EduTech

Asistencia tecnológica a la accesibilidad en la Educación Superior Virtual

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Antes de usar este documento revise el listado de documentos y verifique que ésta es la última versión del Entregable 4.1.

Tabla de Contenidos

1.RESUMEN

En este documento se resume el listado de publicaciones científicas derivadas de las acciones realizadas durante el proyecto EduTech.

2. LISTA DE PUBLICACIONES

A continuación se resume el listado de publicaciones científicas derivadas del proyecto EduTech.

Título	Autores	Resumen	Enlace
Techniques for the Publication of Accessible Multimedia Content on the Web	Tania Acosta ; José Zambrano-Miranda ; Sergio Luján-Mora	Multimedia has become one of the most important sources of information and communication on the web. However, despite recent technological progress, people with disabilities and the elderly face difficulties accessing multimedia on the web. In some cases, these difficulties are impossible to overcome and are a fundamental cause of digital exclusion. Given the importance of this topic, several investigations on the problems of accessing multimedia resources have been carried out. Some organizations have also proposed certain standards to guide the creation and publication of accessible web content. Nevertheless, the authoring tools used in the process of publishing multimedia on the web do not offer all the accessibility features required. Authoring tools can also be used by people who do not have knowledge about web accessibility or programming, resulting in web publications lacking accessibility. This research proposes 278 novel techniques to guide authors, designers, programmers, and testers in the publication of accessible and inclusive multimedia on the web. These techniques are designed to guarantee the compliance with the recommended success criteria of Authoring Tools Accessibility Guidelines (ATAG) 2.0 of the World Wide Web Consortium. Moreover, these techniques can be used to evaluate the accessibility of the existing authoring tools used to create multimedia for the web. Additionally, we present 80 possible failures that can cause the non-fulfillment of ATAG 2.0. These failures can help authors discern what to avoid and help evaluators check whether particular multimedia is accessible.	https://doi.org/10.1109/ACCESS.2020.2981326
Empirical Studies on Web Accessibility of Educational	Milton Campoverde-Molina ; Sergio Luján-	Web accessibility means that people with some type of disability can make use of the Web in the same conditions as the rest of the people. When we talk about web	https://doi.org/10.1109/ACCESS.2020.2994288

Título	Autores	Resumen	Enlace
Websites: A Systematic Literature Review	Mora ; Llorenç Valverde García	accessibility, we refer to a web design and development that allows these people to perceive, understand, navigate and interact with the Web. Web accessibility also benefits other people, including elderly people whose abilities have declined as a result of age. The Web is an essential resource in human activity: education, employment, government, commerce, health, entertainment and many others benefit of the power of the Web. The aim of this systematic literature review is to analyze the empirical methods of evaluating accessibility to educational websites, disabilities and their errors described in a total of 25 selected studies. The results show that in 20 of the 25 papers, web accessibility was evaluated with automatic tools, in 2 papers it was evaluated with real users and in the other 3 papers with automatic tools, real users and experts. There is also evidence that all the educational websites analyzed in the papers need to correct errors. In conclusion, educational websites do not meet any version of the Web Content Accessibility Guidelines (WCAG) and their conformance levels. According to the results, the empirical evaluation methods used for web accessibility could be improved by adopting automatic evaluation tools for website construction and manual mechanisms with web accessibility experts. The challenge for educational institutions is to carry out web accessibility projects to comply with WCAG and other web accessibility standards and current laws of educational inclusion.	
Web Accessibility Evaluation of Videos Published on YouTube by Worldwide Top-Ranking Universities	Tania Acosta; Patricia Acosta-Vargas; José Zambrano-Miranda ; Sergio Luján-Mora	Video consumption on the web has increased markedly in recent years. Universities use videos in different teaching-learning modalities, as well as on their websites, to publish information aimed at their stakeholders. Access to education and information has been recognized as a human right in several international conventions and the constitutions of most countries. Therefore, it is essential to ensure that videos published on the web can be accessed by people with disabilities. The universality of the web is so important that some organizations worldwide have contributed to the development of standards and recommendations focused on web accessibility. Despite	https://doi.org/10.1109/ACCESS.2020.3002175

