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Methodological Experience in the Teaching-Learning of the English Language for Students with Visual Impairment

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Abstract: This document evidences an innovative methodological vision in the teaching-learning process of the English language focused on the inclusion of all its students in a heterogeneous learning environment. Learning a foreign language as a second language is a challenge that all students must overcome, but this challenge is more significant in visually impaired students. Therefore, the present research is based on a historical, descriptive process that reviews high-impact scientific articles supported by recognized databases. Later on, it warns about breaking down the stages of the process, supporting the analytical method, and then joining each stage, starting from the simple to the complex using the synthetic method, thus consummating a complete analytical-synthetic process. In this way, the present work shows a description of the methodological experience from a set of good practices for visually impaired students in the classroom environment. The proposed work systematizes the methodology applied in the educational process and categorizes the stages of the methodological process developed according to the skills and abilities required for learning by using typhlo-technical tools. On the other hand, the research determines a route map that allows and facilitates the management of the method implemented in learning the English language for students with visual impairment. Consequently, this constitutes a valid alternative for educational inclusion within an innovative environment that welcomes the use of information and communication technologies to achieve the natural inclusion and autonomous participation of students with visual impairment.

Keywords: visual impairment; educational innovation; special education; educational inclusion; information and communication technologies

Citation: Cárdenas, J.; Inga, E. Methodological Experience in the Teaching-Learning of the English Language for Students with Visual Impairment. *Educ. Sci.* **2021**, *11*, 515. https://doi.org/10.3390/educsci11090515

Academic Editor: Eila Jeronen

Received: 27 July 2021
Accepted: 30 August 2021
Published: 7 September 2021

1. Introduction

A globalized world is called for to ensure that new cultures and languages touch the lives of an increasing number of people [1]; therefore, the English language as a universal language has become an indispensable tool for personal communication and professional mobility into national or international environments, even in social relationships with other cultures, and more in current times with free access to information.

People with visual impairment are at a total disadvantage because the Braille system or audio recorded materials do not make it easy enough to find all the information required and available for true social inclusion since the student conglomerate is very heterogeneous [2]. In addition, the teacher must consider this issue before their academic planning because cognitive skills develop differently in each human being [3,4].

It should be emphasized that the educational needs presented by visual impairment students (VIS) are heterogeneous, as is the blind population itself [5]. Higher education institutions (HEI) are obliged to offer the necessary support and adaptations [6,7], not only

for able-bodied students but for all in an inclusive English language learning environment, achieving true educational inclusion [8].

Special education not only requires a special education evaluation to achieve adequate educational management for human beings with functional diversity or a particular disability, but it also requires being inclusive from traditional educational environments. There is the possibility of using information and communication technologies among the skills that a teacher needs to learn and apply in the classroom environment to generate a teaching-learning process for children, youth, and adults with disabilities; thus, this refers to an educational innovation impact [9,10].

Additionally, it is considered that for acquiring a second language, it is essential to develop different skills, both receptive (listening and reading) and productive (speaking and writing), which could be evaluated in different scenarios to verify effective learning. In that case, it becomes an unavoidable challenge for a teacher who traditionally has had students with full capabilities. When he/she faces an inclusive policy, he/she does not know how to achieve and articulate a classroom to integrate both types of students (abilities vs disabilities) [11,12].

As a consequence, this paper proposes generating a road map that allows a language teacher to conduct himself/herself effectively in traditional and virtual environments that facilitate an effective inclusive education, moving from a political and governmental disposition to a practical and authentic option.

Visual impairment students must confront the need to learn to cope with and overcome the barriers that are presented to them in different learning environments. These barriers limit the options for active and autonomous participation among students with or without visual impairment in order to achieve true educational inclusion [7,13]. Likewise, to facilitate English language learning to VISs, it is required to incorporate new methodological strategies in the teaching-learning process of the language [3,14,15]. This situation leads to new challenges and challenges to teachers, who are faced with the need to motivate and maintain the attention of students who do not have such disabilities. This is an important task that cannot be neglected in a learning environment [16]. Students need guidance and accompaniment that motivates them to develop their skills and abilities to focus on obtaining significant achievements that increase their knowledge-generating competencies, which enable inclusion in traditional and everyday environments where they can develop without any inconvenience in both [17] personal and professional daily activities.

The learning of a second language other than the mother tongue is another crucial variable that must be taken into account with VISs due to the lack of didactic resources available in educational institutions to ensure the inclusion of this group of students in learning environments shared with the rest of the students who do not have a visual impairment or low vision. For this reason, it is essential to incorporate a road map that facilitates the teacher's task of guiding and accompanying the learning process of VISs. This accompaniment has to be carried out in communion with an excellent methodological practice that necessarily incorporates emerging technology [18,19], through emerging typhlo-technical tools [20], relying on the principles of a vision of Education 4.0 to achieve a true educational inclusion of the VISs, reducing the time spent and encouraging them to enter a cooperative-collaborative learning environment [8].

Lastly, the article is organized as follows. Related work is described in Section 2. The problem formulation is explained in Section 3. The road map and result analysis is provided in Section 4. Finally, this article will be concluded in Section 5.

2. Related Works

As it has been noted, special and inclusive education refers not only to a single special education assessment process. Currently, it requires a comprehensive proposal that involves using technological tools, which are accessible, easy to use, relevant, and interactive, and the use and application of free software that allows us to have a global vision of the specific topics to be addressed. Likewise, the applications should be designed for different

technological devices and the predisposition of teachers in order to learn new didactic strategies for inclusive classroom learning environments. Building a road map aimed at multiple or specific disabilities that generates a pragmatic contribution of inclusion for these students and, on the other hand, incorporating an added value to the curriculum of a traditional teacher who faces reality in the teaching-learning process and manages to include the VIS in a shared environment with the rest of the students are tasks of the institution. Technology support has made it possible to overcome many barriers in the educational field for the VIS; for instance, it is possible to refer to the study conducted by the authors of [21] on the different educational strategies of inclusion. They made oral adaptations to a model of teaching a foreign language.

However, work in pairs and groups found disadvantages because the instructions were given through signs and were not accessible to the VIS. The recorded audio exercises had to be listened to in an isolated classroom so as not to interrupt the rest of the students. When the teacher wrote on the blackboard, he/she had to read in a high tone so that VISs would understand, and evaluation was focused on listening and speaking skills. Reading and writing skills were not evaluated; much time was needed to make necessary adaptations for the VIS, and teachers must be trained to make them.

