COURSE FOR PRE-PRIMARY SCHOOL TEACHERS

# DIDACTIC UNIT 9

## BRIDGES TOWARDS PRIMARY AND SECONDARY EDUCATION

Looking out for a School for All

This is the educational material uploaded to VIRTUAL INCLUSIVE EDUCATION and developed by REDTREE MAKING PROJECTS in collaboration with SMALLCODES SRL, ASOCIACIÓN ALBA, ANIRIDIA EUROPE, ANIRIDIA NORGE, and ANIRIDIA ITALIANA within the project “LOOKING OUT FOR A SCHOOL FOR ALL: EARLY EDUCATIONAL INCLUSION FOR STUDENTS WITH LOW VISION”, co-funded by the ERASMUS PLUS PROGRAMME OF THE EUROPEAN UNION.

Co-funded by the Erasmus+ Programme of the European Union

**This project has been funded with support from the European Commission.**
**This publication [communication] reflects the views only of the author, and the Commission cannot be held responsible for any use which may be made of the information contained therein.**

Co-funded by the
Erasmus+ Programme
of the European Union

# COURSE FOR PRE-PRIMARY SCHOOL TEACHERS

Edited by VIRTUAL INCLUSIVE EDUCATION in June 2021.

Coordinated by **Jordi Rizo.**
Designed by **Luis Gómez.**
Translated by **Adrián Monleón.**

Address: c/ Jesús y María 26 - ground floor
46008 - Valencia, Spain

e-mail: info@redtree.es

Tlf: +0034 960 150 604

*"Ideal teachers are those who become bridges over which their students can cross, and after having facilitated their crossing they collapse with satisfaction, encouraging them to create their own bridges."*

- Nikos Kazantzakis

## OBJECTIVES OF THE DIDACTIC UNIT

At the end of this didactic unit, you will:

- Have a greater knowledge of the educational needs of students in primary and secondary education with visual impairment.
- Become familiar with the adaptations of access to the school curriculum, and with the teaching strategies to be used in each area of these educational stages.
- Know the guidelines for using available resources to meet the educational needs of visual impairment in primary and secondary education classrooms.
- Establish the importance of the use and integration of ICTs in primary and secondary education.
- Evaluate ICT educational resources that favor communication in visually impaired students.
- Design an action plan with educational and didactic activities to be carried out with students with visual impairment through ICTs.

## INTRODUCTION

It is in the primary education cycle when students complete their first stage of compulsory education. During this period, students grow cognitively, affectively, socially, and motorly, leading to important changes in their development. The adequate development of these aspects is decisive for the academic performance and socialization of the student, especially for students with visual impairment, as we saw in Unit 3. Therefore, knowledge of the psycho-developmental characteristics of primary education students by the teachers is essential to achieve an effective and efficient educational and pedagogical

intervention (Castillo, 2009)[1]. Also, the increase in the inclusion of persons with disabilities in schools highlights the need to train teachers in the various methods and didactic and educational materials available to duly help these students.

Both in the teaching degree and in the master's degree for secondary school teacher, the academic profile of teacher can be said to be general in nature. Although there is the option of studying the mention of "Attention to Diversity", in which aspects of disabilities are taught, we cannot expected that any teacher knows and uses everything that is now required to face the inclusion of students with disabilities in the classroom. By this, we mean that this mention of "Attention to Diversity" does not provide the same level of training to meet the needs required by a student with a sensory disability as with another type of disability.

With this topic, we want to spread the knowledge of visual disability within the educational environment through the existing bridges between the development of pre-primary education and primary and secondary education, so teachers become aware of reality, at a theoretical and practical level, to have a better pedagogical function with their students - in other words, to transfer the knowledge of what the needs of students with visual impairment in these educational stages are, so teachers can apply different strategies and learning methods, and to help them use different pedagogical materials available in their classroom.

## 9.1 ADAPTATIONS OF ACCESS TO THE SCHOOL CURRICULUM

Based on the guidelines established by Álvarez (2000)[2] and those that Andrade (2011)[3] follows in his guide -emphasizing the adaptations of access to the school curriculum- in this chapter we will try to specify which adaptations may be needed in the different areas of primary education for children with visual disabilities, due to the learning difficulties linked to their sensory impairment.

Following the aforementioned reference model, the answers will be framed within the general context in which learning takes place, establishing an intimate relationship between the student's conditions and the teaching strategies to be introduced.