Título	Autores	Resumen	Enlace
		these efforts, the rights of millions of people are currently violated, as they are excluded from access to both education and information published on the web. Regarding videos, the reasons are a lack of captions, sign language, audio descriptions, and transcriptions, among others. The objective of this study is to evaluate the accessibility of videos published on YouTube by the best universities in the world based on compliance with the Web Content Accessibility Guidelines (WCAG) 2.1 of the World Wide Web Consortium. We carry out a manual evaluation of 91,421 videos, which were all published on YouTube by 113 universities taken from the Shanghai Ranking. Our purpose is to highlight the urgent need to change the current low level of accessibility that their educational videos show. Consequently, statistical results are presented regarding the compliance with video accessibility according to the regions and positions of the universities in the ranking.	
A Method to Develop Accessible Online Serious Games for People with Disabilities: A Case Study	Angel Jaramillo-Alcázar, Paz Cortez-Silva, Marco Galarza-Castillo and Sergio Luján-Mora	Video games that are used as teaching tools are called serious games. However, there is an important factor that is not usually considered in the design of serious games—the inclusion of people with disabilities. Inclusion can be reached only if accessibility takes on an important role for all. On the other hand, new trends have resulted in different smart devices being used in classrooms. These devices also allow for applications, such as serious games, to be used to support people's learning process. Despite this, these applications are generally not multi-platform and do not usually consider accessibility features for people with disabilities. This paper proposes a method to develop accessible online serious games that consider people with disabilities as potential users. The method is applied in the case study of an online serious game that teaches about the architecture of a computer in a fun and entertaining way. The method also presents and describes several guidelines to improve online serious game accessibility for people with disabilities. Finally, tests are conducted with some users to gather information about the online serious game and the accessibility features included. This study	https://doi.org/10.3390/su1222 9584

Título	Autores	Resumen	Enlace
		has important implications for the development of learning tools that consider people with disabilities.	
An Approach to Accessible Serious Games for People with Dyslexia	Ángel Jaramillo-Alcázar, Eduardo Venegas, Santiago Criollo-C, Sergio Luján-Mora	Dyslexia is a cognitive disorder that affects the evolutionary ability to read, write, and speak in people, affecting the correct learning of a large percentage of the population worldwide. In fact, incorrect learning is caused because the educational system does not take into consideration the accessibility parameters that people with dyslexia need to maintain a sustainable educational level equal to others. Moreover, the use of mobile devices, such as smartphones and tablets, has been deployed in education programs, offering many benefits; however, the lack of accessibility of those devices creates new barriers to students with dyslexia that hinder their education. With the aim of reducing these barriers, this paper presents an approach to the development of accessible serious games games for children with dyslexia. As a case study, a serious game based on a previously proposed serious game development method and a new set of accessibility guidelines for people with dyslexia is presented. The main purpose of the serious video game is to improve the treatment of dyslexia, through the collection of data obtained from two puzzles designed to train certain cognitive areas that affect this disability. This article has a double contribution: on the one hand, the guidelines and the method that can help video game developers and therapists to develop accessible serious games for people with dyslexia and, on the other hand, the two specific serious games that can be used by therapists, family members and people with dyslexia themselves.	https://doi.org/10.3390/su13052507
Systematic literature review on software architecture of educational websites	Milton Campoverde-Molina, Sergio Luján-Mora, Llorenç Valverde	The modern world greatly depends on information systems and the software that governs them. The software architecture defines and designs the holistic structure that the software will have, its components, the interaction between them and all the development is done around it. The purpose of this systematic literature review (SLR) is to analyse the software architectures used in educational websites, methodologies, technological components and	https://doi.org/10.1049/sfw2.12024

