

Enabling students with SEN through the use of Digital Learning Resources: Guidelines on how to select, develop and use DLR with SEN

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This article tackles the issue of the use of Digital Learning Resources (DLR) in the education of students with learning problems. It presents an argument for the employment of DLR in the education of these students and it raises additional concerns in the choice of these resources when used with students with learning disabilities. DLR are of paramount importance in today's teaching and learning processes, becoming even more important with special education needs (SEN) as they enable forms of participation previously unavailable. However, and given the particular characteristics of students with SEN, it is necessary to safeguard some pre-requisites in the production and use of these resources with these students. We discuss the pertinence and general precautions when using DLR with students with or without disabilities who face some form of learning problem.

Keywords: Digital Learning Resources; DLR; ICT; SEN

1. Introduction

Digital Learning Resources (DLR) arise in close connection with the use of computers as co-responsible for the transformation of education, aiding the process of teaching and learning of any student. The DLR engages, attract, excite and inspire learners of all ages, abilities and needs. They can be used to arouse and channel the students' creativity as they can be adapted to their needs and develop more stimulating materials for personalizing learning. They come in different forms, from a single digital image that complements content to a virtual environment where the flexibility of simulation and experimentation become more secure, away from constraints of error consequences. In education, a digital resource is any element that can be stored in a digital format, adopted and adapted for use in learning. Some of these resources may or may not have been designed from scratch to use in teaching and learning, but they can be used effectively to make learning more rewarding, stimulating and engaging and, in parallel, optimizing the work of the teacher [1]. Thus, given the diverse breadth of resources with different applicability, in our understanding a DLR embodies, therefore, an educational resource on digital media that is effectively used to teach and learn.

When related to what we may call "analog resources", digital resources have a number of differences that go beyond the simple format or medium for presenting information. They are easily manipulated, capable of internal and external links, quickly convertible, accessible, transportable and replicable. These features also mean supporting changes in the nature and characteristics of content. Facilitated access and navigation through hypertext is a feature only possible in digital documents that is obviously not accessible on paper [2], increasing abundance, richness, access, flow and volume of information available.

ICT and DLR created new ways of learning, closer interaction and learn-how of users. Multimedia provides alternative, enriched, vibrant, challenging and, above all, multisensory forms of access to information. Concomitantly, DLR may be interactive, accepting and responding to inputs from users and allowing richer involvement processes. Consequently, being actively engaged in a learning activity is beneficial for learning; thus, involvement in a learning environment facilitates exploration, and reciprocally exploration promotes involvement.

Hypertext and multimedia enhance the immersion in the digital environment and detach these digital resources from the ones that are paper based. Depending on the teacher's planning, DLR usually allow different types of navigation, in a contextualized and mediating autonomous learning environment [3], complying with the pace and style of student learning.

With the gradual emergence of technology in the classroom, there is a manifest demand from teachers of educational resources that suit the curriculum needs and that simultaneously accommodate the needs and learning styles of their students [4]. Therefore, the growing importance of the selection and development of DLR as tools that enhance learning by those who have more contact with students should be noticed. For its inherent characteristics, these resources appear as tools that serve all students and, by means of the complementarity afforded by their digital side, with the additional advantages of access and participation as an asset for students with Special Educational Needs (SEN).

The diversity of user profiles, combined with the pedagogical issues involved in their use, makes the selection and use of DLR that really assist the different users more complex, in so far as the user has to take ownership of these resources to better learn and develop skills with and through them. Pedagogical assertiveness, accessibility and high-quality interaction with ICT products are fundamental requirements in today's education and DLRs are no exception.

The rampant growth of DLR available online from a diversity of sources, with different levels of quality, advises special attention to the conditions of use and their technical and pedagogical quality. It is essential that teachers acquire a critical perspective on the selection of the resources they intend to use, insofar as learning effectiveness correlates significantly with the characteristics and quality of learning resources (LR) used [2]. But what determines quality? Are the traditionally accepted quality principles of DLR sufficient for users with special needs? The DLR can have a vital role in the education of students with SEN, but what are the features and specifications of a DLR for a student that struggles with learning limitations? These are some of the questions that we will try to answer here, grounded on the analysis of DLR design requirements and its relationship to the particularities of users with Special Education Needs.