### 9.1.1 KNOWLEDGE OF THE NATURAL, SOCIAL, AND CULTURAL ENVIRONMENT

This learning area proposes various objectives related to the development and personal and social autonomy of the child with visual impairment. The environment, be it natural, social, or cultural, is what shapes and structures the way of being in the world. In this area, the contents, concepts, or procedures

[1] Castillo, R, P. (2009). Desarrollo psicoevolutivo en niños de 6-12 años. Revista digital "Innovación y experiencias educativas", 14.
[2] Álvarez Gámez, F. (2000) Acceso al currículo. Didáctica y adaptación en las áreas curriculares generales. En: Martínez, Liébana, I. (coord.). Aspectos evolutivos y educativos de la deficiencia visual. Madrid, ONCE
[3] Martín Andrade, P. (2011): Guía de orientación para la inclusión de alumnos con NEE en el aula ordinaria. Alumnos con discapacidad visual Necesidades y respuesta educativa. Escuelas católicas.

that may present greater difficulties are those for which vision is a primary character. Persons with impaired sight will find special difficulty in understanding the most distant physical environment (such as stars and planets), and in the descriptions of other environments and landscapes to which he/she is not used.

Some adaptation criteria to be used are:

- Enriching perception by promoting the sensorial plurality of approach to reality.
- The variety of perceptions and descriptions of peers as a source of information for the child.
- Handing them models, sketches, and plans in relief so they can interpret them.
- The oral description of visual physical realities difficult for them to access due to their type of perception.

On the other hand, regarding "how" to teach, some observations that are considered essential in the methodology of this area, in addition to the general principles:

- The teacher has to use procedures that invite students with low vision to use experimentation and methodical observation, focusing on objectivity and the systematic organization of experiences.
- It is necessary to know that the child's learning pace may be slower in some subjects, so it may require carrying out specific or additional tasks.
- The task of developing specific materials for the better understanding of contents does not always have to fall on the teacher: it can be transferred to the imagination of the classmates, so they can envision and create them themselves.

### 9.1.2 ART EDUCATION

Art education develops the necessary capabilities to carry out two basic processes: the perception and interpretation of physical, musical, and dramatic representations, and the expression of feelings and ideas through those same means. In this processes, it is vital to understand:

- How children with low vision perceives the world.
- The information gathering process through the haptic system.
- The difference between the information obtained by this system and that collected through sight.
- What techniques and strategies the child knows and uses to obtain and retain information.
- What characterizes their mental images and how they can represent them.

The first of the axes (perceiving and interpreting) is developed in the earliest stages of school, through recreational activities carried out mainly in the same classroom or in the school. In them, students develop auditory and tactile perception, perception of shapes, spatial orientation, and body scheme, while establishing group relationships that favor the appearance of positive social attitudes (see the development of students with visual impairment in Unit 3). As they advance, these activities lose their playful side and offer the possibility of perceiving and interpreting artistic realities distant from the immediate environment and of greater complexity: museums, concerts, exhibitions, theatre, etc.

Depending on variables such as the student's expectations, their degree of vision, previous experiences, level of integration, etc., the teacher should be able to adapt the objective they intend to achieve with a given activity.

The second of the axes (expression and communication) is conducive to carrying out activities that involve different groups of the educational community. This is the case, for example, in the exhibition of works made by students, the decoration of the school, the staging of theatrical works, or music or dance performances. These collective activities are based from the start on teamwork, so they constitute an excellent means for interpersonal relationships and to discover individual interests, motivations and abilities. If students with visual impairment participate in a play, they need to have access to the necessary resources to obtain the information that their classmates get with their sight: stage size, stage set and its distribution, the location of exits and entrances, possible obstacles, and also clear reference points for their movement while in stage.

Regarding the adaptation and access to the materials, the quantity and variety of resources that can be used in this area is an advantage, since this diversity guarantees the exploration and sensory manipulation of materials with different characteristics and possibilities of use, while allowing the teacher to replace those with difficulties of use or adapt with another.
Next, we will look at the contents included in this area and their didactic treatment:

a) Arts:

Some contents, especially related to color and visual aspects, will require adaptations guided by the following basic criteria:

- Replace the contents (procedures), whenever possible, with an "equivalent" one accessible to visually impaired children. For example: substitute colors for textures, but bear in mind that each perception channel has its own characteristics, and that just a substitution is not an adaptation.
- Value the development and creation process more than the final result.
- Pay individual attention in the monitoring and evaluation of the procedure.

Lastly, drawing deserves a special mention for its didactic value; it is a form of graphic representation of great importance as a means of expression. Arts, in addition to having applications in the learning of other areas, allow developing fine motor skills and haptic-manual skills. Also, drawing will show us the mental image that the student has of the different elements that surround them and their spatial relationships.

b) Music and drama:

Music is an area in which students with visual disabilities can easily integrate into the group, since it prioritizes the sense of hearing. However, it will also allow us to offer them multi-sensorial experimentation situations, especially with kinesthesia. The teaching and learning of musical expression and production will be carried out through three different means: voice and singing, music instruments, and movement and dance.