Título	Autores	Resumen	Enlace
		empirical results. The search of the SLR yielded 23 studies from the most significant academic sources in education and software engineering. The results of the SLR show that the analysed educational websites were proposing a software architecture, developing a system, proposing a model, assessing of a platform, proposing a Folksonomy-Based Ontology Maintenance, reviewing smart home design, and proposing a Web-based platform to aid parallel, distributed and high-performance computing education. Of the 23 selected studies, 13 carried out an evaluation of their research with either students, teachers, professionals or a combination of these. In conclusion, the selected studies present narrated experiments of projects or individuals that seek to improve collaborative learning in the educational area. Finally, an important finding is that the proposed software architectures do not contemplate laws or quality standards for universal access.	
Exploring the Impact of Accessibility in Mooc and Oer: A Multivocal Literature Review	P Ingavélez-Guerra, S Otón-Tortosa, António Teixeira, Vladimir Robles-Bykbaev, Angel Pérez-Muñoz	This report presents a review of the accessibility models in Learning Resources and MOOCs with the aim of establishing common terms in the research of the EduTech project and other projects associated with virtual accessibility in member HEIs. This study is based on the search and analysis of articles and publications related to the subject following the MLR format. The results showed a lack of applicability and data that support the current situation in Latin America, however, the experiences of European projects and regulations that support their sustainability, establish guidelines that could guide implementation processes in higher education institutions in partner countries.	https://doi.org/10.38069/edenconf-2020-rw-0011
Mobile Learning Technologies for Education: Benefits and Pending Issues	Santiago Criollo-C, Andrea Guerrero-Arias, Ángel Jaramillo-Alcázar, Sergio Luján-Mora	Today's world demands more efficient learning models that allow students to play a more active role in their education. Technology is having an impact on how instruction is delivered and how information is found and share. Until very recently, the educational models encouraged memorization as an essential learning skill. These days, technologies have changed the educational model and access to information. Knowledge is available online, mostly free, and easily accessible. Reading, sharing,	https://doi.org/10.3390/app11094111

Título	Autores	Resumen	Enlace
		listening and, doing are currently necessary skills for education. Mobile devices have become a complete set of applications, support, and help for educational organizations. By conducting an analysis of the behavior and use of mobile devices on current students, efficient educational applications can be developed. Although there are several initiatives for the use of mobile learning in education, there are also issues linked to this technology that must be addressed. In this work, we present the results of a literature review of mobile learning; the findings described are the result of the analysis of several articles obtained in three scientific repositories. This work also lists certain issues that, if properly addressed, can avoid possible complications to the implementation of this technology in education.	
Towards a New Learning Experience through a Mobile Application with Augmented Reality in Engineering Education	Santiago Criollo-C, David Abad-Vásquez, Marjan Martic-Nieto, Fausto Andrés Velásquez-G, Jorge-Luis Pérez-Medina, Sergio Luján-Mora	With the rise of information technology and digitization, education has been faced with the need to adopt new learning models using technology to create innovative educational methodologies. In addition, due to pandemic restrictions and in order to help contain the spread of the virus (COVID-19), all educational institutions have been forced to switch immediately to online education. The application of augmented reality (AR) in education provides important benefits, such as increased engagement and interactivity, and can help to minimize the negative effects of the disruption of face-to-face education. Therefore, this paper focuses on describing the effect of an augmented reality mobile application (NetAR) that was developed for engineering students as a complement to traditional education. To achieve this objective, an experimental group and a control group were established to work with the application for three weeks for three hours a day. Moreover, there are a number of usability issues with AR that may impact learning effectiveness and motivation. Therefore, the usability of the application was evaluated with the IBM Computer System Usability Questionnaire (CSUQ) tool. The usability results show that users are satisfied with NetAR, and the statistical data	https://doi.org/10.3390/app111114921