2. Digital Learning Resources: Tools for access and participation

There are numerous students referred to as having SEN because they evidence greater difficulty in learning than most other students of a similar age or because they have a disability that constitutes a barrier, preventing or delaying access to active participation in learning. Others still, without known limitations and even with skills above average, tend to be prone to academic failure.

The use of traditional “paper” LR may cause constraints to those who find obstacles in their handling – for example, browsing a page, or reading printed material – or simply don’t adapt or don’t find pencil written exercises appealing. The answer may lie in resorting to the use of ICT supported LR, increasing student involvement with the provision of different formats (multimedia) for presenting and manipulating information.

Technologies, as witnessed by various educational agents, are exceedingly successful in transforming the education of pupils with SEN. It is unquestionable what can be accomplished by these students with the aid of the additional advantages of these tools. They provide a range of different opportunities, especially for those students whose learning patterns do not follow a “typical” development pattern. As teaching tools, they allow diverse and differentiated strategies for these students, contributing for school attainment. Their use as Assistive Technology (AT)¹ enables students with physical, cognitive and sensory/perceptual disabilities, individually or combined, to access available information and interact with it from a computer [5].

The transposition of activities from paper to digital support provides previously unattainable opportunities for students who are deprived of access to conventional curriculum and learning, and through ICT based resources can play an active role in their learning. DLR provide opportunities to adapt to individual learning needs within a broad spectrum of areas of competence (perceptual, cognitive, academic, etc.). Thus, we must not neglect that the present world is immersed in technology and to educate with technology is to educate for technology.

2.1. About the quality of Digital Learning Resources

The quality of a DLR is related to the design and use of DLR that effectively support teaching and learning [6]. The quality of resources is a basic requirement of extreme importance, influencing the achievement of key objectives of learning that allow for the conversion of information into knowledge [4].

DLR quality assessment perspectives vary according to the authors points of view, but all agree that, without excluding the preponderance of the context, two key factors must be taken especially into account [1, 2, 4, 7]:

- **Pedagogical factors** - the educational and pedagogical nature, their educational potential and effective monitoring of teaching and learning;

- **Design factors** - related to the design, according to criteria of navigability, usability and accessibility.

From this perspective, the focus is mainly on quality: of content, of teaching and learning support, and of interaction with the user (usability).

Choosing DLR can present a variety of challenges for educators. The regrettably extinct British Educational Communications and Technology Agency (Becta), considering the central role of education professionals in the evaluation and selection of DLR so as to establish quality standards for the guidance of authors/developers, conceived quality principles guides² [6, 8] and guides³ targeting teachers and school leaders as an aid for choosing and using DLR [1]. We invoke these guides given their practical nature for those who seek innovation in the educational process. There are 16 quality principles that relate to the design and use of DLR to support effective teaching and learning. These quality principles are organized into two basic groups which are interrelated [6]:

• **Core pedagogic principles**, which underpin effective learning and teaching, drawing from learning theory and commonly accepted best practice;

¹ **Assistive technology (often abbreviated as AT)** is any item, piece of equipment, software or product system that is used to increase, maintain, or improve the functional capabilities of individuals with disabilities.[...] Different disabilities require different assistive technologies. Assistive technology includes products and services to help people who have difficulty speaking, typing, writing, remembering, pointing, seeing, hearing, learning, walking, etc. http://www.atia.org/i4a/pages/index.cfm?pageid=3859#What_is_AT – accessed: 28/12/2010.

² *Quality principles: for digital learning resources* : <http://publications.becta.org.uk/download.cfm?resID=32112> – accessed: 28/12/2010.

³ *Choosing and using digital learning resources* http://schools.becta.org.uk/upload-ir/downloads/choosing_digital_resources.pdf – accessed: 28/12/2010.

- **Core design principles**, covering issues such as resource design, accessibility and interoperability.

Tables 1 and 2 show the organization of these principles, including a brief description.