1. Through singing we develop memory, auditory discrimination, imitation, and vocal development. Gestured song also provides information about the non-verbal codes that accompany language.
2. The use of percussion instruments and the study of an instrument favor the development of laterality, the sense of rhythm, motor control, and awareness of space and time. On the other hand, the study of musical signs favors the development of abstract skills and a sense of order.
3. Dancing also develops the sense of rhythm and contributes to the awareness of our own body and the internalization of the body scheme, in addition to developing the necessary skills to know and master space.

Some guidelines provided by ONCE's team of music specialists regarding this topic are:

- The music classroom: it is necessary for students to know the place where music will be taught, and which and where are the materials that they are going to use, also warning them of any change in their placement.

- Body expression: when designing body expression activities, there should be physical contact (holding one or both hands, hand resting on shoulder or arm, etc.). In this way, thanks to this point of contact, visually impaired students will always have a reference with their classmates, and will be able to carry out activities with greater security. In activities where walking is necessary -like a staged performance, or in any type of dance- it is essential that the student learns to move through the space to be used if it is outside the classroom, locating all the elements that may pose an obstacle to mobility and that are necessary in the representation (including size and shape of the area, accesses to it, and location in relation to the other spaces to be used).

- Musical language: it is important to have the technical aids prescribed, also in the music classroom, to facilitate students with low vision their reading and writing. At first it will be necessary to use material in relief to represent the qualities of sound: cards with conventional musical figures, staves to use with stickers, or adhesive velcro tokens to use as musical notes, etc.

- Plate instruments: except in very exceptional cases of proven simplicity, we should not expect the simultaneous use of two drumsticks in exercises done by a child with visual impairment. This technique requires training based on motor memory, through which we store distances and locations related to the movements of the drumsticks on the instrument. First we must allow the child to touch the plates smoothly and successively with their free hand, in the same order that the melody should be produced, as an orientation for the hand handling the drumstick.

- The flute: we recommend the teacher not act just as a model, adopting the correct position when handling the instrument and trying to get the student to imitate it through tactile perception. In this case we must substitute imitation for correction: the ideal flute placement, the proper way to blow air, the articulation of the tongue to achieve short and repetitive sounds, and the placement of the fingers following a logical difficulty order should be the indicators that show us the way to achieve mastery of the instrument. The use of the numbering of the holes is interesting to remind the blind student of the different combinations necessary to obtain the different musical notes, starting from 0 to designate the hole on the back, and 1 to 7 for the rest. This system can replace visual graphics,

being able to write the entire list of possible combinations -notes- for the student with visual impairment.

- Directing strategies: in addition to doing it visually with the hand or the baton, soft whistles or light percussions should be agreed to in advance and perform to indicate the start and ending of the piece (although it is not necessary to have these acoustic signals all the time, it is advisable to resume them if there is an imbalance of movement). The teacher should direct from a place visible to all students, but not significantly separated from the group, so he/she can couple regulations with soft phrases that guide visually impaired students.

### 9.1.3. PHYSICAL EDUCATION

The educational functions of this area are: knowledge and mastery of the body scheme, development of psychomotor capabilities, and access to the sensation and global perception of reality, symbolic and abstract thinking, cognition, identification of one's space and of others, aesthetic and hygienic functions, and the possibility of communication and relationship among equals.

This area requires many adaptations, so we can speak first about the didactic adaptation that the physical education teacher will carry out through the sequencing and globalization of contents. The sequencing of this area should be based mainly on procedures, selecting activities that -based on previous knowledge and step by step- facilitate harmonious and functional movements for students with low vision. As for globalization, it should be mainly directed to those aspects that are more difficult to achieve due to the nature of this impairment:

- Perception, structuring, and orientation in space.
- Perception, structuring, and relationship with time.
- Knowledge and mastery of the body as an instrument of expression and communication: gestures and movement, mimicry, dance, acting…
- Motor, symbolic, and cooperation games.

Along with the globalized treatment of the contents, the area of physical education also allows to integrate globally some of the so-called transversal themes. Andrade (2011) focuses on two of them, due to the special importance they have in the education of children with visual impairment: road safety education and education for free time. The first of these is intended to help them acquire and develop habits that allow them to move safely on the street, thus facilitating their orientation and autonomy when traveling. The second helps them against the natural tendency to a sedentary lifestyle, and to open up the possibility of their adult leisure activities being more active, by stimulating an appeal for movement and the need to exercise.

