications for intervention. *Learning Disability Quarterly*, *27*(1), 53–63. https://doi.org/10.2307/1593632

Farnsworth, M. (2018). Differentiating second language acquisition from specific learning disability: An observational tool assessing dual language learners' pragmatic competence. *Young Exceptional Children*, *21*(2), 92–110. https://doi.org/10.1177/1096250615621356

Fletcher, J. M., Lyon, G. R., Fuchs, L. S., & Barnes, M. A. (2019). *Learning disabilities: From identification to intervention*. Guilford Press.

Friend, M. P., & Cook, L. (2004). *Interactions: Collaboration skills for school professionals* (4th ed). Allyn and Bacon.

Fuchs, D., Deshler, D. D., & Reschly, D. J. (2004). National research center on learning disabilities: Multimethod studies of identification and classification issues. *Learning Disability Quarterly*, *27*(4), 189–195. https://doi.org/10.2307/1593672

Fuchs, L. S., Fuchs, D., Compton, D. L., Wehby, J., Schumacher, R. F., Gersten, R., & Jordan, N. C. (2015). Inclusion versus specialized intervention for very-low-

performing learners: What does *access* mean in an era of academic challenge? *Exceptional Children*, *81*(2), 134–157. https://doi.org/10.1177/0014402914551743

Good, T. L. (1987). Two decades of research on teacher expectations: Findings and future directions. *Journal of Teacher Education*, *38*(4), 32–47. https://doi.org/10.1177/002248718703800406

Grumline, R., & Brigham-Alden, P. (2006). Teaching science to learners with learning disabilities. Science Teacher, 73(3), 26-31.

Heine, C., & Slone, M. (2019). Case studies of adults with central auditory processing disorder: Shifting the spotlight! *SAGE Open Medical Case Reports*, *7*, 2050313X1882346. https://doi.org/10.1177/2050313X18823461

Hitchcock, C., & Stahl, S. (2003). Assistive technology, universal design, universal design for learning: Improved learning opportunities. Journal of Special Education Technology, 18(4), 45-52.

Hocine, N., & Sehaba, K. (2024). A systematic review of online personalized systems for the autonomous learning of people with cognitive disabilities. *Human–Computer Interaction*, *39*(3–4), 174–205. https://doi.org/10.1080/07370024.2023.2242364

Johnston, O., Wildy, H., & Shand, J. (2019). A decade of teacher expectations research 2008–2018: Historical foundations, new developments, and future pathways. *Australian Journal of Education*, *63*(1), 44–73. https://doi.org/10.1177/0004944118824420

Jones, S. M., Farrington, C. A., Jagers, R., Brackett, M., and Kahn, J. (2019). National Commission on social, emotional, and academic development: a research agenda for the next generation. *The Aspen Institute*. Available online at: https://www.aspeninstitute.org/publications/a-research-agenda-for-the-next-generation/ (accessed June 10, 2024).

Kashikar, L., Soemers, L., Lüke, T., & Grosche, M. (2024). Influence of the 'Learning Disability' label on educators' performance expectations—A matter of attitudes towards inclusion? *Journal of Research in Special Educational Needs*, 1471-3802.12664. https://doi.org/10.1111/1471-3802.12664

Kay, H., Rose, J., & Turnbull, J. (1995). Continuing the Commitment: The Nursing Contribution to Comprehensive Learning Disability Services. Department of Health.

Klingner, J. (2009). Learning disability vs. learning English as a second language. Reading Today.

Koskinen, P. S., & Wilson, R. M. (n.d.). Captioning in the classroom. Retrieved June 15, 2024, from http://www.nicap.org/classroom.asp

Learning Disabilities Association of America (LDA). (2020). "Types of Learning Disabilities." https:// ldaamerica.org/types-of-learning-disabilities/

Lipkin, P. H., Okamoto, J., the COUNCIL ON CHILDREN WITH DISABILITIES and COUNCIL ON SCHOOL HEALTH, Norwood, K. W., Adams, R. C., Brei, T. J., Burke, R. T., Davis, B. E., Friedman, S. L., Houtrow, A. J., Hyman, S. L., Kuo, D. Z., Noritz, G. H., Turchi, R. M., Murphy, N. A., Allison, M., Ancona, R., Attisha, E., De Pinto, C., … Young, T. (2015). The individuals with disabilities education act (Idea) for children with special educational needs. *Pediatrics*, *136*(6), e1650–e1662. https://doi.org/10.1542/peds.2015-3409

Martin, G. (2001). 'Valuing people'--a new strategy for learning disability for the 21st century: How may it impinge on primary care? *The British Journal of General Practice: The Journal of the Royal College of General Practitioners*, *51*(471), 788–790.