Título	Autores	Resumen	Enlace
		from the control group indicate that the application positively affects learning.	
Sensorised Low-Cost Pencils for Developing Countries: A Quantitative Analysis of Handwriting Learning Progress in Children with/without Disabilities from a Sustainable Perspective	Luis Javier Serpa-Andrade, José Juan Pazos-Arias, Martín López-Nores andVladimir Espartaco Robles-Bykbaev	Learning to write is a demanding endeavour that requires a combination of linguistic, motor and cognitive skills. Some children suffer from delay or inability to acquire those skills, which often hampers their performance at school and brings about serious consequences for self-esteem, personal expectations and social relationships. The situation worsens in developing countries, due to the lack of resources and specialised personnel. With this background, this paper describes an experiment with a newly-developed sensorised pencil with triangular prism shape, which is shown to yield substantial improvements in children with/without special education needs. A team of experts in the areas of speech therapy, occupational therapy, educational psychology, physiotherapy and pedagogy have expressed very positive opinions about the sensorised pencil and the accompanying software for the acquisition and analysis of quantitative data about handwriting. Furthermore, the device stands out for its low cost in comparison with similar developments, which is a key factor to aid children from low-income families. This fact is explained with a success story of manufacturing and delivering sensorised pencils in the Ecuadorian province of Azuay, framed in a multi-layer sustainable development perspective based on collaboration of several institutions and individuals.	https://doi.org/10.3390/su122410682
Moving beyond Limitations: Designing the Helpdys App for Children with Dyslexia in Rural Areas	Andres Larco, Jorge Carrillo, Nelson Chicaiza, Cesar Yanez, Sergio Luján-Mora	Dyslexia is a relatively common language disorder which is generally ignored in rural communities. It hinders children's learning processes and, in some cases, is the cause of dropouts or violence in schools. The present work strives to create a web and mobile app as a preliminary step towards the diagnosis and treatment of dyslexic children. Apps providing didactic educational games and activities improve literacy skills for students with reading disabilities. The current work incorporates user experience and prototyping to fulfill app requirements. The authors evaluated the apps with the Mobile App Rating Scale	https://doi.org/10.3390/su13137081

Título	Autores	Resumen	Enlace
		(MARS) tool to assess engagement, functionality, aesthetics, and information. The app's improvements were immediately implemented and tested in the "Escuela Linea Equinoccial" (Ecuador) school, proving its utility for future use in the education system. The app can be a valuable tool for children with dyslexia to progress successfully through school, raising their self-confidence and, thereby, helping them reach their full potential as adults able to make a positive contribution to society.	
Accessibility of university websites worldwide: a systematic literature review	Milton Campoverde-Molina, Sergio Luján-Mora, Llorenç Valverde	The identity and institutional image of universities are presented to the world through their websites. On their websites, universities publish their academic offerings, their mission, their vision, their academic objectives, their achievements, their regulations, their news and all their university work. Hence, the importance of university websites is accessible. The accessibility of university websites has been evaluated several times in the past, but there is no work that has summarized all the evaluations performed to provide a general overview of the situation. Therefore, in this research we have performed a systematic literature review (SLR) to consolidate, analyze, synthesize and interpret the accessibility results of university websites published in 42 papers that have been selected for this study. The methodology used in this SLR was that proposed in Kitchenham's guidelines, which includes three stages: planning the review, conducting the review and reporting the review. The results present the analysis and synthesis of the evaluations of 9,140 universities in 67 countries. Of these, 38,416 web pages, 91,421 YouTube videos and 28,395 PDF documents were evaluated. Manual methods, methods with automatic tools and the combination of both methods were used for the evaluation. Most websites were evaluated using the ISO/IEC 40500:2012 and Section 508 standards. The accessibility guidelines most commonly violated in the evaluations were: adaptable, compatible, distinguishable, input assistance, keyboard accessible, navigable, predictable, readable and text alternatives. In conclusion,	https://doi.org/10.1007/s10209-021-00825-z

Título	Autores	Resumen	Enlace
		the university websites, YouTube videos and PDF documents analyzed in the 42 papers present important accessibility problems. The main contribution of this SLR is the consolidation of the results of the 42 studies selected to determine the findings and trends in the accessibility of university websites around the world.	
Improving Accessibility in Online Education: Comparative Analysis of Attitudes of Blind and Deaf Students Towards an Adapted Learning Platform	Concepción Batanero-Ochaíta; Luis De-Marcos; Luis Felipe Rivera; Jaana Holvikivi; José Ramón Hilera; Salvador Otón	People with different capacities, such as the deaf and blind, have problems accessing educational content due to lack of accessible technology. Accessibility and usability are closely related concepts that share the goals for a satisfactory user experience. Existing literature establishes a direct relation between accessibility and usability, and reports that there are problems with both in learning platforms, and more generally with most websites. The objective of this paper is to evaluate the accessibility and usability of a learning platform by interrogating its participants. Three groups of students with different capacities (blind, deaf and deaf-blind) used an accessible learning platform prototype to assess the accessibility and usability of the platform and its contents. This article presents a comparative study of the perception and attitude of blind and deaf students towards the use of a learning platform adapted to their personal needs. Results showed that their attitude to the adaptation was very positive but there were differences in the perception of the ease of use of the application and with the level of difficulty to access the learning content. This work contributes to knowledge by showing the effects that adaptations have on learning contents for blind and deaf students in terms of accessibility and ease of use through the analysis of the perceptions of participants. Future work may consider increasing the sample of students, as well as developing and testing new technologies and approaches that address other forms of functional diversity.	https://doi.org/10.1109/ACCESS.2021.3095041
Process model for continuous testing of web accessibility	Milton Campoverde-Molina; Sergio Luján-Mora; Llorenç Valverde	The lack of accessibility on websites can result in people with disabilities not accessing information online. Therefore, this research aims to create a process model for continuous web accessibility testing by adapting and customizing three methodologies: Deming cycle (Plan, Do,	https://doi.org/10.1109/ACCESS.2021.3116100