On the other hand, the existing technological assistance at present has increased, especially concerning information technology in education [22], to provide proper solutions.

Furthermore, technological devices are increasingly being coupled and built according to the different needs of people with visual impairment [23], using accessible resources, implementing simple navigation [24] and safe portability, reducing the maximum weight, and ensuring ease of use and an economically achievable cost [25] in order to overcome the existing barriers [26], reduce the digital gap, and help individuals achieve autonomy in their personal and professional development.

A study conducted at a cross-cultural level [27] warns of the needs of people with visual impairment. Thus, low vision and deaf-blindness should be understood for the development of automation, control, and assisting technologies that can be applied internationally and meet the current requirements of the knowledge and management of technology [28] to help individuals develop their skills and abilities to be socially productive entities [29].

The present work is focused on sharing a methodological experience through good practices in teaching English to VISs, based on the use of technology and different typhlotechnical tools which have been a fundamental support for accessing information and the management of didactic material adapted, which has been reviewed and validated by visually impaired people, respectful of the rights of persons with disabilities, i.e., "Nothing about us without us". In addition, the active participation of the VIS is promoted, and they move from passive and receiving entities to active and productive entities of their knowledge.

It is worth mentioning that the VISs performed the same activities, tasks, and work in pairs or groups, and they were even evaluated with the same instruments as the rest of the students in the classroom. The difference is that the VISs had to be provided with a laptop or PC desktop with the JAWS software and a respective set of headphones, and the evaluation instruments adapted to digital form had to be installed on the computer. Afterwards, it must be removed to be evaluated; if necessary, additional time was provided for them to comply with the planned activity.

Figure 1 presents the summary of the concept of educational inclusion for VISs within a traditional classroom environment, thus allowing for an actual, pragmatic, and non-bureaucratic educational inclusion process, which moves from a political decision to act and the direct relationship between the teacher and the VIS.

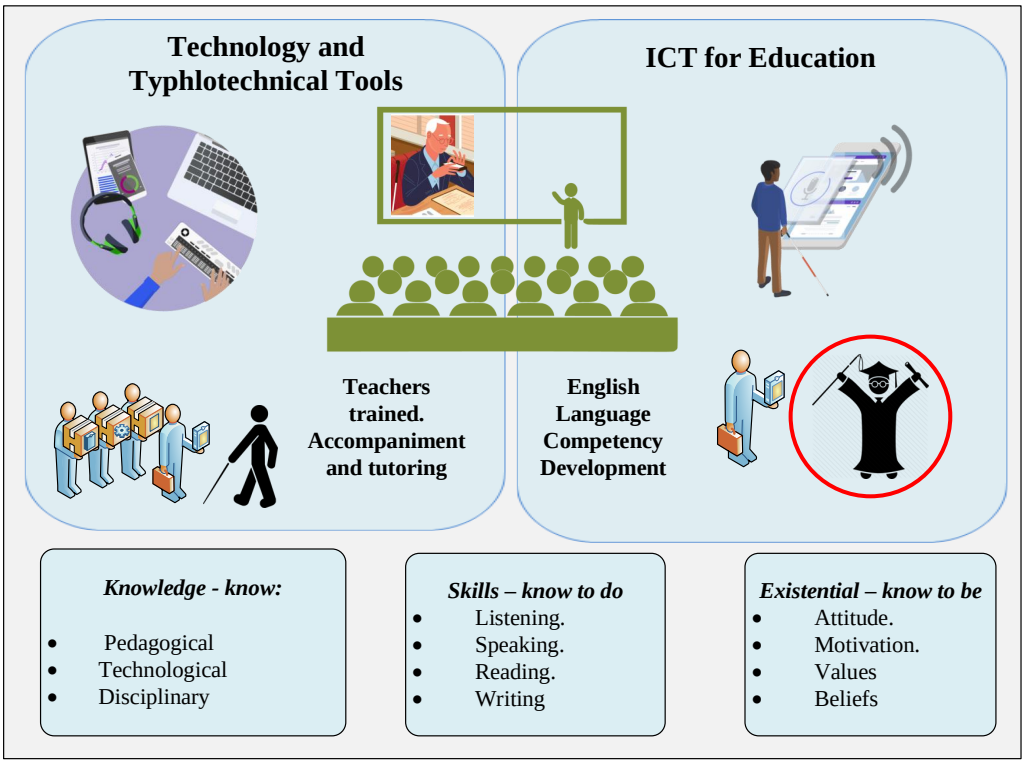


Figure 1. Concept of inclusive education for VIS in English language learning. Source: authors.

In the last decade, information and communication technology (ICT) has become an inseparable ally of students' academic activities. It allows them to have access to information independently [30], and intelligent devices [31] as technological support tools [16] play a fundamental role for VISs through the different advantages of applications that allow them to be in direct contact with information in a learning environment.

However, it should not be denied that there is also resistance to the use of information technology or the use of typhlo-technical tools [32] by students and teachers, as noted by [22], due to the lack of adequate planning.

With the non-existence of curricular programs for VISs, students according to their condition do not know how to use emerging technology. There is a lack of technological resources available to each student, teachers are not adequately trained and do not know how these technical tools work, and there is a lack of knowledge in the application of new pedagogical strategies and didactic methods to develop different skills and abilities that can be applied in a learning environment by the teacher for real educational inclusion.

There is a lack of knowledge and training in the usage of technologies and an ignorance of the needs of VISs by teachers who create educational barriers that influence the academic performance of the students, such as the usage of texts with photographs, pictures, and pictographs, etc. On the other hand, some students use the technical tools "Non Visual Desktop Access" (NVDA) and "Job Access With Speech" (JAWS), but they are not enough if there is not a positive attitude of the teacher and a predisposition for self-training and being updated with the use of technological tools. In addition, the lack of these technological aids increases the barriers in VIS learning. Additionally, the lack of methodological strategies to motivate students has increased barriers.

It should be taken into account what authors such as [33] mention in their studies; nevertheless, there is a negative attitude concerning VIS inclusion by some students who do not have any disability. However, they have shown that if teachers possess the skills, knowledge, and techniques to achieve inclusive education, it is possible that VISs might academically have better results than other students.

