

Aula adaptable a las necesidades de estudiantes con baja visión y su aplicación empresarial

Adaptable classroom to the needs of students with low vision and its business application

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➤ Resumen

En este artículo se pretende identificar las necesidades educativas específicas y las pautas psicopedagógicas necesarias para atender a la población con baja visión y ceguera, conforme a la legislación costarricense vigente, en particular la Ley 7600, Ley de Igualdad de Oportunidades para las Personas con Discapacidad. Además, se toma como referente al Centro Nacional de Educación Hellen Keller de Costa Rica, institución dependiente del Ministerio de Educación Pública, que atiende a personas con discapacidad visual y sordoceguera. Como resultado, se propone un aula adaptable para ser implementada en las empresas con el fin de diseñar perfiles laborales para personas con capacidades especiales, reconociendo que esta población desarrolla habilidades fundamentales en el ámbito empresarial. El diseño propuesto incorpora características que consideran las necesidades específicas de estas personas, proponiendo un espacio funcional, factible, proporcional, libre de obstáculos, seguro y de fácil desplazamiento; con elementos que faciliten la orientación espacial y temporal de los usuarios, así como una adecuada iluminación, contraste, sonidos y texturas.

Palabras clave: Capacidades especiales, Ley 7600, accesibilidad, aulas de clase, aplicación empresarial, ceguera, baja visión o deficiencia visual.

➤ Abstract

This article aims to identify the specific educational needs and psycho-pedagogical guidelines required to support individuals with low vision and blindness, in accordance with current Costa Rican legislation—particularly Law 7600, the Law on Equal Opportunities for Persons with Disabilities. The study also draws on the experience of the Hellen Keller National Education Center of Costa Rica, an institution under the Ministry of Public Education that serves individuals with visual impairments and deafblindness. As a result, the article proposes an adaptable classroom model to be implemented in companies for the purpose of developing job profiles for individuals with special abilities, recognizing that this population possesses essential skills valuable to the business sector. The proposed design incorporates features that address the specific needs of these individuals, offering a functional, feasible, proportionate, barrier-free, safe, and easily navigable space. It includes elements that support spatial and temporal orientation, as well as appropriate lighting, contrast, auditory cues, and textures.

Keywords: Special abilities, Law 7600, accessibility, classrooms, business application, blindness, low vision or visual impairment.

1. Introduction

Cedillo & Fernández (2018) support the importance of implementing a Higher Technological Institute for the inclusion and education of people with special abilities in Arequipa, the second city in Peru with the largest number of inhabitants with disabilities according to the National Institute of Statistics and Informatics (INEI), and thus improve the quality of life of such people.

According to Dunlop Alan (2011), the opening of the HAZELWOOD school has been extremely successful. Students, both children and adolescents, are adapting positively to their new environment and showing remarkable progress. The school is supported by dedicated teachers in an institution that satisfies parents and provides them with a safe and secure environment. This world-leading school is a school for children who are blind and has an architecture adapted to the needs of this population and is located in the City of Glasgow, in the City of Scotland.

The total number of persons with disabilities in the world is large and growing. Therefore, the rights of these people have been the subject of great international attention and, within them, the rights of children with disabilities acquire special relevance (Nuñez & López, 2020). For which, the Convention on the Rights of the Child approved by the General Assembly of the United Nations establishes in its article 23.1 the following: “States Parties recognize that the mentally or physically disabled child shall enjoy a full and decent life in conditions which ensure dignity, enable the child to become self-supporting and facilitate the child’s active participation in the community.”

Likewise, Rojas-Devia (2017) states that blindness is the second disability with the greatest impact on society and states that worldwide there are between 40 and 45 million blind people, the figures continue to increase without considering people with reduced vision, indicating that they deserve a space for learning and developing through a process of exploration by developing activities and language of the city through the senses.

In Spain, the ONCE (Organización Nacional de Ciegos Españoles) has been working for 68 years to achieve the social emancipation of people with blindness or severe visual impairment (ONCE, n.d.). Therefore, Rodríguez (2017), acquires knowledge of the procedures followed by the Organization to provide the necessary support to children with visual impairment at the educational level and to know how to work with children in ordinary educational centers when they have the collaboration of any ONCE professional.

In addition, Sanmartino (2016) conducts his design study of a comprehensive signage program, for the classroom building of the Siglo XXI university campus, for sighted and non-sighted people, in which he manages to design a Comprehensive Signage Program for the classrooms of Siglo XXI University that contemplates the integration of people with blindness.