Table 1 - Summary Core Pedagogic Principles of DLR Quality Principles (Adapted from [6])

Core pedagogic principles	Inclusion and Access	Interconnected with the accessibility principle. The learning experience should support inclusive practice in most circumstances. It can be achieved through flexibility to adapt resources to different learning preferences, or suggesting alternative ways of addressing the stated objectives, where educational resources can be limited in relevance.
	Learner engagement	Teaching and learning should captivate, motivate, engage and challenge learners. DLR must be worthwhile and not only entertaining. It must avoid reactions to learning that reduce motivation or discourage the use of ICT as tools to learn.
	Effective Learning	The actual experience of learning fosters change and behavioral development. Use flexibility of approaches and perspectives enabling learner's choice or personalization of the most suitable, providing evidence of achieved learning outcomes and generalization of learning, to enable effective knowledge construction.
	Assessment to support learning	In order to support learning, teaching and learning should incorporate formative assessment of what has, or has not, been learnt or understood. This includes providing feedback to the learners on their acquisition of knowledge and skills. Feedback should be specifically aimed at improving learning and should provide or point to other activities that further learning support.
	Robust summative assessment	Comprehensive, valid and reliable summative assessment should be used to provide information on learner performance that can be used for guidance or selection in relation to future education or work opportunities.
	Innovative approaches	DLR may be innovative in their design and use of technology and/or innovative in the approach to teaching and learning that they offer.
	Ease of use	A DLR should be as transparent and intuitive as possible for the user. It should provide guidance and their use should not be an obstacle to the learning experience. It must adapt to the user's ICT skills.
	Match to the curriculum	The DLR should be aligned with the curriculum, providing appropriate and trustworthy activities, goals and assessment to the intended level and meeting the curriculum.

Table 2 - Summary Core Design Principles of DLR Quality Principles (Adapted from [6])

Core design principles	Digital learning resource design	The DLR should exploit the opportunities provided by ICT to enhance teaching and learning. It can be reached by offering clear benefits over non-ICT resources, providing educational stimulus and feedback and tasks that challenge targeted users, enabling collaborative work, allowing the exploration, adaptation and differentiation of resources to meet needs, facilitating, where appropriate, the autonomous choice of the route through the resource; supporting customization, providing other information formats to engage students with the educational purpose; allowing, where appropriate, record keeping, taking advantage offered by the used platform (PDA, Tablet PC, and others).
	Robustness and support	The DLR should support the user appropriately, providing help, providing navigation aids that allow nullifying actions, providing quick visual and auditory responses to user actions, allowing the user to exit at any time, not being adversely affected by user experimentation and errors, permitting quick information about the error and recovery.
	Human-computer interaction	The DLR should facilitate sound interaction between human and computer, meeting their expectations/needs through clear, transparent and intuitive graphic aspects and features, pleasant and supportive aesthetics, and visual and auditory cues and feedback.
	Quality of assets	The DLR should ensure that contents are appropriate to the context of use. Assets should be technically stable and easily and consistently accessed and selected according to their intended objectives.
	Accessibility	The accessible design of DLR should ensure that no user be unduly deprived of benefiting from the resource use simply due to their particular needs or preferences of access. It must provide and inform about accessibility options and interface format information. Accessible interface and information layout must be present.
	Interoperability	Interoperability standards must be met so that they can be used in the identified environment as differentiated browsers and e-learning platforms. Proper referencing, description and cataloging (metadata) should facilitate indexing and search services on their own. Whenever possible they must be available and shareable.
	Testing and verification	A well-planned design process must ensure that the DLRs suit the audience, are culturally appropriate, show specific facts, constitute suitable challenges, are robust and adapt to the target environments.
	Effective communication	Principles underpin the implementation of the pedagogic and design nuclear cores. It is related with all the information provided concerning specifications (including accessibility) and educational resources.

Given the inherent characteristics and purposes these principles do not address some types of resources and similarly it is difficult for a DLR to be capable of covering all principles. However, depending on their role in the learning experience, the DLR should comprehend, contribute to or support these principles. The understanding of these principles is particularly important during the design, evaluation, selection and implementation of DLR among all students. It assists educational practitioners and managers to make more informed decisions about digital learning resources and supports developers to improve the quality of digital learning resources [6].

We agree with the 2008 Becta's guide on the choice and use of DLR, that the following set of questions summarizes the principles above and should be taken into consideration in order to facilitate the educator's assessment and selection of resources that are adequate to the needs of the teaching and learning process:

- Does it match the curriculum?*
- Is it inclusive and accessible?*
- Does it engage learners and promote effective learning?*
- Is it easy to use?*
- Does it offer effective formative assessment?*
- Does it offer robust summative assessment?*
- Does it encourage innovation?*
- What if we make a mistake while using it?*
- Are the images, sound files and videos fit for purpose?*
- Can it work with other systems?*
- Does the resource tell me what I need to know?*
- What about finding and sharing?*

The answers to these questions should be given special attention when looking for a DLR as they may either translate into a resource that constitutes a facilitator of learning or become an impediment to the acquisition of knowledge. Besides the high relevance aspects already referenced in the selection and use of DLR with any student, the peculiarities of students with learning problems raise additional concerns, for any constraints that may arise are mainly due to functional limitations derived from any learning disabilities or difficulties.