This has already been mentioned by [34]. The youth of this time need to be connected to the Internet to perform their usual activities. VISs also feel this need because they have to adapt to the development of technology; to the access and navigation facilities that allow for typhlo-technical tools, such as JAWS and NVDA programs, which facilitate the use of information technology; and to the access to different apps such as WhatsApp, YouTube, and Google social networking. In other words, in satisfying the need for communication, searching for information, or accessing entertainment, technology has had positive and far-reaching effects in improving the quality of life and equity between VISs and their sighted peers [35].

The work of [36] proposes the use of a computer program with a didactic approach based on communicative English for people with visual impairment. This program is characterized by the Russian keyboard letters found in the center row and is known as the "ten-finger typing method" or tactile typing based on the touch method used by pianists. This method can be used to learn other subjects, too, not only for languages as the authors mention. It achieves an inclusive education for VISs called APROL.

It is worth mentioning the different research conducted by authors such as [37] and their novel method of communication and interaction between the Braille system and technology. Another device consists of a smart glove that translates the Braille alphabet to text by tactile sensors placed in the palm of a glove converted into text by a PC or smartphone. The devices have low-cost assisted technology for people who have deaf-blindness. Additionally, there is innovative Braille display equipment that translates text to Braille and also text to audio to be heard by a smartphone. However, without a doubt, innovations such as the OrCam MyEye are the revolution for VISs converting text into an audio message that reduces English language learning time for VISs.

3. Problem Formulation and Methodology

This document includes a process of good practices to achieve an inclusive VIS education in a public or private higher education institution (HEI).

The research scenario was developed with VISs at Salesian Polytechnic University of Ecuador in Quito, during the academic periods between 2016 and 2020, through a project of educational inclusion, visual impairment, and educational innovation using ICT in communion with typhlo-technical tools.

The methodological process of bibliometric and qualitative character aims to find results that account for a route with the best performance for teachers and VISs from strategies employed to teach English. The method used is based on surveys to the main actors of the educational process and incorporates a systematic analysis.

The data collection technique for the bibliometric analysis was based on the Web of Science and Scopus databases. The best documents were obtained to build the state of the art, which was determined by keywords such as visual impairment, technological devices in use, ICT associated with English learning, and inclusive education. Subsequently, with this technically filtered information, a qualitative assessment was performed to reach a data collection technique based on a Likert scale survey to determine the degree of success and effectiveness of the technological strategies applied by teachers and available for both the institution and external VISs.

The data of the exhaustive bibliometric analysis on inclusive education and its direct relationship with VISs allow us to determine the incidence by authors, universities, and countries and its impact generated in the scientific community. The VosViewer software was used to obtain the most relevant scientific information, which was ordered by the publications with the highest number of citations from Web of Science and Scopus.

To perform the bibliometric analysis in scientific networks to obtain this information, the freely available VosViewer software and a computer with an Intel® Xeon® CPU E3-1535M 2.90 GHz processor and 64 GB of RAM were used. Web of Science and Scopus databases were used for this study, which were related to the highest impact.

Additionally, a qualitative analysis was used that evidences coincidences concerning the problems in achieving an educational inclusion of VISs and even more when learning a second language through QDA Miner. In parallel, a scheme or a road map is generated that involves the most critical stages for teachers and students around the teaching-learning process of the English language in university environments.

Finally, a survey involving the Likert scale was generated to directly know the relationship of the proposed scheme as a strategy for the language institute of a private higher education institution. The survey was determined for three scenarios: (a) students of the HEI, (b) external students, and (c) teachers of the language institute.

This fact is given since we mention digital applications such as Podcasts, YouTube, Gamification, MakerSpaces, QR Codes (Unitag), cloud sites, 3d environments (Virtway, Virbela), interactive presentations (Genially), and digital application agendas (Symbaloo), from which alternatives could be generated, each one more suitable than the other, depending on the scenario in which it is developed.

Figure 2 incorporates a road map, and it is based on the minimum steps required to achieve the educational inclusion of VISs in the English language learning process; it incorporates the stages that the teacher and students must follow and complete, accompanying emerging technologies and the most relevant information and communication technologies in the process.

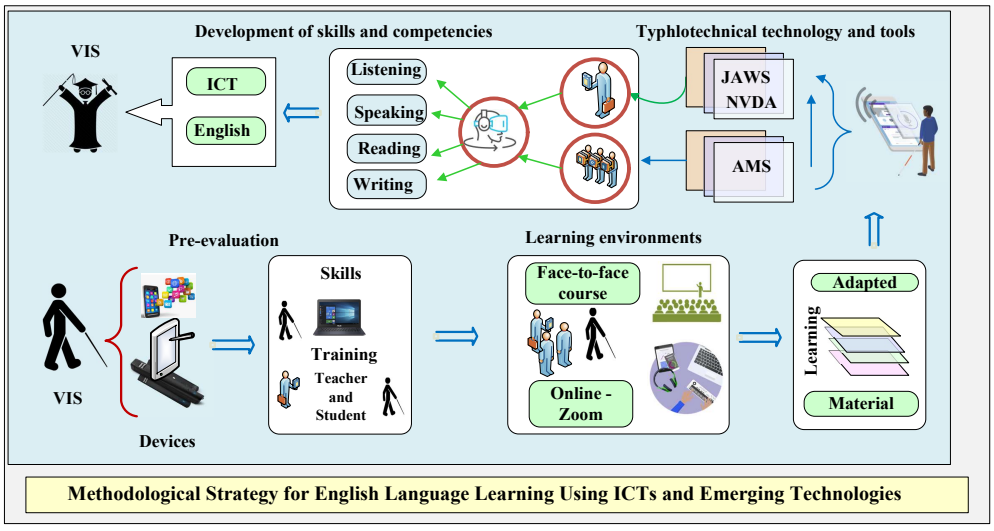


Figure 2. Outline of the road map for learning English for VIS. Source: authors.

It is necessary to note that a process of good practices in the teaching-learning process implies the predisposition of the teacher, the VIS, and the HEI. It will also be determined by the teacher's interest and motivation and the inclusive methodology that can be appropriately varied and planned within a flipped learning model.