Título	Autores	Resumen	Enlace
		Check, Act), Website Accessibility Conformance Evaluation Methodology (WCAG-EM), and Total Quality Management. The process model is composed of four phases. The first phase (Plan) allows defining the accessibility problem, its importance, and the Web Content Accessibility Guidelines (WCAG) against which it will be evaluated. In addition, determine the current situation of the websites, the potential causes of accessibility problems, classify the success criteria by principles, guidelines, and levels of conformity, to elaborate the solution plan and the action plan. The second phase (Do) allows the execution of the action plan to correct the accessibility problems. In this phase, we should perform continuous testing with automatic evaluation tools, end-users, and experts to corroborate that the changes have had an effect. The third phase (Check) allows measuring compliance and non-compliance with the defined Key Performance Indicators (KPIs). This phase also explains the reasons for non-compliance. The fourth and last phase (Act) documents the solutions learned for inclusion in future developments. It was tested using a case study to determine the viability of the process model, which allowed corroborating its functionality and applicability. In future work, we plan to adapt the process model to different workgroups, develop accessible mobile applications, and comply with web accessibility in electronic documents.	
Thinking about Inclusion: Designing a Digital App Catalog for People with Motor Disability	Andrés Larco, Paul Peñafiel, Cesar Yanez, Sergio Luján-Mora	Some apps serve as assistive technologies or digital therapeutic tools that can be used by rehabilitation professionals in the motor disability context, bringing benefits to therapists and people with disabilities. However, websites or catalogs do not provide reliable information, easy search, and intuitive access to these apps, causing access information difficulties. Therefore, this work proposes to develop a digital catalog of software focused on motor disability. This work performed a systematic search of websites and catalogs related to motor disability, a systematic search of the apps that the digital catalog would show, and a quality evaluation of selected apps using the Mobile Application Rating Scale	https://doi.org/10.3390/su131910989

Título	Autores	Resumen	Enlace
		tool. The digital catalog was developed with the information obtained in the previous phases combining the Prototyping and User Experience criteria, then assessed by final users, software testers, and a web accessibility evaluation tool. The catalog obtained a satisfactory quality score based on the end-users' and therapists' satisfaction when finding technological resources to use in their professional and health-care activities. This research aims to contribute to those interested in developing software for people with disabilities and encouraging them to create and design their implementations based on this study.	
The use of accessibility metadata in e-learning environments: a systematic literature review	Paola Ingavélez-Guerra, Salvador Otón-Tortosa, José Hilera-González & Mary Sánchez-Gordón	E-learning environments constitute an essential element in education, as they help students to ensure their pass their courses and graduate on time. Although guidelines, techniques, and methods have been presented in some literature in recent years to contribute to the development of accessible e-learning environments that promote digital inclusion, their implementation is challenging. In this context, the use of accessibility metadata not only provides a way to enhance the description of adapted educational resources but also facilitates their search according to the needs and preferences of students, in particular those with disabilities. In this paper, a systematic review was conducted in order to provide the state of the art regarding the use of accessibility metadata in e-learning environments. A total of 746 documents were found during the period from 2012 to 2019, of which 31 were selected according to the inclusion and exclusion criteria relevant to our review. The findings revealed an intensive use of models and standards of accessibility in e-learning environments, however, using accessibility metadata remains underused. In fact, the evaluation of accessibility and adaptability through the use of its metadata was not found. The findings obtained also helped to establish challenges and opportunities in this research field as well as to provide an overview that could support those who generate educational resources to keep their interest in making them accessible.	https://doi.org/10.1007/s10209-021-00851-x