Mastropieri, M. A., & Scruggs, T. E. (2010). The Inclusive Classroom: Strategies for Effective Instruction (4th ed.). Pearson.

Mazon, C., Clément, B., Roy, D., Oudeyer, P.-Y., & Sauzéon, H. (2023). Pilot study of an intervention based on an intelligent tutoring system (Its) for instructing

mathematical skills of learners with ASD and/or ID. *Education and Information Technologies*, *28*(8), 9325–9354. https://doi.org/10.1007/s10639-022-11129-x

McDaniel, S. C., Bardhoshi, G., & Kivlighan, D. M. (2022). Universal SEL implementation to improve community and prosocial skills: A pilot study. *The School Community Journal, 32*(2), 57–76.

McDonald, P., & Riendeau, M. P. (2003). From disability and difference to diversity: A Copernican revolution in learning. Independent Schools, 63(4), 84-88.

McDonough, E. M., Flanagan, D. P., Sy, M., & Alfonso, V. C. (2017). Specific learning disorder. At S. Goldstein & M. DeVries, *Handbook of DSM-5 Disorders in Children and Adolescents* (pp. 77–104). Springer International Publishing. https://doi.org/10.1007/978-3-319-57196-6_4

McLaughlin, M. J. (2012). Access to the Common Core for all: Six principles for principals to consider in implementing CCSS for learners with disabilities. *Principal*, pp. 22–26. Retrieved from http:// www.udlcenter.org/sites/udlcenter.org/files/ McLaughlin_2012.pdf

Meyer, A., & Rose, D. H. (2000). Universal design for individual differences. Educational Leadership, 58(3), 39-43.

National Institute for Health and Care Excellence. (2014). *Overview | Mental health problems in people with learning disabilities: Prevention, assessment and management | Guidance | NICE*. https://www.nice.org.uk/guidance/ng54

North Central Regional Education Laboratory. (1997). Education technology. Retrieved June 10, 2024, from http://www.ncrel.org/sdrs/areas/issues/methods/technlgy/te400.htm

Payton, J., W., Wardlaw, D., M., Graczyk, P. A., Bloodworth, M. R., Tompsett, C. J., & Weissberg, R. P. (2000). Social and emotional learning: A framework for promoting mental health and reducing risks behavior in children and youth. *Journal of School Health*, 70, 179-185.

Pelleboer-Gunnink, H. A., Van Weeghel, J., & Embregts, P. J. C. M. (2021). Public stigmatisation of people with intellectual disabilities: A mixed-method population survey into stereotypes and their relationship with familiarity and discrimination. *Disability and Rehabilitation*, *43*(4), 489–497. https://doi.org/10.1080/09638288.2019.1630678

Peterson-Karlan, G. R., & Parette, P. (2005). Millennial learners with mild disabilities and emerging assistive technology trends. Journal of Special Education Technology, 20(4), 27-38.

Olson, M.A. & Fazio, R.H. (2009) Implicit and explicit measures ofattitudes: the perspective of the MODE model. In: Petty, R.E.,Fazio, R.H. & Briñol, P. (Eds.) Attitudes: insights from the newimplicit measures. New York: Psychology Press, pp. 21–63.

Quenneville, J. (2001). Tech tools for learners with learning disabilities: Infusion into inclusive classrooms. *Preventing School Failure: Alternative Education for Children and Youth*, *45*(4), 167–170. https://doi.org/10.1080/10459880109603332

Rapp, W. H., and K. L. Arndt. (2012). Teaching everyone: An introduction to inclusive education. Baltimore, MD: Paul H. Brookes.

Rapp, W. H. (2014). Universal design for learning in action: 100 ways to teach all learners. Baltimore, MD: Paul H. Brookes.