In addition, the teachers must consider the material adapted, which is available to the VIS, including the use of e-books and open-use educational resources placed on learning management platforms or LMS. Thus, the adaptation of learning content can incorporate free-use digital content curation phases. The search, selection, adjustment, adaptation, organization, and dissemination can be incorporated to move to a phase of filtering, grouping, and sharing technological resources for VISs.

The present work proposes that to obtain a genuinely inclusive education that incorporates VISs in English language learning, there should be no differences in the learning process between VISs and those who have complete vision since having reached higher education is an achievement. They have overcome many academic barriers and previous complicated stages to continue with their higher education studies.

It is worth mentioning that in order to reduce the existing differences in the heterogeneous group of students by a great extent, it was necessary to create connectivity with the VISs in a learning environment that facilitated the generation of knowledge from a true revolution with the use of technology and typhlo-technical tools that allowed us to reduce the time involved in traditional methods of learning English with the Braille system.

The impact of both emerging technologies and information and communication technologies (ICT) had to be inclusive, allowing the teacher to experience educational innovation by applying effective good practices. The research professor had to investigate and to know how to incorporate technologies; include them in the learning environment, defined as a living environment; and have the motivation to advance in a VIS professional career.

Among the necessary components that had to be included within the good practices were those directly related to a process of change: necessary adjustments or appropriate adaptations in the didactic material as a bridge of connection to achieve meaningful learning and motivate students to continue developing their skills and abilities in the acquisition of knowledge of the English language.

Therefore, several aspects were considered to ensure the accessibility of the material, such as the elimination of images and photos, following a logical sequence regarding the page numbers, review and correct editing of the content, eliminating columns, and inserting the information vertically according to each context of the sentence or message in order to have a logical and coherent sequence of information. The tables should be described so that VISs can understand them, along with other components to be interpreted that the JAWS screen reader cannot identify or read logically.

In adapting the practice exercises and reinforcement of the acquired knowledge where students must choose for answering or completing some exercise, it is recommended to use three suspension points after each sentence, question, or alternative so that VISs can write or answer using the letter R (for right), that is, so the VIS has total accessibility to the information for his/her active participation in developing the four skills necessary in language learning, which are listening, speaking, reading, and writing.

In addition, the information that was in the tables had to be rewritten, an adaptation of all practical activities was used in the process, and hyperlinks were used to facilitate navigation between the different files. We are very convinced that no adapted material is adequate for VISs; however, it is adequate to help their learning process, and they feel motivated to understand that they are in the same conditions as the rest of the students regarding access to information as academic support in the learning of the English language.

The process of adaptation and appropriate adjustments of the didactic material in use for each learning level was done from level A1 to level B2 according to the Common European Framework of Reference (CEFR) for language learning and the curriculum career requirements in the HEI. The study population was 13 students with visual impairment during the eight academic periods of the study that they had to fulfill from 2016 to 2020. In addition, the English teacher participation was necessary to achieve this objective. A total of 61% of teachers had had in their classrooms in some academic period a VIS, and 39% were directly involved in adapting and adjusting the material. Additionally, the collaboration of the blind staff who work in the institution's typhlo-library was also involved in validating the adapted material.

All the adapted didactic material had to be validated by blind people (it is advisable that the reviewers are blind people with knowledge about the English language in order to obtain an effective and full validation according to their needs); otherwise, a teacher from the English institute must accompany the blind people to help them validate the resources. The objective of validating is to guarantee full operability, functionality, accessibility, and easy navigation between the different files and documents.

Consequently, to manage this material, a guide was elaborated to follow a navigation route that facilitates the accessibility and use of adapted didactic material, using the JAWS program, a screen reader. Currently, this software is the most recommended for VISs to have access to information and to be able to work both in the classroom and autonomously

from home; additionally, the necessary technological tools must be provided, such as a PC adequately equipped with the JAWS screen reader, audio players, a set of headphones, text to mp3 transformation applications, and finally an installation of the digitally adapted didactic material on the computer.

Then, we can define a set of strategies within the teaching-learning process for VISs, among which we can cite: (a) teachers should be incorporated into the learning process of ICT for education, among which relevant aspects are denoted as web tools for e-learning, pedagogical innovation based on ICT, gamification and simulation, and educational research and learning management systems (LMS), but without discarding the advances defined as Education 4.0, mobile learning or m-learning, educational neuroscience, education and social development, and the management of educational innovation projects considering inclusion, where the participation of VISs and students without disabilities is noticed; (b) the HEI must contribute with access to scientifically relevant technology and with results obtained in the practice of the English language for VISs, which will imply motivation and will generate suitable environments to acquire new knowledge; and (c) VISs are responsible for assuming the challenge to join continuous training courses in the use of ICT for education that are suitable not only for the academic training of VISs.

4. Analysis of Results

Based on the results obtained, this document shows the need to incorporate ICT and typhlo-technical tools that generally facilitate academic management in HEIs and, in particular, that motivate English language learning in an inclusive learning environment.

Figure 3 shows the methodological strategy in English language learning, which is focused on achieving meaningful learning based on the incorporation of didactic material adapted according to VIS needs in communion with the ICT tools.