On the other hand, Calderón (2013) details several parameters for universal design, an architecture without barriers, establishing that this is necessary to consider, because visually impaired people are people like any other person only with an impairment so it is important to adapt a different design system for their benefit.

Likewise, Alvarado *et al.* (2016) determined through the results of their research that in Costa Rica there are few resources, production and adaptation services that exist for people with low vision or blindness, also at the national level there is no clear regulation in relation to this issue.

It should be noted that the Legislative Assembly of the Republic of Costa Rica (2013) establishes the term “Accessibility” as the measures adopted by both public and private institutions to ensure that persons with disabilities have access on equal terms with other people and the physical environment, also including the identification and elimination of barriers. Similarly, Morera (2011), indicates that one of the most relevant results was the fact that the University of Costa Rica (UCR) was making several positive changes in the different inter- university fields for people with special abilities, however, despite the initiatives, there was still no clear and defined north on how to manage actions related to gender, accessibility and disability.

According to the above, it is currently of vital interest to know what are the minimum infrastructure resources needed within a classroom in learning centers for the population with low vision and blindness, specifically in schools and colleges of the Ministry of Public Education (MEP) of Costa Rica, which will provide, through an analysis, a proposal to this population regarding the possibility of complying with the school cycles in more favorable infrastructure conditions and adapted to their needs. In addition, it will allow generating recommendations on the optimal design of an adapted classroom, also strengthening the acquisition of knowledge to these students, so that they can later be incorporated into more complex school cycles. The

purpose is also to use this study as a starting point to create job profiles in companies that consider people with special abilities, since this population usually develops valuable skills in work environments.

This research aims to demonstrate that, in Costa Rica, although this group with low vision and blindness has been provided with specialized attention using teaching methodologies with specific learning techniques, it has been difficult to optimally meet the needs of this population, because of lack of knowledge and scarce existence of adapted physical infrastructure in the different educational centers.

2. Methodology

The research used a qualitative approach because it provides in-depth data, interpretive richness, and unique experience. It also provides a point of view as an appearance or phenomenon unfolds. Also, Hernandez *et al.* (2010) indicate that this approach is used to describe or refine those issues involved in the interpretation process. To achieve the objectives, by focusing on the proposal for the creation of a classroom design with special infrastructure, a qualitative methodology of descriptive scope was employed. The analyses are based on the needs of students with low vision or blindness in Costa Rica.

To have a basis for the respective analysis and proposal, the author selected a case study about one expert in Costa Rica about the needs of students with low vision. In the process interviewed a visually impaired expert, Mr. Marco Chavarría R, who has a direct relationship with the Hellen Keller National Education Center of Costa Rica (CNEHK), an institution under the Ministry

of Public Education (MEP) of Costa Rica, established in 1985 as part of the reform of the former Helen Keller Training and Rehabilitation Institute, which had been operating since 1939. The CNEHK is responsible for providing care to the country's adolescent, youth, and adult population with visual impairment and deaf blindness, thus promoting their rights and welfare (Meléndez, 2020).

3. Results

Valuable information was obtained for this study through a bibliographic review and the interview with Mr. Marco Chavarría R.,

a visually impaired person, who is part of the Hellen Keller National Education Center of Costa Rica (CNEHK), an institution that serves people with visual impairment and deaf blindness.

Mr. Chavarría states that there is a population of different ages, from 18 to 65 years old, with visual impairment: low vision and blindness. He also informs about the support structure established by the MEP for the Costa Rican population, which includes the Helen Keller Institute, to provide academic, labor and functional support, the support structure summary is shown in the following chart:

Chart 1

Support structure established by the MEP for the Costa Rican population

Support structure established by the MEP for the Costa Rican population covered by the Hellen Keller Institute	Features
Academic	From 12-13 years old, a child who drops out of primary school and goes on to secondary school even in open.
Functional	From 12 years of age onwards, but with no age limit for adolescents or adults, it is necessary to retrain the user to learn how to move.
Labor	From 18 to 65 years of age, established retirement age for the Costa Rican population, applies to job placement.

Source. Author's elaboration based on an interview with a member of CNEHK.