Raskind, M. (2000). Assistive technology for children with learning disabilities. San Mateo, California: Schwab Foundation for Learning.

Roldán-Álvarez, D., Martín, E., & Haya, P. A. (2021). Collaborative video-based learning using tablet computers to teach job skills to learners with intellectual disabilities. *Education Sciences*, *11*(8), 437. https://doi.org/10.3390/educsci11080437

RTI International, Bulat, J., Hayes, A., Macon, W., Ticha, R., & Abery, B. (2017). *School and classroom disabilities inclusion guide for low- and middle-income countries*. RTI Press. https://doi.org/10.3768/rtipress.2017.op.0031.1701

Shaban, A., & Pearson, E. (2019). A learning design framework to support children with learning disabilities incorporating gamification techniques. In the 2019 chi conference on human factors in computing systems (pp.1–6). New York, NY, USA: Association for Computing Machinery.

Siti, I., & Rabiah, A. K. (2011). Edutism: An assistive educational system for the treatment of autism children with intelligent approach. In Visual informatics: Sustaining research and innovations (pp. 193–204). Springer Berlin Heidelberg. https://doi.org/10.1007/978-3-642-25200-6_19

Skills for Health, Health Education England and NHS England. (2019). Core Capabilities Framework for supporting people with a Learning Disability. https://www.skillsforhealth.org.uk/wp-content/uploads/2020/11/Learning-Disability-Framework-Oct-2019.pdf

Standen, P. J., Brown, D. J., Taheri, M., Galvez Trigo, M. J., Boulton, H., Burton, A., Hallewell, M. J., Lathe, J. G., Shopland, N., Blanco Gonzalez, M. A., Kwiatkowska, G. M., Milli, E., Cobello, S., Mazzucato, A., Traversi, M., & Hortal, E. (2020). An evaluation of an adaptive learning system based on multimodal affect recognition for learners with intellectual disabilities. *British Journal of Educational Technology*, *51*(5), 1748–1765. https://doi.org/10.1111/bjet.13010

Strobel, W., Arthanat, S., Bauer, S., & Flagg, J. (2007). Universal design for learning: Critical need areas for people with learning disabilities. *Assistive Technology Outcomes and Benefits*, *4*(1), 81–98. https://eric.ed.gov/?id=EJ899369

Swanson, H. L., Harris, K. R., & Graham, S. (Eds.). (2013). Handbook of Learning Disabilities (2nd ed.). The Guilford Press.

Tobisch, A., & Dresel, M. (2017). Negatively or positively biased? Dependencies of educators' judgments and expectations based on learners' ethnic and social backgrounds. *Social Psychology of Education*, *20*(4), 731–752. https://doi.org/10.1007/s11218-017-9392-z

Towell, D., & Hollins, S. (2000). Achieving positive change in people's lives through the National Learning Disability Strategy: An invitation to partnership between higher education and the world of practice. *British Journal of Learning Disabilities*, *28*(4), 129–136. https://doi.org/10.1046/j.1468-3156.2000.00086.x

UNESCO. (1994). *The Salamanca Statement and Framework for Action on Special Needs Education*. Adopted by the World Conference on Special Needs Education: Access and Quality. Salamanca, Spain, 7-10 June 1994. Paris: UNESCO.

United Nations Educational, Scientific and Cultural Organization (UNESCO). (2005). Guidelines for inclusion: Ensuring access to education for all. Paris: UNESCO.

University of Michigan. (n.d.). *Case studies*. Dyslexia Help at the University of Michigan. https://dyslexiahelp.umich.edu/professionals/learners-strengths-and-interests/case-studies

Vygotsky, L. S., & Cole, M. (1978). Mind in society: Development of higher psychological processes. Harvard university press.

What are learning disabilities? – Learning disabilities association of america. (2012). https://ldaamerica.org/advocacy/lda-position-papers/what-are-learning-disabilities/

Worthen, M. (2016). The future of personalized learning for learners with disabilities. *State Education Standard*, *16*(3), 35.

Zins, J. E., Weissberg, R. P., Wang, M. C., & Walberg, H. J. (Eds.). (2004). Building school success through social and emotional learning. New York: Educators College Press.