Título	Autores	Resumen	Enlace
Guidelines to Establish an Office of Student Accessibility Services in Higher Education Institutions	Ricardo Mendoza-González, Sergio Luján-Mora, Salvador Otón-Tortosa, Mary Sánchez-Gordón, Mario Alberto Rodríguez-Díaz, Ricardo Emmanuel Reyes-Acosta	The objective of this paper is to propose a set of guidelines to establish an office of Student Accessibility Services (SAS) in Higher Education Institutions (HEIs). The proposed guidelines help to integrate disjointed knowledge to facilitate its interpretation and implementation during deployment of basic support services in favor of students with disability. These guidelines can help to mitigate complexity in providing SAS for the first time in HEIs. These guidelines cover both the design and implementation of an office of SAS and its management. Knowledge was found through a multivocal literature review (MLR), which allowed to capture not only academic approaches but also vantage points and experiences from practice. Key concepts and aspects were organized into eight components (five related to the design and implementation, and three associated with the management context). An expert appraisal method was used as a proof of concept, which complemented a previously performed preliminary implementation example. Obtained results demonstrated the pertinence of the conceptual proposal and confirmed guidelines capability for full implementation in a real-world scenario.	https://doi.org/10.3390/su14052635
Method for the Development of Accessible Mobile Serious Games for Children with Autism Spectrum Disorder	Ángel Jaramillo-Alcázar, José Arias, Israel Albornoz, Alex Alvarado, Sergio Luján-Mora	Autism spectrum disorder (ASD) covers a range of neurodevelopmental disorders that begin in early childhood and affects developmental activities. This condition can negatively influence the gaining of knowledge, skills, and abilities, such as communication. Over time, different techniques and methods have been put into practice to teach and communicate with children with ASD. With the rapid advancement in the field of technology, specifically in smartphones, researchers have generated creative applications, such as mobile serious games, to help children with ASD. However, usability and accessibility have not been often taken into account in the development of this type of applications. For that reason, in this work we considered that both, usability and especially accessibility are a very important differentiators for the quality and efficiency of mobile serious games. Our	https://doi.org/10.3390/ijerph19073844

Título	Autores	Resumen	Enlace
		approach has two important contributions, the incorporation of accessibility as a fundamental requirement in the development of a mobile serious game and the proposal of a method for the development of this type of applications for children with ASD, a method that can be used by other developers.	
Accessibility Challenges in OER and MOOC: MLR Analysis Considering the Pandemic Years	Paola Ingavélez-Guerra ,Vladimir Robles-Bykbaev, António Teixeira, Salvador Otón-Tortosa and José Ramón Hilera	The review of state of the art on creating and managing learning resources and accessible Open Educational Resources (OER) and Massive Open Online Courses (MOOC) is a topic that cannot only consider formal literature. The evidence and lack of a measurement consensus require the inclusion of contextual information, corroborating scientific results with practical experiences. For this reason, this article presents a review of accessibility models, OER and MOOC, considering the gray literature to capture experiences and trying to establish a shared understanding of the terminology commonly used in research on virtual accessibility and its impact on higher education. The bibliographic review relies on analyzing articles and scientific publications related to the topic following the Multivocal Literature Review (MLR) format. The results of this review establish that it is possible to apply accessibility review methodologies with transversal actions in the creation and management of learning resources and MOOCs. The research is related to one of the seventeen sustainable development goals defined by the United Nations to ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.	https://www.mdpi.com/2071-1050/14/6/3340
Quality Assurance in E-Learning: A Proposal from Accessibility to Sustainability	Cristian Timbi-Sisalima, Mary Sánchez-Gordón, José Ramón Hilera-Gonzalez, and Salvador Otón-Tortosa	Given the importance of developing and offering accessible education for all, indispensable aspects of education for sustainable development (ESD) are needed. This study addresses that need by proposing a quality self-assessment for virtual education from an accessibility perspective. This proposal is based on previous literature about quality assurance in e-learning that considered accessibility and its application in the	https://www.mdpi.com/2071-1050/14/5/3052