In addition, the interviewee was consulted about the minimum infrastructure requirements that facilities for the blind and low vision population should have, and stated the following:

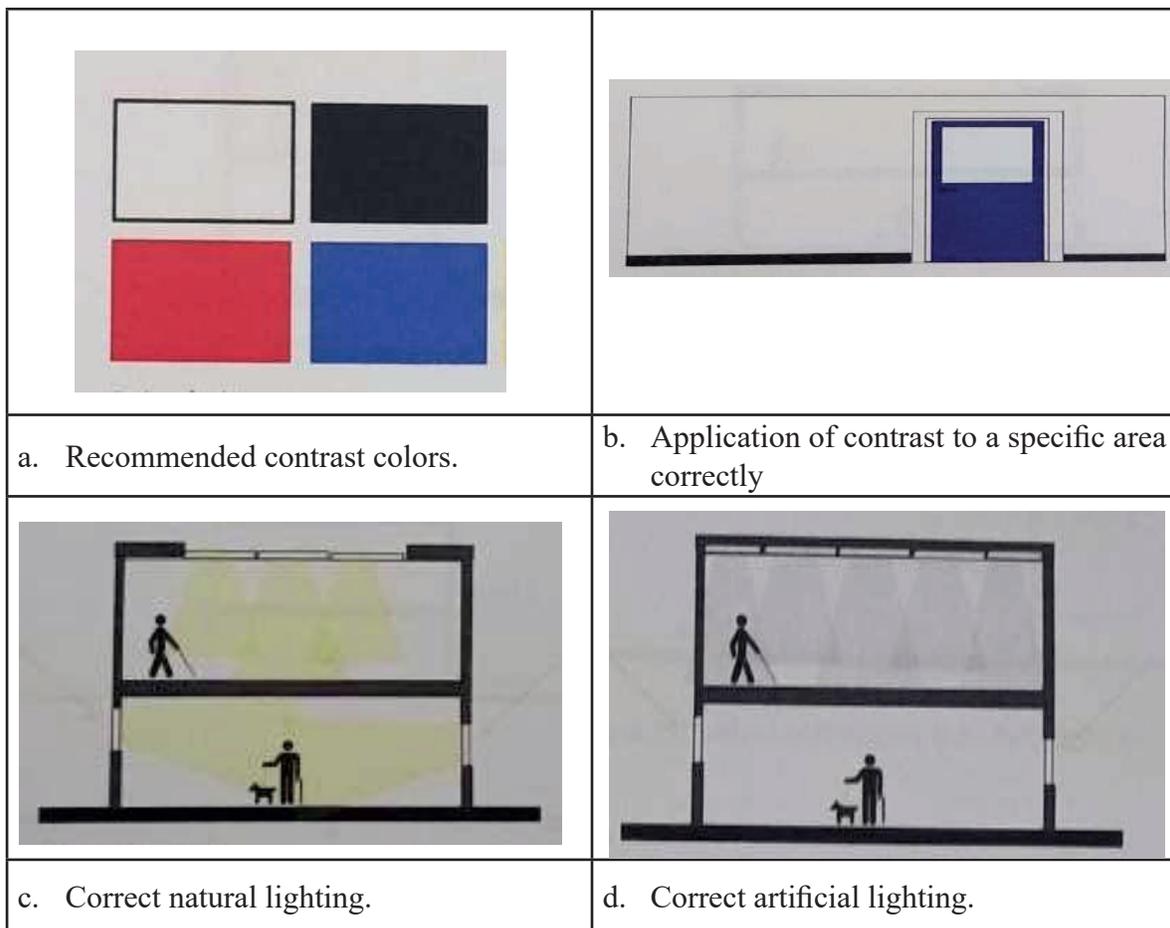
It should be noted that the Hellen Keller has restructured its facilities, which still do not achieve the required total adaptation, however, 'due to the objective of this research I must focus on classrooms in the educational system where ideally it should have the conditions for a visually impaired student to integrate. (Mr. Chavarría).

Likewise, Mr. Chavarría through the interview exposes the importance of understanding the difference between blindness and low vision, where blindness implies not seeing anything, it is equivalent to close your eyes and see against the light, some degree of light perception is manifested, but not functional light, while on the other hand; low vision works with more sensitive sensors, it

is affected by different factors such as: the position of the sun, the rotation of the earth, lighting colors, the height of the classrooms, etc. In addition, it emphasizes the minimum requirements for an inclusive infrastructure for people with low vision and blindness, such as the ways to apply contrasts and natural and artificial light, which are represented in the following chart:

Figure 1

Ways to apply contrasts and natural and artificial light



Source. Author's elaboration based on an interview with a member of CNEHK.