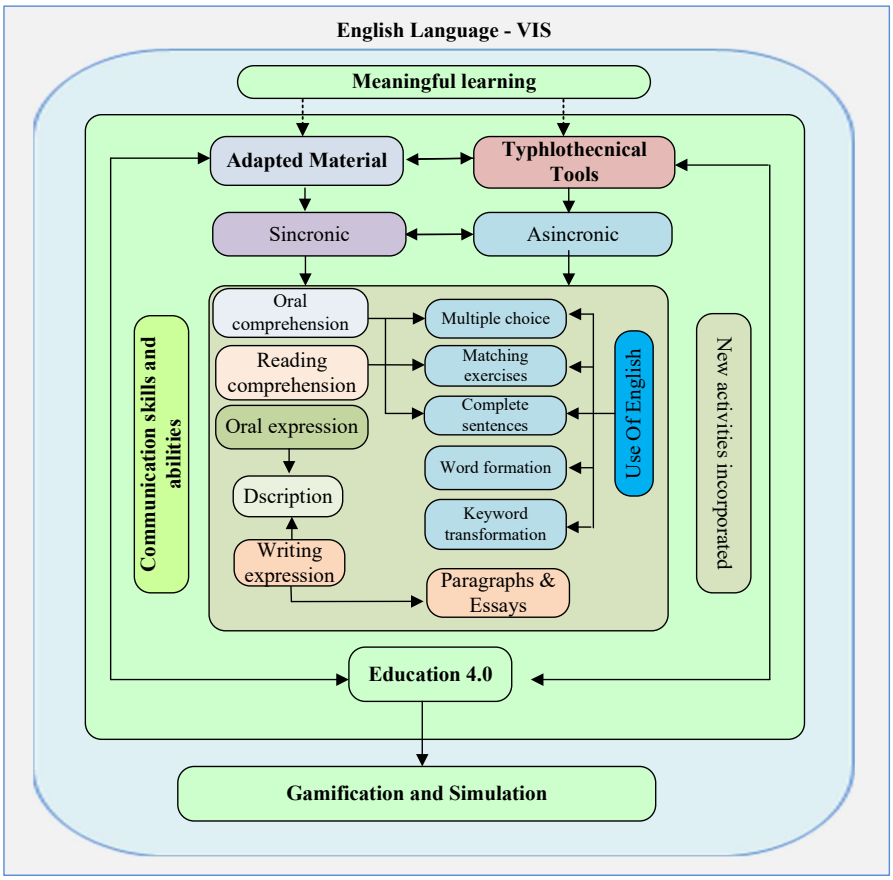


Figure 3. Methodological strategy of English language learning for VIS. Source: authors.

The accessibility of information as academic support in English language learning through technology has allowed VISs to perform previously difficult or unattainable activities to develop and evaluate their educational progress.

Among these, we have the writing skill, which was previously left aside to be evaluated, because the teacher needed to know the Braille system for this skill to be evaluated, or else the VIS would dictate to another person to write: in other words, assisted work.

On the other hand, reading comprehension through the Braille system only contemplated the development of the stimulus of the touch sense, as opposed to the current typhlo-technical tools that allow the development of another stimulus, the hearing sense, which allows VISs to respond to reading activities in different formats.

In the same way, this strategy has allowed the incorporation of additional academic activities to develop the different skills and communicative abilities, making their participation active and autonomous, eliminating assisted work in synchronous or asynchronous learning.

It is worth mentioning that it was essential to practice the innovation and changes that Education 4.0 offers us through its didactic tool known as the gamification technique, which allowed us to increase motivation through sensory games, orientation, and mobility.

The use of emerging technology and appropriate materials placed in the service of a VISs has not only allowed them to reduce time in the English language learning process, but it has also incorporated a clear and functional alternative for classroom environments to be transformed into inclusive learning environments.

After adapting work, implementation, and generating a road map, the result of the systematization has been to generate autonomous, secure, and confident students who can interact and socialize with their teachers and classmates in daily and reinforcement activities using the English language during and after class.

Based on the experience acquired during this process, it can be mentioned that there is an urgent need for teachers to be trained in the use of emerging and alternative tools. This means that their "disciplinary, didactic and pedagogical knowledge" is not enough; it is also necessary to incorporate in their training the technological knowledge and management of typhlo-technical tools.

The Web of Science (WoS) database has been taken into account for this study, which implies a higher degree about others such as Scopus. On the other hand, Table 1 highlights the relevance at the world level in the field of visual impairment, where the top five, which can be evidenced with countries such as the U.S., the U.K., Australia, China, and Germany, give clear perspectives of who leads convincing results concerning VIS inclusion in the teaching-learning processes. The universities that have excelled in the scientific field are also evidenced, an essential factor that will serve for future scholarship in education in close relation to VISs, since capturing the knowledge of the most developed countries and the most relevant universities will be an added value for developing countries.

Table 2, in the same way as Table 1, but now using the Scopus database, exposes a new ranking of the five countries as the U.S., the U.K., Australia, Canada, and Holland, changing the position for the fourth and fifth place countries, respectively.

However, the top three countries are maintained in both analyses. The universities do change; in fact, first place is maintained for both databases. Likewise, another relevant factor to consider is the contributions of the countries and the universities that support this type of study that relates to VISs and the teaching-learning processes.

The present research results contribute to the generation of an additional road map that should be focused on the immediate future through scholarship in the field of visual impairment for HEIs, teachers, and VISs. Additionally, it contributes with a clear and timely policy to innovate education and generate an inclusive environment of a socio-affective and motivating nature.

The evidence found, not only of an empirical nature but also of a technical nature, undoubtedly contributes to promoting research environments in the use of new ICT for VISs, improving the quality of the teaching and learning process of the English language at uni-

versities, and facilitating the acquisition of current knowledge from diverse sources in a universal language that contributes to the social enrichment for VISs in a developing country.

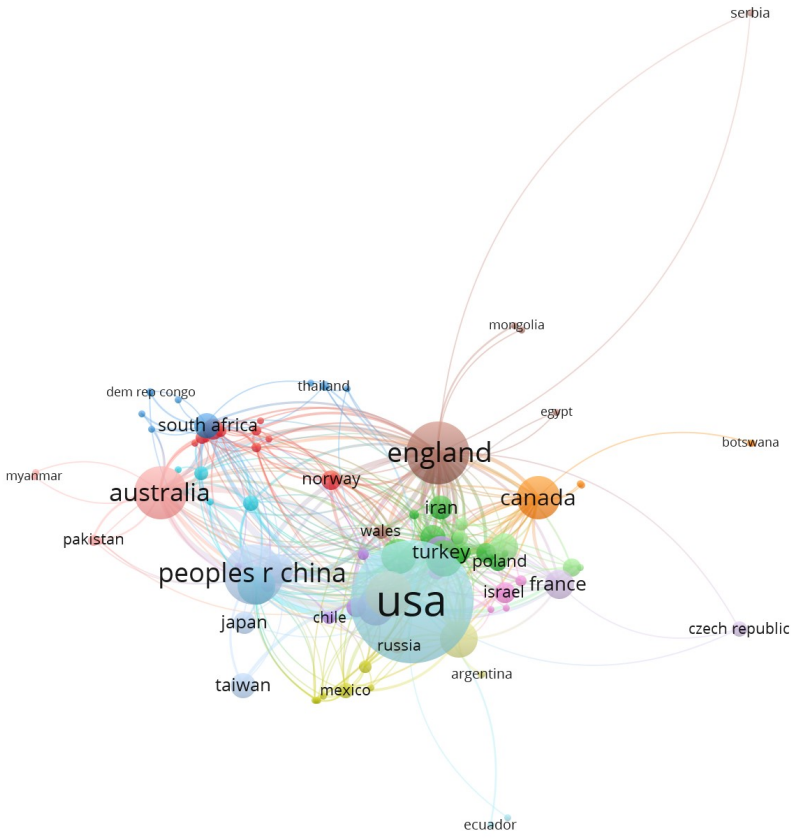
Table 1. WoS—Visual Impairment—Worldwide Impact—Countries—Universities.