With some simple adaptations, the child can start practicing some sports like: athletics in its different modalities, swimming, tandem cycling, futsal, judo, weightlifting, mountaineering, skiing, or *goalball* -the only specific sport for blind persons-.

Lastly, this area uses in many of its developments an aided methodology, which is specified in the following action guidelines:

- Children with visual impairment will sometimes need a guide for walking and running.
- For certain activities, the teacher or a classmate will be the model through which they perceive movement and posture.
- They will also explore slowed down movements of the model to incorporate them into their own body scheme.
- It will be necessary to incorporate elements into the game that allow a clear differentiation (red and blue clothing or markings in team games, for example).
- The landmarks in a circuit or route must be marked.
- The access of children with low vision to certain physical/sports exercises will be solved with the incorporation of a sound, like clapping.
- Although an excessively verbal methodology has sometimes been deemed as negative, the truth is that verbal support seems absolutely necessary. The clarity of information facilitates an adequate conquest of the movements.
- The repetition of mechanical movements is very necessary until they become automated.

### 9.1.4 LANGUAGE AND LITERATURE

The contents that constitute the area of language and literature have a close relationship with the rest of the areas, since they provide the basic tool to carry out their learning. Furthermore, language, in the case of visually impaired people, is not only the most valuable tool of knowledge and communication, but also the means to understand the outside world, the main substitute for visual information.

Based on the guidelines established by Andrade (2011), here are some specific observations about contents that appear in the curriculum: oral and written communication (reading and writing).

<u>Oral communication</u>

As we have stated throughout the course, it is necessary to carry out an initial evaluation to establish the child's level of oral communication. Some conditions imposed by visual impairment must be taken into account when addressing the contents of oral communication:

- Although, according to this author, the acquisition and development of language in a child with visual impairment does not seem altered, some studies state that lexical richness can be affected, which conditions two basic language uses: understanding and expression. If this is the case, enriching the child's vocabulary with direct and close experiences will help to improve their knowledge of reality.
- It is also necessary to consider the intervention of the haptic and auditory systems as mediators of learning, the use of verbalisms, and not forgetting that a lack of vision can be a barrier when starting a conversation and intervening in communicative situations, so the author proposes a series of measures:

- Specify how many persons are participating, who they are, where each one is, if someone is a moderator…
- Establish norms regarding the order, type, and time of interventions, rules to request the speaking time, the role of the moderator…
- Avoid the use of substitutive terms: “that”, “this”, “there”, “he/she”… these do not provide information to people with visual impairment.
- Don’t forget to name the reality you are referring, in any situation in which the child is present.

Regarding attention and listening, although students with low vision do not receive certain visual stimuli that would dissipate their focus, it is also true that they also do not receive visual stimuli (eye contact or everything received through sight, like glances, gestures, and movements of the sender, call signals from the teacher, etc.), which favor attention and subsequent learning. Therefore, it is necessary to identify the signs of inattention and develop strategies for the child to perceive the situation, so he/she can focus again on the oral communication they were receiving.

Written communication

Reading and writing are the two basic teachings that take place in written language, and they are the two pillars on which the entire school life is be supported. Given their significance, their importance for children with low vision comes from the correct understanding of the code (ink or Braille) that they will predominantly use. Determining which code to teach -ink or Braille- will be based on the analysis of multiple variables, including the study of their current visual situation and its prognosis. Also, when placed in the school environment, it is essential to know the academic functionality of the code; in other words, to consider whether the chosen code is going to be valid for the study in the different educational stages, or if it is going to impose limitations on proper academic tasks, leading to a lack of motivation:

- An excessive effort to read even short texts.
- Difficulty to access their own writings, with the consequent lack of control over them.
- Staying in uncomfortable and harmful postures.
- An excessive slowness in reading.
- Poor handwriting.

Blind children, in addition to the common prerequisites to learn reading and writing, will have started in the specific aspects required by the Braille system:

- Development of tactile perception.
- Independence of the fingers.
- Correct position of the hands and movements to be carried out, and proper posture.

In the adaptations indicated for the learning of literacy, it is essential that learning takes place in the classroom, in parallel to the literacy learning of their classmates, although sometimes adaptations are necessary (like with signs that can be confused with each other due to their “mirror” writing or their similarity in shape).