It can be observed that contrast helps to orient and distinguish between one environment and another. The use of contrast helps to define borders, wall limits, floors, windows, doors and furniture. Therefore, it is recommended to use colors that reflect light on walls, for example, white, as long as there are spatial elements of contrast that help to locate in space, such as a wide and linear strip halfway up the wall. On floors it is recommended to use opaque and non-skid materials with colors that absorb light.

Regarding to lighting, natural light provides a more thermal aspect and offers a stimulating connection with the exterior, which is very variable and this presents advantages and disadvantages, since depending on weather conditions, the different times of the day and the seasons make the spaces changeable. Although, the artificial light should provide brightly lit spaces where there is no shadowy gloom, as this phenomenon disorients visually impaired users.

On the other hand, Mr. Chavarría was asked during the interview if considers that Costa Rica has given more interest and effort to cover the needs of the blind or low vision population, at a pedagogical level, and if

considers that it has given importance to the minimum physical conditioning necessary to serve this population; He answered that it is necessary to take into account 2 things, the truth and the politically correct, but that unfortunately at the present time in Costa Rica neither of the 2 applies, due to the fact that in terms of infrastructure, they are engineers, architects who do not know what a disability is until they enter in context and which they are hired by “inopia”, it means when a candidate is hired even though he/she does not meet the requirements of the job position, due to the fact that after a selection process has been carried out, there are no candidates who meet the required conditions and there is an urgency to fill the job position. He explains that currently there are many people who do not know what they are doing and unfortunately students with special abilities become a center of experimentation.

Mr. Chavarría provides his point of view on the most relevant aspects that can be improved at the infrastructure level, which should be used in the different institutions that serve the blind and low vision population, which are reflected in the following chart:

Chart 2

Most relevant aspects at the infrastructure level

Daylighting management	Contrast	Efficient classroom construction guide	Extensive furniture
Angle of natural sunlight.	Dark floors and furnishings.	In which the most appropriate classroom for the needs of people with visual impairment is established and designed.	Wide table and with veins on the edges.
If the building is very tall, overlap between light.	Light walls, white-board and curtains.		Wide doors Wide spaces between furniture to be able to move around.

Source. Author’s elaboration based on an interview with a member of CNEHK.

According to the above, the proposal of the present study is based on putting into practice the recommendations provided by Mr. Chavarría and having commitment and professional quality.

Proposal

The following design proposal is proposed according to the recommendations and the study conducted. The design of the proposal includes all the recommendations from the study and the interview with Mr. Marco Chavarría, who is blind and lives closely the experience of students with this special ability.

Proposed classrooms

- a. A 10 cm thick texture guide will be used to contrast with the color of the floor, which will help the user to locate the table and chair.

- b. Walls should be matte white.
- c. At 90cm from the floor it will have a guide texture that, on the wall surface, will help the user to distinguish the depth of the room.
- d. Each classroom should have openings that allow for filtered natural lighting and ventilation. They should avoid glare and reflections; it is recommended to use curtains in case of weather changes.
- e. The luminaires will be recessed in the ceiling and should generate light overlap.
- f. Each room will have built-in wall cabinets with sliding doors to avoid interrupting circulation.

The subsequent figures are generated as a proposal for the adaptable classroom, Figure 1: Plan view of Model Classroom and Figure 2: 3D view of Model Classroom:

Figure 2

Plan view of Model Classroom

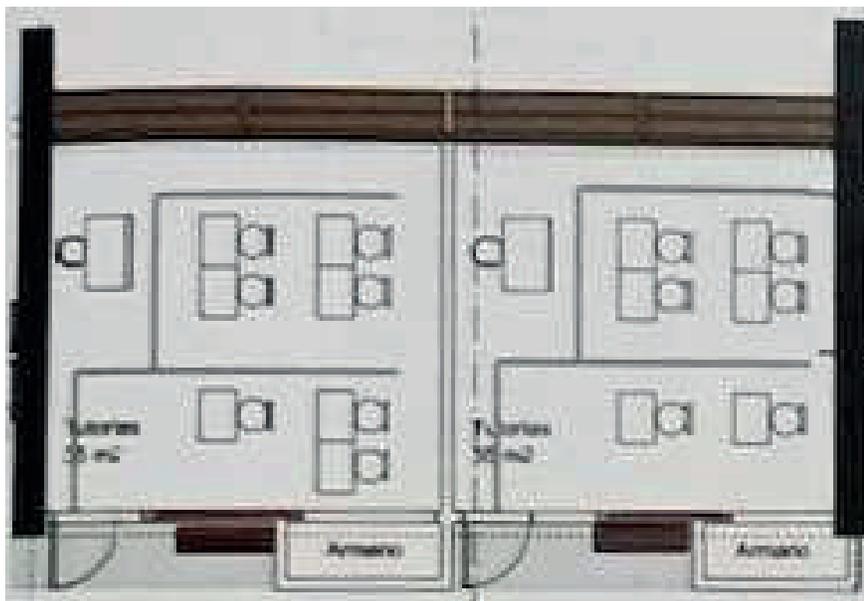
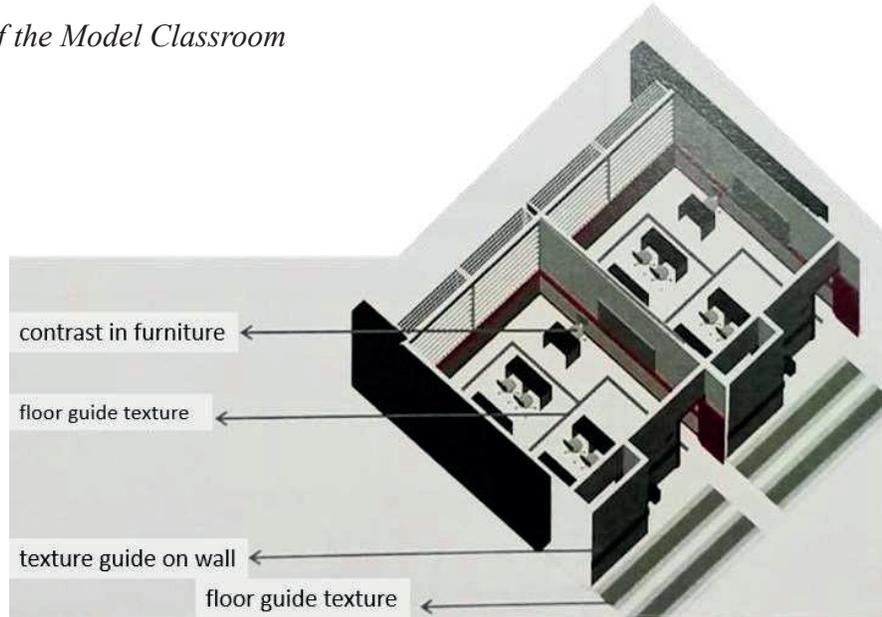


Figure 3*3D view of the Model Classroom***Recommendations**

It is essential for users with blindness and low vision to know, live and feel the world in which we live, for blind and low vision people, this is built on the basis of tactile sensations, impressions that convey ideas, for them every object is linked to these tactile qualities that provide power, beauty or even discordance.

For this reason, it is essential to propose spaces that meet the needs of users. Among the recommendations proposed for the Ministry of Public Education (MEP) of Costa Rica to implement in educational institutions are:

- A coherent design: designing a space of comfort for the user in terms of proportions will help the user to recognize and remember the space, which should be functional, feasible and flexible of use.
- Simplicity and clarity of circulation: it must be clear and easy to remember; it must contain clear connections between spaces for its efficient mobilization.
- Use of color and its contrasts: to help orient and distinguish environments.
- Visual, tactile and auditory warnings: the space must provide clues so that the user knows where to go, elements that orient and avoid any type of risk. Use of Braille language system and surfaces with relief that allow perception, mobility and orientation, sonic that allow the use of auditory technology.
- Natural and artificial lighting: openings that allow filtering ventilation and natural lighting, these must avoid reflections and glare, there will always be light overlapping in the case of artificial lighting.

4. Discussion

The knowledge acquired at the academic level is scaled to companies for the achievement of organizational objectives. With the present study, what is learned in the classroom proposal adaptable to the needs of students with low vision or blindness, can be used as essential basis to be applied in companies, specifically for the design of job profiles.

It has been shown that, through job profiles of people with special abilities, other skills have been developed which are essential for companies, so that when companies hire this population, they acquire a loyal collaborator to the organization, achieving the loyalty of internal customers.

It is transcendental that the laws or guidelines for equal opportunities for people with special abilities, such as Law 7600 in Costa Rica, are learned and applied in an optimal way from school and university, in order to achieve an integral development in the business sector and institutes.