3. Particular aspects on the use of Digital Learning Resources with pupils with Special Educational Needs

Just as with students without impairments, there are well acknowledged benefits of the use of DLR by students with learning limitations, from which, primarily, we highlight the motivational aspect of interacting with stimulating multimedia that reacts to user control, enhancing initiative and autonomy in the exploration of content and, above all, the increased perceived awareness of less dependence on third parties.

Furthermore pupils with SEN are a population with a particular interest in the use of DLR, as these resources may be the solution to the barriers these students face in using non-digital resources. Students with disabilities have the right to expect the same standard of education as their schoolmates. Therefore, they also have the right to access and use mainstream educational tools of any kind, including ICT based ones [9].

However, the use of computers and the educational resources supported by this equipment for pupils with SEN has particular aspects. In this matter usability and accessibility issues become even more pressing, given that many have functional limitations that hamper the use of conventional means. Additionally, students with sensory and motor disabilities are often accompanied with Assistive Technologies that enable their access to ICT. Are the DLR native options sufficient for students with limited access to interact? What is the reaction of the DLR linked with access specific software? It is possible that the DLR can adapt to a variety of users with and without special needs?

3.1. Usability and Accessibility Issues

Usability and Accessibility are frequently mentioned when a software product is being developed and use by handicapped people is involved. Although true, usability and accessibility concerns and benefits all users. Universal usability is a concept that combines these two issues and was pioneered by Ben Shneiderman [10]. It advocates the recognition and the accommodation of the diversity of user needs and circumstances. It strives to make the content and functionality accessible *and usable* by all and not only specific targeted groups [11].

To achieve Universal Usability digital based learning resources must (i) support a broad range of hardware, software, and network access (technology variety); (ii) accommodate individual differences among users, such as age, gender, disabilities, literacy and others (user diversity); and bridge the gap between what users know and what they need to know (gaps in user knowledge) [10].

As stated in Wikipedia⁴, the three concepts of universal usability ("usable by all") universal accessibility ("accessible by all") and universal design ("design for all") are strongly related and cover, from the user's end to the developer's end, the three important research areas of information and communications technology (ICT): use, access, and design.

To reach a greater number of users, although it seems utopic, the conception of DLR must strive to attain the needs of different users as Universal usability should not target specific groups of disabled users, given that it not only benefits users with vision, hearing, or motor impairment, but also users with environmental constraints [12].

Stakeholders and teachers must also bear in mind this premises to assure the DLR are in fact educationally effective and a good investment as they can be monetized to a diversity of students.

⁴ Universal usability. http://en.wikipedia.org/wiki/Universal_usability . Accessed in: 13/03/2011.

An overview of some individual key concepts is fundamental to facilitate the understanding of their relationship with students that present use limitations and therefore are of crucial importance when DLR are brought out for discussion.

3.1.1. Usability

The usability of a product is usually characterized by the degree of ease of its use, even if a user is not familiar with it, commonly designated as intuitiveness. According to ISO/IES 9126 and 9241:11⁵, usability is defined as a function of efficiency, effectiveness and satisfaction with which users can achieve their objectives in specific environments/contexts when they use a particular software product. It is related with the capability of a product being learned, perceived, understood and used and still be pleasing to the user, in particular contexts of use. In the case of digital resources, usability takes on an even more particular relevance, since the degree of effort and resources required to achieve a given objective, product efficiency and user satisfaction are fundamental to promote dynamic teaching and learning that leads to success. Although the value of content and activities are preponderant, usability is determinant for the success of a DLR. It doesn't matter if content has great value and educational potential when the resource utilization is uncomfortable and/or causing unnecessary cognitive efforts, removing the student's availability to learn. The students' efforts should be channeled solely to the use of the resource as a promoter of learning and not for squabbling with the product to use. The usability of an educational resource should therefore be highly addressed in order to promote effective and efficient use and exploration [13]. When it comes to pupils with SEN, this aspect acquires greater relevance as an increment of obstacles may occur for students with already possible participation constraints due to sensory and motor impairments. Additionally, the comorbidity of cognitive problems that may hinder the use of DLR with more complex interface options is quite frequent. Specific Learning Difficulties – more frequently reading and writing disorders as Dyslexia – can pose an obstacle to the use of systems that rely on complex text commands. The coexistence of highly transparent icons (of quick understanding) and of intuitive use can assist individuals more cognitively affected, bypassing the obligation of identifying written menus and commands.