### 9.1.5 FOREIGN LANGUAGES

Here too, the child's experiences are the basis for meaningful learning. When starting a new learning, especially foreign languages that require a new code, it is common to start from facts, situations, or realities known to the child and already mastered in their mother tongue. This teaching is supported by verbal and non-verbal techniques like gestures, mimicry, dramatization, drawings… that facilitate the acquisition of the new code in multiple ways, often using images of terms and situations. This principle and method, common and favorable to this area, does not have to be avoided or eliminated, but it must be adapted, completed, and enriched for students with visual impairment. The teacher, in this case, will:

- Prioritize dialogue or conversation over visual teaching resources.
- Show three-dimensional materials or drawings in relief, instead of pictures.
- Complement with parallel explanations, in the student's mother tongue, those activities that involve recognizing scenes, gestures, or non-verbal language.

Regarding the objectives and contents, it is evident that although what we stated in the area of language is also applicable to this area, it can be completed with specific guidelines to carry out adaptations in the foreign language, such as:

- The sequencing of the contents: in pre-primary and primary education, it is appropriate to prioritize oral communication over written communication, to go from understanding to expression. Thus, while understanding oral messages from different sources (the teacher, other classmates, sounds, or audiovisual recordings) does not pose difficulties for children with low vision, adapting to the characteristics of their learning may require an individual adaptation or to complete the information, especially with the use of audiovisual materials such as:
  - oral descriptions of images by the teacher or a classmate;
  - make a written comment of a video;
  - even staging specific passages.

- On the other hand, as support in this area, there are specific materials for its development. It is necessary to highlight the use of the dictionary as a basic means in the learning of a language, especially when advancing in its knowledge. Until recently, if the student lacked enough visual remains, the adaptation had to be made by the teacher, the family, or the classmates themselves. However, as we have seen in previous topics, PCs, electronic devices, and software have alleviated this difficulty.

### 9.1.6 MATH

Andrade (2011) points out the non-existence of a direct relationship between visual impairment and the difficulties in learning the area of mathematics. Even so, he points out difficulties that a child with low vision may encounter in calculus and geometry.

Calculus

Several statements of the curriculum for primary education in the different blocks make direct reference to this content, highlighting the value of mental calculation and estimation. However, some of the causes that Fernández de Campo (1986) points out in producing blockages in the learning of calculus are: a poor attitude due to the abstract nature of the proposed exercises, scarce focus, the wrong use of automatisms (poorly mastered), and considering calculus tools as "instruments of torture". To solve this, he proposes to emphasize mental calculation and the later use of a calculator.

Mental calculation, long forgotten or seldom used, is once again revalued as an excellent means to strengthen self-esteem, develop concentration, focus, a reflective attitude, and the ability to link, compare, and select data. All of them are desirable side effects for any student, which will be amplified by their specific impact on visually impaired students, who should have been provided with basic strategies and skills for what will be their main operating medium. The fluency in mental calculation, later complemented with the use of the calculator, is very effective in compensating for the slowness imposed by calculation-specific tools.

Closely related to calculation is estimation, also almost absent in mathematics, based exclusively on its accuracy. But in daily life, estimates are made very frequently regarding time, capabilities, distance, or size, without the conventional tools or means needed to know exact values or results. This is why it is of great importance to work on estimation, since its mastery implies a useful knowledge of objects, their measurement, their distance from others, and the relationships between them. Estimation, along with the understanding and internalization of body units (a footlong, a span) constitute excellent tools for the approximation to real values.

This skill, useful for everyone in daily life, is of great help for children with low vision when it comes to recognizing sizes or perceiving distances (50 steps away; three spans long…) and to face new situations or realities of difficult or impossible tactile access, in which auditory perception will frequently be complemented with the estimation strategies developed.

Geometry

There is no doubt about the contribution of the contents of this area to the development of organizational capabilities and spatial orientation, nor about their essential applications in other areas of the curriculum. Knowing the body scheme, a sufficient development of laterality, and good handling and tactile recognition skills are prerequisites to start learning geometry.

The family and school environment are full of geometric shapes that visually impaired children do not fully perceive, so their recognition will be limited to fewer than their peers, not for lack of ability, but due to ignoring the existence of many of the objects that surround him/her, which diminishes or eliminates the curiosity to discover and establish relationships between them. A clear educational consequence follows from this: the knowledge and familiarity of children with low vision with their environment will be an explicit objective in the programming carried out.

At the beginning of their schooling, handling real objects and geometric bodies is the means par excellence to ensure that the student identifies them, recognizes their characteristics, and manages to make a correct transfer of this learning to their daily activities. Moya (2014) states that, for example, thermoform sheets or drawings in relief can be used. Also, the lack of vision of the student should not condition the teacher to exempt him from activities that involve the creation or interpretation of graphic representations, on the contrary, they should favor them with the assurance that they are contributing to the development of extremely useful skills and strategies, both for their application to everyday situations and to other learning.