Título	Autores	Resumen	Enlace
		field of higher education. The bibliographic review was conducted by following Multivocal Literature Review (MLR) guidelines. The initial search returned 999 items from 5 academic databases and 32,200 professional sources from Google. After reviewing the sources, 37 of them were included. Then, the accessibility criteria were identified and integrated into an evaluation model. Such a model is divided into four dimensions: (1) organization, (2) student body, (3) teaching, and (4) infrastructure. The model also includes a set of standards (16), requirements (48), and evidence (63) that apply to each dimension. Moreover, self-assessment guidelines for accessible virtual education were proposed. They included a conceptual and theoretical framework, a self-assessment model, and a methodology for applying the model. The methodology included five phases: planning, model tuning or refinement of the model, evaluation, results, and continuous improvement. As future work, the implementation and validation of the guidelines will be carried out	
Automatic Adaptation of Open Educational Resources: An Approach From a Multilevel Methodology Based on Students' Preferences, Educational Special Needs, Artificial Intelligence and Accessibility Metadata	Paola Ingavélez-Guerra; Vladimir E. Robles-Bykbaev; Angel Pérez-Muñoz; José Hilera-González; Salvador Otón-Tortosa	he need for adaptive e-learning environments that respond to learning variability is now a fundamental requirement in education, as it helps to ensure that students learn and pass their courses within a set time frame. Although guidelines, techniques and methods have been established in recent years to contribute to the development of accessible and adaptable e-learning environments that promote digital inclusion, their implementation is challenging due to the lack of knowledge of an adequate way to do it and because it is considered more of a technological competence for scholars in the area. In this context, automated support for adapting material that responds to the correct use of accessibility metadata not only provides a way to improve the description of adapted educational resources, but also facilitates their search according to the needs and preferences of students, particularly those with disabilities. In this article, we carry out a multilevel methodological proposal for the automatic adaptation of	https://ieeexplore.ieee.org/document/9669174

Título	Autores	Resumen	Enlace
		open educational resources, in order to provide a tool that contributes to the accessibility and correct use of their metadata in e-learning environments. A research is conducted with students with disabilities to establish their real needs and preferences, highlighting the need to strengthen the adequate description and coherent alternative text in images, the correct subtitling in videos and the conversion of audio to text, data that are relevant to our proposal. The research conducted aims to contribute with an automated support tool in the generation of accessible educational resources that are correctly labeled for search and reuse. This research also aims to support researchers in artificial intelligence applications to address challenges and opportunities in the field of virtual education, in addition to providing an overview that could help those who generate educational resources and maintain their interest in making them accessible	
Towards the Implementation Process of Accessible Virtual Campuses in Higher Education Institutions in Latin America	Francisco Sánchez Vásquez, Juan Carlos Pérez-Arriaga, Gerardo Contreras Vega, Sergio Luján-Mora, Salvador Otón-Tortosa	Ensuring equitable and inclusive access to educational services in Higher Education Institutions (HEIs) requires the development of strategies that consider the diversity of their academic members, administrative staff, and students, as well as the use of information and communication technologies. The identification of requirements for technological accessibility in HEIs allows for the establishment of actions aimed at considering accessibility aspects in the processes of admission, permanence, and graduation, in order to support students with disabilities in their transit through these institutions. Having a systematic approach to guide the design of educational strategies in HEIs contributes to the identification of areas for improvement for the benefit of educational quality and community members. This article describes the proposal of a process based on the Plan-Do-Check-Act (PDCA) cycle, and a methodology for the implementation of accessible learning environments oriented to the implementation of an accessible virtual campus based on the establishment of five defined phases: diagnosis, planning, implementation, control, and	https://www.mdpi.com/2076-3417/12/11/5470