3.1.2. Accessibility

As shown above, usability is strictly related with accessibility, since the criteria for good usability often merges with accessibility criteria in the quest for a product's ease of use. Most of the accessibility features benefit all users by providing increased usability [14].

Accessibility presents a range of different issues and problems that the non-specialized teacher or educator may find difficult to assess and understand until they appear during enactment of education processes involving students with disabilities. This situation underlines the need for specific standards in the field of accessibility of ICT-based educational tools so that all of those involved in the education of students with special needs can gain a perception about the accessibility level of individual products and consequently be able to make an informed decision when selecting a product to meet their needs [9].

To consider the accessibility of a product is to acknowledge the diversity of its potential users and the peculiarities of interaction with a particular product, which can manifest itself in user preferences (preference for visual or auditory information, for example), users with different skills, restrictions on the quality of equipment used and the existence of special needs that cannot be ignored by product developers [15]. In the universe of users there may be cases of individuals who have no access to visual or auditory information and users with motor impairments that hamper or incapacitate interaction with the product, and there can be cases in which sensory and motor deficiencies coexist (Table 3).

Table 3 - More frequent limitations and more common used accessibility strategies

Physical disability	Motor problems have implications in accuracy and speed of movements affecting the use of common computer peripherals. It becomes necessary to use alternative methods of interaction, such as the activation of the accessibility options of OS, keyboard navigation and the combination with AT.
Hearing Disability	Prevents the input of sound stimuli, which should, where possible, be compensated by visual information (e.g. through the subtitling of sound content or availability of alternative text). The hearing impaired do not use specific AT but may use the accessibility options of the OS.
Visual Disability	People with visual disability often use screen reading software for sound and/or refreshable Braille displays or a Braille terminal. However, this software requires that the non-textual information is complemented by textual descriptions. The functions of the magnification and high contrast of the OS are often used by people with vision problems.

⁵ International Standard Organization.

Digital accessibility is the capacity of a product to be flexible enough to meet the needs and preferences of as many people as possible, and its compatibility with AT used by people with special needs. Digital accessibility is independent of the AT that an individual may use. Accordingly, the fact that content is accessible to a given AT as a specific screen reader, it does not certify this product as accessible as it can be incompatible and, therefore, inaccessible with other AT software or even earlier versions of the same software. Likewise, we cannot guarantee the accessibility of a digital resource based on needs of specific users. A product does not become accessible because it can be used by people with a specific limitation [15]. A digital resource is only really accessible if it is accessed and understood by all its users. Digital accessibility, particularly with regard to Web accessibility, is documented by a set of guidelines specified by the W3C⁶, now known as WCAG⁷, version 2.0, intended to make the WEB more navigable (Table 4):

Table 4 - WCAG 2.0 Quick Reference List

Text Alternatives	Provide text alternatives for any non-text content so that it can be changed into other forms people need, such as large print, braille, speech, symbols or simpler language.
Time-based Media	Provide alternatives for time-based media.
Adaptable	Create content that can be presented in different ways (for example simpler layout) without losing information or structure.
Distinguishable	Make it easier for users to see and hear content including separating foreground from background.
Keyboard Accessible	Make all functionalities available from a keyboard.
Enough Time	Provide users enough time to read and use content.
Seizures	Do not design content in a way that is known to cause seizures.
Navigable	Provide ways to help users navigate, find content, and determine where they are.
Readable	Make text content readable and understandable.
Predictable	Make Web pages appear and operate in predictable ways.
Input Assistance	Help users avoid and correct mistakes.
Compatible	Maximize compatibility with current and future user agents, including Assistive Technologies.

Maintaining navigation through hypermedia in the same window and placing on-screen information on a linear scheme for those who rely only on keyboard use to operate a computer, as well as textual alternatives to visual media for the sight deprived, are examples of the above enunciated accessibility guidelines. While apparently simple, these aspects can make the difference and must be given due attention in the development of resources for impaired pupils. These rules should also apply to other digital resources and their knowledge can help teachers in the selection of resources to use with students who have some organic limitation that gets in the way of the interaction with a DLR. Few website based DLR like the Spanish Site *Contenidos Educativos Digitales*⁸ are accessibility compliant and possess the attributes necessary for navigation by people with sensory and/or physical disabilities enabling the choice to type of adaptation required or no-adaptation.