However, while students with low vision need to learn these contents, we also need consider the influence that visual impairment will have on them. Specific aspects to be considered are:

- The pace, both of the creation and interpretation of representations will be slower.
- Precision and formal presentation should not be judged with generalized criteria.
- Verbal support is extremely important, to strengthen their work or warn them about possible mistakes made both during the interpretation and creation process.

Lastly, the benefits for the blind child of knowing, handling, representing, and internalizing a wide range of resources are evident, and will be reflected in the development of their capability for abstraction, the creation of generalization strategies, and in the construction of natural categories of greater complexity.

## 9.2 ICTs (INFORMATION AND COMMUNICATION TECHNOLOGIES) AND TIFLOTECHNOLOGY

We have already previously spoken about how the technological advances of our era have changed the way of understanding education; new generations of students are born being native in the use of technologies. Thus, traditional teaching methods and strategies are falling into disuse, due to the need to adapt them to the skills and capabilities of the students and the environment. The innovation and development of new educational materials is unstoppable, making essential that schools equip themselves with the necessary technological resources, to provide teachers and students with access to information and new methods to communicate and express themselves. According to Cabrero (2001), ICTs must be used as a means, not as a source of knowledge themselves, so schools must consider a series of factors when making the decision to get new ICT resources.

One of the main aspects to consider is -as we saw in Unit 4, when addressing new technologies as a means of inclusion in the classroom- if the resource can meet the special educational needs of students with disabilities, to avoid that instead of assuming progress, the introduction of ICTs induces access-related segregation. Regarding this ICT-accessibility and inclusion, we must consider the role we have as teachers and how we can contribute to their inclusion in classrooms with diverse students. Teachers are the ultimate responsible for ensuring that each student complies with their corresponding educational program, and that they do so in the best possible conditions. It is our responsibility to know the students and manage the most appropriate resources to meet their needs, derived in this case from visual impairment, especially in primary and secondary education cycle, where -unlike in pre-primary- the use of technology extends to a daily basis as a tool in almost all subjects. Therefore, we will focus in this

chapter on pointing out tips and guidelines that allow persons with low vision to access information and communication and improve in their performance of some tasks in the educational field.

### 9.2.1 ACCESS TO INFORMATION ON THE COMPUTER

Computers are a basic tool for personal and school life. Their use by students with low vision in primary and secondary education is essential for most subjects, both to access relevant information and for communication. This is why accessibility conditions the total autonomy of visually impaired students, although as Toledo (2001) points out, their condition may impose a slower learning pace at first. What is essential is that all teachers know that low vision students use the same computers as their peers, with the same software, like the internet browser, Microsoft Word, Excel, etc. Furthermore, it is necessary to adapt the computer to the particular needs of each student, and this requires learning of technological resources that guarantees their effective use (Candelos and Lobato, 1997).

So, how do students with low vision access the computer depending on their visual functionality? These students, unlike fully blind students, can work with the computer screen and the mouse. Their degree of vision allows them -with adaptations- to see details and read, with due contrast and size. However, to access the computer they need the elements in the screen to be in sizes, colors, and contrast appropriate to their condition and limits, as well as specific configurations (zooming) (ONCE, 2003):

- Screen magnifier/zoom: this software allows to enlarge the whole screen or part of it, to make it more easily perceptible. It modifies features of the screen like color, contrast, size, and shapes, and usually has a series of characteristics that allow visually impaired students to navigate the screen in optimal conditions and with greater recognition. This software is easy to use, can be permanently configured, and can be easily used by students starting in pre-primary education (Gaston, 2010). Some of them worth highlighting are:
  - JAWS for Windows: it combines the ability to enlarge characters and reading screens, also with the possibility to choose what the user wants to be read when browsing through different programs.
  - Zoomtext Xtra: this software supports graph enlargements from x2 to x16 size.

A demo version of both of them can be downloaded from their respective websites. In the case of JAWS, the limitation of the demo version is just time-based, allowing 40 minutes in each work session. On the other hand, the use of the free NVDA (NonVisual Desktop Access) screen reviewer is increasing.

### 9.2.2 INTERNET ACCESS

Nowadays, part of the work carried out in the classrooms is based on using the internet, making it necessary to provide the appropriate means to visually impaired students to participate in an inclusive environment without risk of failure. Once we know that students with visual disabilities can access the computer, it is very important that the web environment is also accessible, to provide equal access and opportunities to persons with disabilities.

When speaking of web accessibility, we refer to a web design that allows students with disabilities to perceive, understand, navigate, and interact online, while providing contents (Serrano and Pedrosa, 2008). This encompasses many types of disabilities, including visual, hearing, physical, cognitive, neurological, and speech problems, so it is necessary to consider: how can a teacher know if the network in which he/she wants their students to work is duly accessible?