Country	Articles	Cites
U.S.	739	19,352
U.K.	215	6291
Australia	158	4645
China	198	3679
Germany	124	3241
Netherlands	74	2968
France	52	2430
Italy	80	2257
Spain	86	2092
Canada	108	1700
University	**Article**	**Cites**
National Eye Institute	24	1644
Ctr Dis Control Prevent	20	1493
Ucl	30	1478
Unive Sidney	30	1478
Johns Hopkins Univ	30	1478
Univ Melbourne	37	1367
Univ Pittsburgh	49	1246
Univ Calif Davis	20	1174
Univ Cambridge	14	1157
Maastricht Univ	19	1078

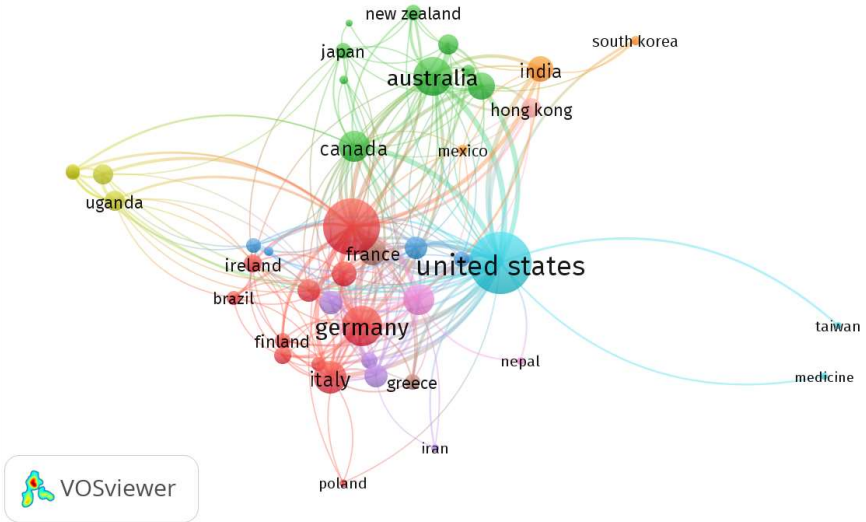
Table 2. Scopus—Visual Impairment—Global Impact—Countries—Universities.

Country	Articles	Cites
U.S.	862	46,788
U.K.	278	17,296
Australia	1368	10,292
Canada	94	5948
Netherlands	93	4919
Germany	109	4577
France	58	4019
Italy	62	3605
New Zealand	16	3300
Spain	49	2445
University	**Articles**	**Cites**
National Eye Institute	10	1178
Emory University	3	1026
Harvard School of Pub Health	2	988
Indiana University	2	928
Case Western Reserve	2	921
George Washington Univ	1	913
Natl. Inst, Child Hlth.	1	913
Stanford University	1	913
Univ Texas Southwestern Med	1	913
University Miami	1	913

Figure 4 shows a summary of the bibliometric analysis of the impact that relates VISs and education, a preponderant factor when extracting the essential methodologies of the countries that have achieved greater recognition from the scientific community around inclusive education and with which countries they are articulated to achieve new contributions and educational innovation.



(**a**) Web of Science—Impact Countries WT and VIS



(**b**) Scopus—Impact Countries WT and VIS

Figure 4. Multi-university network map—Wearable technology, WT and VIS—(**a**) Web of Science, (**b**) Scopus. Source: Authors.

Table 3 presents the results of the survey carried out on 13 VISs of the HEI, as well as 17 VISs external to the HEI, to evaluate if there is a particular situation in the establishments where they have received English instruction, and finally on 33 teachers of the language institute (LI) of the HEI who participated directly and indirectly in this process of good methodological practices.

The following Likert scale nomenclature was used in the analysis of results, so that the following analysis will be recognized according to the following acronyms:

Totally agree = TA; Agree = A; Neither agree nor disagree = NAND; Disagree = D; Strongly disagree = SD.

Table 3. Vision of English language learning for students with visual impairment.

Item	Questions Survey	Students HEI	Students External	Teachers HEI
		TA-A%	TA-A%	TA-A%
1	Do typhlo-technical applications complement academic performance?	84%	100%	97%
2	Does synchronous learning fulfill the objective of modifying and redefining theoretical concepts?	54%	76%	76 %
3	Were the texts and digital materials conditioned for English language learning?	77%	82%	61%
4	Does English allow you to open doors to the outside world and acquire new knowledge?	100%	100%	97%
5	Have you considered another HEI for learning English because it has better technical material?	54%	41%	52%
6	Has English language learning at the HEI been satisfactory?	84%	88%	82%
7	Does the digital material fit properly with VISs?	77%	88%	67%
8	Did the technical tools available at the HEI facilitate English language learning?	77%	88%	81%
9	Do adaptations of didactic resources motivate learning participation and experimentation?	69%	88%	79%
10	Did ICTs in the English learning process for VISs foster the development of autonomous work?	69%	94%	75%
11	Did JAWS screen reader facilitate the development of listening, speaking, reading, and writing skills?	69%	88%	70%
12	Are VISs provided with the use of technical tools such as (JAWS), (NVDA), MP3, and bibliography?	77%	100%	76%
13	Did VIS tutorials favor continuous improvement of the learning processes?	100%	88%	94%
14	Are didactic adaptations freely accessible for VISs at the HEI typhlo-library?	69%	88%	82%
15	Did mobility and navigation within the adapted equipment meet your expectations?	69%	88%	72%
16	Are the didactic resources adapted for English learning meaningful and functional?	75%	88%	91%
17	Did the JAWS evaluation system meet expectations?	69%	76%	67%
18	Is an English language learning road map for students and teachers adequate?	92%	100%	88%
19	Are HEI teachers trained in ICT management for VISs?	61%	64%	46%
20	Has the HEI teaching staff facilitated inclusive education, particularly for VISs?	100%	100%	82%

Based on the results obtained from the three actors surveyed, 84% of VISs at the HEI, 100% of VISs external to the HEI, and 97% of teachers at the HEI express that they are TA and that the typhlo-technical applications were the essential complement in academic performance in the learning of the English language.