In the field of education, accessibility of ICT products must be guaranteed: accessible information technologies can facilitate students' independent learning and information retrieval [9].

3.1.3 Access through Assistive Technology

Assistive Technologies are technologies that enhance, improve, compensate and retain the functional capabilities of students with disabilities. They are specifically designed to support individuals with functional limitations in the overthrow of obstacles in their environment and promote the greatest possible autonomy. They can be customized and adapted to the user in order to take advantage of existing functional skills and reducing limitations.

Access to a personal computer and therefore the use of DLR by people with disabilities often presents itself as a task of difficult or impossible execution. In response, students with SEN utilize AT making access possible. In the case of

⁶ World Wide Web Consortium

⁷ Web Content Accessibility Guidelines (WCAG) 2.0, available at: <http://www.w3.org/TR/WCAG20/>

⁸ Available at: <http://conteni2.educarex.es/?e=3> – accessed: 28/12/2010

individuals with sensory and motor impairments, the use of specific access hardware and software enables interaction with computers and access to digital information.

The use of computers by blind people is usually achieved through the use of screen readers that convert only textual information that is outputted by synthesized voice (text-to-speech) or through refreshable Braille Displays. Others with motor disabilities may use alternatives to mouse or keyboard, using virtual onscreen keyboards associated with pointing devices through head or eye movement, and others may use integrated communication and computer access solutions that work through indirect selection via scanning (only a click is needed as several options like arrows for mouse movement) are scanned activated by different kind of switches that use different types of contact such as up / down touch, side to side touch, push or pull, tilting, pressure, squeezing, swiping, suck / blow, etc.

The DLR must conform to standards that allow interconnection with assistive technologies without the information they present is impaired.

5. The role of DLR in Universal Design for Learning (UDL)

The UDL has its roots in the architectural principles of universal design, where structural adjustments that are made to meet the needs of people with disabilities tend to benefit all individuals, such as the use of ramps that benefits not only users of wheelchairs as well as people who have kids in strollers or use suitcases with wheels. It is an approach that seeks that all students have equal opportunities to learn. It comprehends the use of educational environments that help students develop knowledge, skills and enthusiasm for learning. It is a concept that advocates the design of a curriculum to include objectives, methods, materials and assessments to support the students through the reduction of barriers, while simultaneously providing effective support to learning [17].

The UDL is governed by three principles that meet the needs of the students by providing an equal opportunity for learning and improving access to content [17, 18]:

- **Provide multiple and flexible methods of presentation** to give students with diverse learning styles various ways of acquiring information and knowledge.
- **Provide multiple and flexible means of expression** to provide diverse students with alternatives for demonstrating what they have learned.
- **Provide multiple and flexible means of engagement** to tap into diverse learners' interests, challenge them appropriately, and motivate them to learn.

UDL applies not only to students with SEN, rather it was conceived in order to make education accessible for students with disabilities, but it provides learning opportunities for all students, guiding educators in finding innovative ways to make the curriculum accessible and appropriate for students with different learning paths, styles and learning abilities and disabilities, in different learning settings (Rose & Meyer, 2002).

The use of digitally based resources incorporates these principles and can be implemented in various educational contexts. For example:

- i) Different ways of presenting content can be achieved resorting to multimedia to present information in more than one format (educational websites, digital books and other specific software);
- ii) Multiple forms of expression are achieved through presenting work in new media formats, concept maps, e-portfolios and blogs;
- iii) Use of interactive learning environments provide other forms of involvement that are usually more attractive to students.

We can therefore note that DLR act as opportunities equalizers that accommodate the UDL goals and thereby constitute themselves as a tool to assist students with SEN.