In December 2008, the WAI (Web Accessibility Initiative) published this version of Web Content Accessibility Guidelines, (WCAG 2.0), developed over a long period of time to adapt to the technological changes that have taken place in recent years, and are the guidelines currently in force internationally. In addition to these documents, extensive and comprehensive documentation on all topics related to web accessibility can be found on the WAI website, and beyond them we can also assess the degree of accessibility to the web through screen reviewers. To do this, screen reviewers automatically analyze, line by line, the HTML code of a web page, checking all the verification points of the accessibility guidelines from the WAI. When finished, they show a detailed report on the level of compliance with these guidelines, indicating the page's level of accessibility (*A*, *AA*, or *AAA*).

The most important thing about these tools is that they are a useful aid in knowing the degree of accessibility of a web page, and combined with the accessibility guidelines published by the WAI, one can carry out a full review to definitively establish the real accessibility of the page under study. Some of them worth highlighting are:

- Reviewers in Spanish: HERA13[4] and TAW14[5].
- Reviewers in English: BOBB15[6] and CYNTHIA16[7].

### 9.2.3 ACCESS TO LEARNING ACTIVITIES THROUGH THE SCHOOL'S ICTS

Lastly, we are going to talk about the access to learning activities through ICTs, based on Cuadrado's and Fernández's work (2009), establishing specific criteria that allow teachers to design digital educational activities with guarantees of accessibility and autonomy, i.e. with the same characteristics for students with visual disabilities as for the rest of their classmates, and pursuing the maximum autonomy of each student.

Determining factors: the way in which activities are made accessible is essentially determined by the age of the student and the objective of the activity.

- *By age of the student*, we differentiate between two types of activities:
    - Guided activities: activities are usually guided until at least the 4th year of primary education, meaning that the activity itself must guide the student in its navigation and in the accomplishment of the tasks. All elements must have a speech or sound illustration to offer the

[4] *HERA (http://www.sidar.org/hera/).*
[5] *TAW* (http://www.tawdis.net/taw3/cms/es).
[6] *BOBB (http://www.cast.org/bobby/).*
[7] *CYNTHIA (http://www.cynthiasays.com/).*

information needed by the student with visual problems. For them, access to the guided activities must also be automatic or easy accessible (for example, with a CD, a direct access in the desktop, from an educational platform, etc.).

- Non-guided activities: those that can be carried out with a screen reviewer and are generally suitable for students above the 5th year of primary school. In them, all elements must have a matching label, have to be accessible with mouse and keyboard, and must have a coherent and logical navigation order.

- *By objectives*: each activity can have one or more objectives, trying to not change them when following the accessibility criteria. However, if an activity covers several objectives simultaneously and their accessibility is different, some should be prioritized over others.

Once the previously highlighted factors have been clarified, certain requirements must be considered when designing learning activities:

- *General requirements*:
  - All activities must be able to be navigated with both mouse and/or keyboard.
  - As far as possible, all activities must start in full screen, without toolbars or scrolling.
  - If the activity has a time limit, it must be possible to expand, reduce, or disable it depending on the student's needs.
  - The student must be told by speech about the number of attempts they have made and the time spent in the activity if this information appears on screen.

- *Aspects related to the screen display*:
  - Pictures, graphs, and images have to be clear, and their objective should be easily extracted from them. In any case, they must be easily recognizable.
  - Images and texts must be sufficiently contrasted with the background.
  - Any objects must be sufficiently highlighted.
  - The pointer or its thickness and contrast must be customizable.
  - The different types of messages (start, finish…) must be differentiated (with differences in color, size, brightness…).

- *Texts*:
  - In general, all texts in the exercises must be editable, so that they can be interpreted by the tiflotechnical tools used by the student.
  - If texts appear as images, they must have an associated sentence explaining what it says (for guided activities), or a description that can be read by a screen reader (for non-guided ones).
  - The font size for any activity must be at least 14.
  - The font must be clear to read, as close as possible to "Verdana" or "Arial".
  - The texts must be well contrasted and highlighted against the background.

- *Sound and speech*:
  - On the first screen of any guided activity, there should be an initial presentation of the scenario and the activity itself, in which students are informed about which key to press to access the toolbar, and to return to the activity again.
  - When changing the screen to start any new activity, there must be another explanation with the specific instructions to solve the new exercise.
  - Applications must include continuous or intermittent sounds to notice the student that they are active. Both the sounds of notice and loading will be soft and low in volume, so they do not interfere with the sounds of the activity.
  - The actions involved in an activity must have a sound linked to them: "select element", "release", "end of activity", "hit", "miss", "successful end of activity", "unsuccessful end of activity with"… Any change that can be seen on the screen must have a matching sound, so the student always knows that something has happened.
  - Any feedback message (hit, miss…) has to be audible. These sound messages of positive reinforcement and continuity will be more necessary in all activities the younger the student is.