Concerning synchronous learning, it can be observed that 54% of VISs at the HEI are TA about the need to increase the interaction and accompaniment in real-time to fulfill the proposed objective of modifying and redefining the theoretical concepts in the learning of the English language.

According to the didactic materials adapted to the needs of VISs, it is observed that 77% of VISs at the HEI express being TA about the adaptation and adequate adjustments of the materials.

Consequently, this has motivated constant participation in the academic activities carried out in the classroom and their autonomous work in a ubiquitous learning environment.

A total of 69% of VISs at HEIs are TA with the mobility and navigation within the adapted materials. This demonstrates that the need to establish continuous training includes access and navigation within the different documents. The files are adapted according to the level that the VISs are advancing in their process.

In addition, 75% of VISs at HEIs express to be TA about the adapted didactic resources being significant and functional for learning the English language.

In total, 61%, 67%, and 72% of the results obtained from the teaching staff of HEIs express being TA about the didactic materials reflecting the need for training and social-

ization of teachers in the usage of the technology and typhlo-technical tools that facilitate access to information, knowledge, and didactic material provided by LI.

A total of 100% of the VISs, both internal and external at HEIs, are TA that English as a universal language is an essential tool in this globalized world that allows them to open doors to an external world and to acquire new knowledge or to be in contact with other people on a personal, academic, or professional level.

In total, 84% of VISs at HEIs mention being TA in their satisfaction about the acquisition and progressive development of different linguistic skills (listening, speaking, reading, and writing) of the English language and the JAWS screen reader. As the primary tool that an HEI provides and facilitates to its students, it has been a fundamental bridge that has promoted the autonomous work in their learning process. It is worth mentioning that there was a student who preferred to work with the Braille system for his comfort with and knowledge of using it.

Likewise, 100% of VISs at HEIs are TA that teachers of LI have facilitated an inclusive education through the accompaniment and personalized tutoring that have favored a continuous improvement and have been motivated to obtain positive results in learning the English language.

Regarding the evaluation, 69% of VISs at HEIs state to be TA that the JAWS screen reader, as technical support, covered the access expectations regarding the evaluation instruments adapted and used in their process; however, additional time is required concerning the rest of the student evaluation instruments due to their characteristics.

Regarding the road map proposed and applied during this process, 92% of VISs at the HEI state that they are TA that it has facilitated the adaptation process, having a guide and accompaniment for the teacher and tutor and having accessibility to information as a fundamental support for the development of the different academic and reinforcement activities in the learning of the language.

The use of technological and typhlo-technical tools as essential support for learning English has allowed them to be included and motivated to do autonomous work, reducing the need of another person's help to develop their skills and have equal opportunities based on the requirements of global communication.

Figure 5 presents a qualitative analysis graphically from scientific articles generated through the QDA Miner software, for which keywords such as education, visual impairment, use of technology, and English language learning have been incorporated, which are related to the research topic and contribute to establishing criteria on English language teaching for VISs.

According to the results obtained from the first category focused on the analysis of education, it is observed that 35.4% corresponds to the category of education and is composed of didactic resources, learning barriers, and educational inclusion. Thus, 14% is related to the support of different technological and didactic resources as fundamental support in learning the English language for VISs. Similarly, 9.5% of the existing learning barriers that directly or indirectly influence the development of academic activities are identified. Consequently, 11% refers to the educational inclusion of the VISs in a shared learning environment.

At the same time, we can see that researchers in the area of educational research related to visual impairment have interpreted through their work that the problems and interests are directly related to the technological, didactic, and human resources required to help students with visual impairment, which are indispensable components to achieve inclusive education.

Additionally, we can observe that 22.3% of the scientific works refer to incorporating the variations on visual disability, confirmed by blindness, low vision, and required assistance. The results obtained indicate that VISs do not require assistance all the time; they need to be independent, and to achieve their autonomy, they need the appropriate resources to facilitate the development of their skills and strengths.

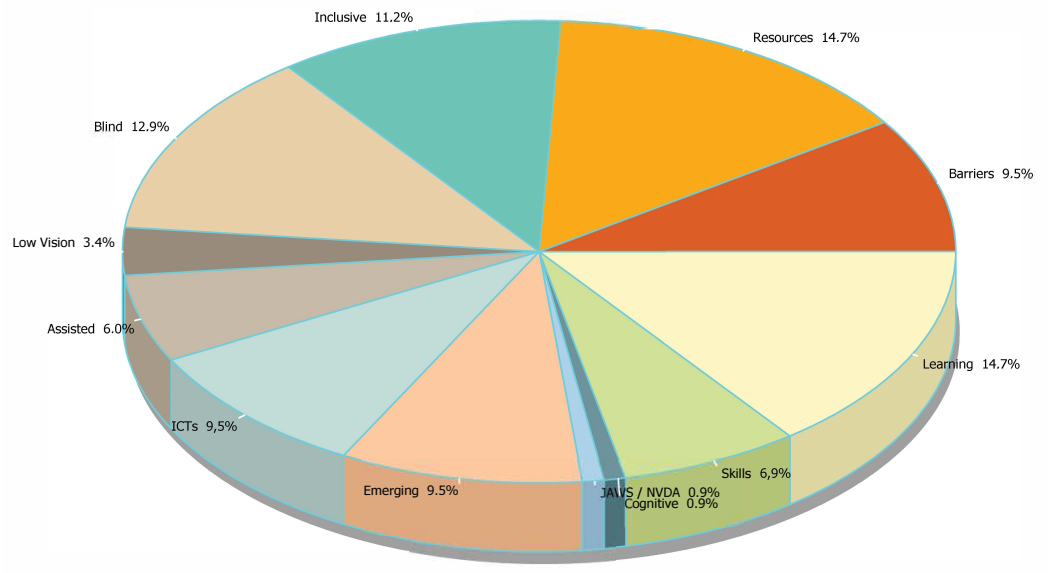


Figure 5. Qualitative Analysis—QDA Miner, considering keys: visual impairment and English learning. Source: authors.