Through the correct adaptation and adoption of equality laws, the next generation will be educated to improve in the design of job profiles, due to the level of awareness that will exist related to the population with special conditions, such as visual, hearing, speech problems, etc. This knowledge will allow job profiles in the future to be more sophisticated, providing more solutions and improvements due to the implementation of Artificial Intelligence and Technology, which will provide great benefits by being more inclusive in companies and in the education sector, generating more possibilities for citizens.

This study provides an understanding of the current functioning in Costa Rica related to

the educational infrastructure for the visually impaired and the conditions of adaptation available to them.

Likewise, in Costa Rica is definitely essential the understanding and application of comprehensive education for people with visual impairment: low vision and blindness; nevertheless, currently they have been determine different needs that not contribute to the appropriate inclusion, there is a latent need in the educational environment that not permit to provide adequate conditions, such as infrastructure limitations that do not allow for adaptation according to needs of people with low vision and blindness at a national level.

It is worrying to state that the vast majority of institutions in the country under study, do not have the curricular psycho-pedagogical guidelines or the structural and logistical factors of the physical space required by students with low vision and blindness. Unfortunately, there is limited material and even practically no help on this area to be able to provide adequate guidance, which generates the lack of knowledge regarding to visual impairment.

This research provides a valuable contribution in response to how to create classrooms adaptable to the specific needs of students with low vision and blindness, it is proposed to use this document as a guide for the comprehensive care of this group of people. In conjunction, to use the proposal idea of a classroom to be adjusted as a reference for companies, specifically in the creation of job descriptions, providing to this population with the right of realization and in the same way, being benefited in the business environment with the different and unique capabilities that this population develops.

5. References

- Alvarado Barrientos, V., Calderón Quesada, M., Chaves Serrano, M., Ortega Sánchez, M., Sánchez González, C., & Ulate Solís, I. (2016). Study on the supply of accessible bibliographic information resources for people in condition of blindness or low vision at national level to the year 2015.
- Calderón Montalvo, A. V. (2013). *Training school for people with visual impairment* (Bachelor's thesis). Pontificia Universidad Católica del Ecuador.
- CDV, workshop for blind and visually impaired children.*
- Cedillo Laguna, M. C. (2018). *Higher Technological Institute for the training and inclusion of people with special abilities in Arequipa.*
- Chavarría, M. (2023, July 22). Specific infrastructure needs for learning for the visually impaired [Personal interview].
- Dunlop Alan (2011). *Metalocus* (n.d.). *Hazelwood School*. Retrieved from <https://www.metalocus.es/es/noticias/escuela-hazelwood>
- Hernández Sampieri, R., Fernández, C., & Baptista, P. (2010). Chacón, J. (Ed.), *Metodología de la investigación* (5th ed.). Peru: McGraw-Hill.
- Legislative Assembly of the Republic of Costa Rica (2013). *Law on Equal Opportunities for Persons with Disabilities and its Regulation No. 7600* (4th ed.). San José, Costa Rica: Editorial Investigaciones Jurídicas.
- Meléndez-Rojas, R. E. (2020). Linkages between social-constructivism and the curriculum of the Helen Keller National Education Center of Costa Rica. *Dissertare Revista De Investigación En Ciencias Sociales*, 5(1), 1-24.
- Morera, M. R. (2011). The dimensions of accessibility at the Universidad de Costa Rica Sede Rodrigo Facio, an approach from the perspectives of disability and gender. *Reflexiones*, 90(2), 71-88.
- National Council of Persons with Disabilities (2017). *Law 8661: Convention on the Rights of Persons with Disabilities*. Retrieved from <http://www.cnree.go.cr/>

Núñez, Á., & López, M. (2020). Identifying support needs for learning and participation of university students with visual impairment: a narrative biographical study. *Quality in Education*, (53), 42-76.

ONCE (n.d.). *Let us help you*. ONCE. Retrieved from <https://www.once.es/dejanosayudarte>

Rodríguez Fernández, A. C. (2017). Students with visual impairment: analysis of the educational support procedure carried out from ONCE.

Rojas Devia, L. V. (2017). Visual Architecture: the formal expression of the spontaneous.

Sanmartino, S. (2016). *Design of a comprehensive signage program, for the UE Siglo 21 campus classroom building, for sighted and non-sighted people* (Doctoral dissertation).