## 9.3 ACTIVITIES

- **Choose a specific topic within one of the areas of knowledge for the 3rd year of primary education, and try to design an adaptation of access to the curriculum for a student with Aniridia or Albinism (residual vision of 20%). What adaptations would you make to the materials, and what learning strategies would you follow?**
  **Send us your proposal through the e-learning platform, and our entities and experts will evaluate, correct, and help you with the adaptation.**

  **** An example: Knowledge of the natural environment > living beings > plants.***

- **Based on the Web Content Accessibility Guidelines published by the Web Accessibility Initiative (WAI), and with the help of the aforementioned screen readers, analyze and evaluate the degree of accessibility of the websites you use in the classroom.**

## 9.4 BIBLIOGRAPHY

- RODRIGUEZ FERNANDEZ, C. (2017): "Alumnos con discapacidad visual: análisis del procedimiento de apoyo educativo realizado desde la ONCE.", Grado de maestro en educación primaria, Curso académico 2016/2017, Universidad de Cantabria.

- MARTÍN ANDRADE, P. (2004): "Alumnos con deficiencia visual. Necesidades y respuesta educativa. Guía de orientación para la inclusión de alumnos con necesidades educativas especiales en el aula ordinaria." Desafíos de la diferencia en la escuela. Escuelas católicas.

- ASOCIACIÓN DE AYUDA A PERSONAS CON ALBINISMO (ALBA), 2018: "Entorno educativo para personas con albinismo 2018. Guía para la formación del entorno educativo para la educación de estudiantes con la condición genética de albinismo y/o deficiencias visuales en el plan de atención a la diversidad (PAD).", Proyecto "*Together we can overcome barrieres: strategy for the equity*".

- IDDA VILLAGUT, N. (2015): "Los alumnos con discapacidad visual en la escuela ordinaria: el uso de la tiflotecnología y las TICs en el área de lengua castellana y literatura en educación secundaria.", Trabajo final de master, Facultad de educación, Universidad Internacional de La Rioja. (Enlace web: https://reunir.unir.net/bitstream/handle/123456789/3283/ILLA%20VILAGUT%2c%20NADIA.pdf?sequence=1&isAllowed=y ).

- SERRANO MARUGÁN, I., PALOMARES RUIZ, A. y GARROTE ROJAS, D.: "Propuestas innovadoras para favorecer el uso de las TIC y propiciar la inclusión educativa del alumnado con discapacidad visual", en ENSAYOS, Revista de la Facultad de Educación de Albacete, Nº 28, 2013. (Enlace web: http://www.revista.uclm.es/index.php/ensayos).

- GARCÍA VILLALOBOS, J (2017): "Acceso a las tic para alumnos con discapacidad visual.", Técnico de Educación de ONCE. Coordinador del Grupo ACCEDO, Ministerio de educación y ciencia, Gobierno de España. (Enlace web: http://ares.cnice.mec.es/informes/17/contenido/11.htm).

- Sánchez Caballero, M. (2015). Baja visión y tecnología de acceso a la información: Guía de ayudas técnicas de bajo coste. Colección Democratizando la Accesibilidad Vol. 8. La Ciudad Accesible 2015. (Enlace web: https://sid.usal.es/idocs/F8/FDO27154/ciudad_accesible_8.pdf).

- ONCE (2003). Conocimientos básicos para el manejo y solución de problemas de ayudas técnicas para discapacidad visual. Madrid: ONCE.

- TOLEDO, P. (2001). Accesibilidad, informática y discapacidad. Sevilla: *Mergablum*.

- SERRANO MASCARAQUE E. y PEDROSA LÓPEZ MªD. (2008): Situación actual en el acceso a la información web de las personas con discapacidad visual en España. X Jornadas de Gestión de la Información: la dimensión del cambio: usuarios, servicios y profesionales. Madrid: SEDIC, p173-182.

- CUADRADO, I. y FERNÁNDEZ, I. (2009): Funcionalidad y niveles de integración de las TIC para facilitar el aprendizaje escolar de carácter constructivista. Revista Informática Educativa Comunicaciones nº9.

- JIMÉNEZ RUIZ, M.C. (2015): "La escolarización del alumno con discapacidad visual en el aula de Educación Primaria", Trabajo de Fin de Grado, Grado en Magisterio de Primaria y Pedagogía, Universidad de Navarra.

# Looking out for a School for All