On the other hand, the 14.7% achieved on learning reflects the importance of resources, i.e., without resources, there is no learning, or without learning, there are no resources; these two elements are complementary and dependent. Therefore, if we want to improve learning, we need to have access to more resources, and with the increase of resources, we increase the possibilities of inclusive education.

In contrast to the 0.9 percentages obtained in the two cases—the first one referring to the use of the JAWS screen reader, which is directly included within the technical resources and the cognitive area that is directly related to learning—we can analyze that the graph has two false positives.

The analysis reflects that if the VISs have the appropriate support and necessary resources, they do not need to have permanent assistance because the typhlo-technical resources replace the assistance and develop autonomy in their learning process.

5. Discussion

An inclusive classroom environment warrants a change of mentality in the teacher and the VIS, due to the incorporation of new pedagogical models such as flipped learning or inverted learning, a model that can incorporate a series of new and traditional didactic tools, among which the use of JAWS stands out; NVDA; learning management systems such as Moodle, Canvas, and Google Classroom; MOOCs (massive open online courses); and emerging technologies such as Orcam My Eye, AIRA app, and Oxsight glasses, which can be mixed with classroom learning in a blended learning model.

However, the set of alternatives will always be limited to the cost of resources. All technology is always freely available or within reach of VISs, teachers, and HEIs. It will depend on the economic situation of each actor to incorporate these tools in their curriculum.

There are emerging situations, such as the pandemic of 2020, which exacerbate the need to use technology in a better way. Therefore, this situation has exponentially increased the need to be updated in technological management that provides a better learning environment for the English language, not only for VISs but for the entire world of higher education, even more so when it depends on additional factors. The Internet speed in Ecuador is in the range of 34.5 Mbps, and the speed required is based on the number of family members; the current demand for resources such as streaming video is in the range of 75 Mbps. The CISCO report presents the average Internet speed by region as of May 2020.

Thus, it is impossible to talk about educational innovation groups in higher education without including technology. Therefore, the technical tools become the primary support for VISs. Likewise, there would be no educational innovation if both teachers and VISs are not connected and familiar with these emerging or conventional technological tools that are the mainstay for the development of different skills and abilities of communication and access to updated information.

In the immediate future, a set of strategies should be defined within the teaching-learning process for EDV, among which we can mention: (a) new teachers and those who do not have the technological skills and who join this academic process should be trained in relevant aspects, such as web tools for e-learning, pedagogical innovation based on ICT, gamification and simulation, educational research, and learning management systems LMS, but without discarding the advances defined as Education 4.0, mobile learning or m-learning, educational neuro-science, education and social development, and the management of educational innovation projects considering inclusion where the participation of EDV and students without disabilities is noticed; (b) the HEI must contribute access to scientifically relevant technology and results obtained in the practice of the English language for EDV, which will imply motivation and will generate suitable environments to acquire new knowledge; and (c) EDVs are responsible for assuming a challenge to join continuous training courses in the use of ICT for education that are suitable not only for academic training but also for the personal and professional life of EDVs.

6. Conclusions

The description of the methodological experience in the teaching-learning process of the English language is described from a methodology of good practices applied to students with visual impairment. It has generated indicators and metrics that show that the results have benefited the VIS educational process. One of the tasks is to take advantage of the human, academic, and technological resources that the HEI provides to VISs to achieve their autonomy in acquiring and developing their skills and abilities in the acquisition of the English language.

The methodology applied in the teaching-learning process of the English language for VISs has been systematized and supported with a bibliometric analysis expressed in scientific documents of internationally recognized databases. Similarly, surveys applied to the actors of the educational process involving a Likert scale were included. A road map was established through minimum required steps, typhlo-technical tools were determined for effective practice, the adaptation and validation of all the support material in English language learning were carried out, and a procedural manual for the adaptation and use of the material was elaborated in order to achieve an effective inclusion in this educational process of VISs.

The stages that were part of the methodological process have been categorized according to the skills and abilities. It was required to guarantee inclusion in the educational process through the incorporation and use of typhlo-technical tools that facilitated the access and navigation of the different didactic materials adapted to the VIS needs for English language learning. We are aware that no adapted material is sufficiently adequate for them; however, it is a complementary aid to performing tasks and activities in different formats to develop their language skills in the academic process.

Finally, the present work exposes a road map that allows and facilitates the management of the proposed and implemented method for English language learning, considering only students with visual impairment. Additionally, it allows it to be used in classroom environments with students without disabilities.

Consequently, this determines that VISs require stabilizing the learning context since they do not have any cognitive problems. For this reason, the teacher that is now required must be trained and updated in technological, pedagogical, and disciplinary knowledge so that he/she can provide practical support in English language learning and help to generate added value in the personal, professional, and productive lives of VISs.

There is no doubt that this can achieve the acquisition of new knowledge, especially if this information comes from developed countries. It becomes a trigger of motivation to be close to what is current, which helps HEIs invest as an aspect of social responsibility in favor of technologies for VISs and training processes for teachers to generate suitable classroom conditions (virtual or face-to-face), which will even favor other students.

Author Contributions: J.C. conceptualized the study, analyzed the data, and wrote the initial draft. E.I. analyzed the data and revised the draft. J.C. provided critical feedback and edited the manuscript. E.I. provided Zoom support and critical feedback. All authors have read and agreed to the published version of the manuscript.

Funding: This work was supported by Universidad Politécnica Salesiana and GIREI, Smart Grid Research Group under the project Flipped Learning and Blended Learning. Funding was also provided by the Smart Grid & Smart Cities Research Group, RECI-IUS.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: Not applicable.

Acknowledgments: This work was supported by Universidad Politécnica Salesiana and GIREI—Smart Grid Research Group, and the master's program in Educational Innovation. Funding was also provided by the Network IUS-RECI-Smart Grid and Smart Cities.

Conflicts of Interest: The authors declare no conflict of interest.

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