6. Considerations on the selection of DLR for pupils with SEN

As mentioned above, DLR can and should be placed at the service of students with SEN taking advantage of the digital potential in relation with conventional teaching means and formats. Its use by these students should consider the principles of quality that would be used for students without special needs, but with particular attention to aspects of usability and accessibility. To aid the educator who searches appropriate DLR for his/her students with SEN, we point out the key features to consider when selecting DLR for these students [19], DLR should:

- take into account the **characteristics of disability/limitations of the student**. For example, communicate the relevant aspects of the task to be completed.
- have **selectable options** by the teacher in order to adjust to the student's learning disability. For example, the reading level of the RED should be adjustable.
- **provide instructional options** that can be tailored to the **student's learning problems**. For instance, provide adequate prompts for learning and response.
- consider the learning characteristics of students with SEN in the **screen design**. For example, all the text should be double spaced and present visual cues.

- take into **consideration the learning characteristics of students with learning disabilities** in the instructional options built into the software. For example, the DLR should have guidelines incorporated for errorless learning and provide over-learning.
- take **sound and animations** included in the DLR as relevant and not interfere with learning. There should be contemplated a disable option.
- offer consistent, obvious and overt **feedback**. The students should not have doubts about the correctness of their answers.
- hold the ability to **support assistive devices** such as screen readers.

Selecting an appropriate DLR for students with special needs is not easy, but the observance of these factors and of the quality principles, helps choosing the most appropriate DLR and capitalizing the advantages. In order to choose effectively from the range of available DLR, educators must leverage accessibility and usability requirements but also consider the type of educational content conveyed and the global educational meaning, impact and effectiveness of the product [9].

7. Conclusion

The use of DLR is, without doubt, a benefit available to the population with SEN. Besides the inherent advantages of moving from "paper to digital", enabling new forms of access and participation and to balance the learning opportunities, the oriented use of DLR enables learning autonomy as well as scaffolding knowledge built through practice interaction.

The use of DLR for special populations requires focalized attention, since the usability problems are common, manifesting themselves in barriers to participation and tipping the balance of equal opportunities. However, these problems are not characteristic of minority groups: many users are frequently faced with obstacles to accessibility and usability, so the development of DLR should pay particular attention to these aspects. Universal Usability should be always at the top of the considerations alongside pedagogical appropriateness. The adaptability needed for users with sensorial, motor or cognitive disabilities is expected to benefit users with differing circumstances of use, preferences, tasks, hardware, etc. Hence, system functions that are designed to help people with disabilities may be usable by everyone in various usage situations. The respect for the principles of Universal Design for Learning should be carefully considered in order to benefit a wider range of students. Our view, shared by many others, is that it is essential to transform the production of DLR for specific for SEN into DLR designed for the common user that is also accessible and usable by people with special needs. It should be possible to make our educational choice from the wide variety of existing resources and not on a restricted set, designed exclusively for people with special needs. These resources should be designed with all students in mind and not only for specific groups with specific characteristics. The criteria for UDL benefits all students, not only students with problems of access or participation.

In a simplified synthesis, a DLR should be adaptable to user preferences: i) alternative formats of presenting the same information (information redundancy); ii) elimination of unnecessary stimuli; iii) accessibility settings that allow adjustments for people with different restrictions on access and participation; and iv) compatibility with Assistive Technologies for people with disabilities.

Assistive technologies play an important role in the lives of people with disabilities and the interconnection with DLR enables these individuals to eagerly use services if they can connect their customized interfaces to standard graphical user interfaces, even though they may work at a much slower pace [10].

The compliance with these principles is essential to avoid drawbacks by students with interaction barriers, moving them away from tools that when well designed and harnessed constitute an ally to inclusion in mainstreaming schools. Recently there has also been an increasing awareness of producers of digital resources for accessibility issues. However, these efforts remain largely for those who specifically produce for SEN. A DLR should be enjoyed by all students. The stigma of students with SEN (specialized DLR users) can easily be eliminated by the development of resources according to Universal Usability guidelines, with greater flexibility that ultimately benefits all its users, because normally what is done for SEN can be used by all students. The converse tends to prevent pupils from taking full advantage of what a digital educational resource has to offer.

The use of the digital is a solution, not "the" solution to promoting attainment, access and participation of students with SEN. In a country where much is made to increase technology availability, with general concerns about the technological literacy of all citizens, but with special attention to the skills of students and teachers, Special Education is a niche that needs further investment. DLR are certainly tools at the service of learners with diverse learning needs, which include pupils with SEN. An effort should be made to raise awareness for the use of inclusive DLR: inclusive not because its design is tailored to special needs, but because its design also includes pupils with SEN. Each and every student should have the opportunity of educational equity: no more and certainly no less.

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