Título	Autores	Resumen	Enlace
		tracing. This proposal is aimed at supporting Latin American HEIs in the integration of technological accessibility requirements from a systematic and continuous improvement approach.	
Sustainable Teaching and Learning through a Mobile Application: A Case Study	Santiago Criollo-C, Erick Altamirano-Suarez, Lucía Jaramillo-Villacís, Kevin Vidal-Pacheco, Andrea Guerrero-Arias, Sergio Luján-Mora	Currently, mobile devices are widely used as a support in education for teaching and learning of multiple academic subjects. An example of this is educational mobile applications, which in recent years have been massively developed and have generated multiple downloads for use in the classroom. Despite their features and benefits, the use of mobile devices such as smartphones is not usually allowed in classrooms due to the distraction they can generate. This paper aims to evidence the use of mobile devices in education and why it should be used as a support in the educational model. To do this, it is proposed to compare two teaching-learning methodologies and identify whether the use of mobile applications can influence the specific education of an engineering subject. The methodologies were tested in the classroom, focusing on IP addressing and network numbering systems, with two groups of students: an experimental group and a control group. At the end of the experiment, their performance was evaluated using a questionnaire. The answers of this questionnaire were subjected to an analysis of variance (ANOVA) and hypotheses were proposed to identify whether the use of a mobile application used as a support in the educational model has benefits in learning. The results indicate that educational mobile applications can be helpful in the teaching-learning process and at present, education can benefit from the use of this innovative learning methodology.	https://www.mdpi.com/2071-1050/14/11/6663
RALO: Accessible Learning Objects Assessment Ecosystem based on metadata analysis, inter-rater agreement, and Borda voting schemes	Paola Ingavélez-Guerra, Vladimir E Robles-Bykbaev, Angel Perez-Muñoz, José Hilera-González, Salvador Otón-	The increasing number of people are living with disability in the World and their access to formal education is considered a challenge for the development of the online education and educational resources. This problem is considered one of the 17 sustainable development goals that are focused on	https://ieeexplore.ieee.org/abstract/document/10007848

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	Tortosa, Elena Campo-Montalvo	inclusive and equitable quality education. Nevertheless, the existing proposals for mainstream accessibility in virtual education are still complex to apply. However, the models, standards, and good practices to contribute to the virtual educational process and the design of learning for all are identified. For these reasons, in this paper, we describe an accessibility evaluation proposal based on 4 interaction domains: user analysis and interaction, intelligent systems, knowledge databases, and evaluation. In the same way, we describe a set of tools that constitute a Repository of Accessible Learning Objects (RALO) from the perspective of accessibility and adaptability metadata. In this line, the knowledge database follows the regulation and educational models focused on the students with disabilities needs and preferences from the conception of universal design. The validation of the proposal is based on the interaction study and analysis of regular and disabled students and teachers who developed the Learning Objects (LO). To determine whether there was consensus among the teacher's scores, we used Kendall's Coefficient of Concordance W	
Estableciendo la unidad de atención a la accesibilidad digital en el Tecnológico Nacional de México/IT Aguascalientes	Ricardo Mendoza-González, Juan Tovar-Luevano, Rafael Portillo-Rosales	El objetivo de este trabajo fue presentar el conjunto de servicios básicos de la Unidad de Atención a la Accesibilidad Digital del Tecnológico Nacional de México/IT Aguascalientes (TecNM/ITA), así como su integración inicial a la estructura orgánica de la institución. Dichas acciones se llevaron a cabo en el marco del proyecto "Asistencia tecnológica a la accesibilidad en la Educación Superior Virtual, EduTech", número de registro: 609785-EPP-1-2019-1-ES-EPPKA2-CBHE-JP, cofinanciado por el programa ERASMUS+ de la Unión Europea. En este sentido, se enfatizó la implementación de los resultados derivados de dos entregables de dicho proyecto:"1.1 Informe del estado de arte de unidades de atención a la accesibilidad tecnológica aplicada a la Educación Superior", y "2.1 Guía de implantación y	https://revistadigital.uce.edu.ec/index.php/CATEDRA/article/view/3293

Título	Autores	Resumen	Enlace
		procedimientos de gestión de una unidad de atención a la accesibilidad tecnológica aplicada a la Educación Superior". Los hallazgos y recomendaciones de estos entregables permitieron establecer los cimientos de la primera Unidad de Atención a la Accesibilidad Digital en todo el sistema nacional de tecnológicos, el cual cuenta con 254 institutos a lo largo del país. Se espera que el contenido de este artículo inspire a otras Instituciones de Educación Superior (IES) para que conformen sus propias Unidad de Atención a la Accesibilidad Digital.	

3. AGRADECIMIENTOS