

Migrating the *dilo con señas* mobile app to a local web environment

Migración de la aplicación móvil *dilo con señas* a un entorno web local

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Abstract

This project documents the migration of the mobile application "Dilo con señas" to a local web environment using IWEB technology to contribute to the improvement of Mexican sign language (LMS) learning, expanding the opportunities for inclusion and autonomy of people with hearing loss, hearing impaired or aphonia of CAM No.8. According to the results of the National Survey of Demographic Dynamics of 2018, 7,877,805 people, have some disability, which represents 6.3% of the total population of the country, of that universe 28% manifests some disability of hearing loss, hearing loss or aphonia (INEGI, 2018). The methodology was IWEB (Solís, 2015) which consists of the following phases: formulation, planning, analysis, engineering, page generation and customer testing and evaluation. As a result, a web application was obtained which consists of the categories; alphabet, animals, house, colors, days of the week, school, family, toys, months and numbers, implemented images of ideograms and dactylogologies, the purpose is to offer an option to improve communication and boost the autonomy of the children of CAM No. 8 with their family and school environment, because it is clear that if they work together a positive and inclusive environment can be created.

Inclusion, Hearing Loss, Signs, Aphonia

Resumen

El presente proyecto documenta la migración de la aplicación móvil "Dilo con señas" a un entorno web local empleando la tecnología IWEB para contribuir en la mejora del aprendizaje del Lenguaje Mexicano de Señas (LMS), ampliando así las oportunidades de inclusión y autonomía de las personas con hipoacusia, débiles auditivos o afonía del CAM No.8. De acuerdo con los resultados de la Encuesta Nacional de la Dinámica Demográfica de 2018, 7,877,805 personas, presentan alguna discapacidad, lo que representa el 6.3% de la población total del país, de ese universo el 28% manifiesta alguna discapacidad de hipoacusia, débiles auditivos o afonía (INEGI, 2018). La metodología fue IWEB (Solís Ramos, 2016) que consta de las fases: formulación, planificación, análisis, ingeniería, generación de páginas y pruebas y evaluación del cliente. Se obtuvo una aplicación web con las categorías; abecedario, animales, casa, colores, días de la semana, escuela, familia, juguetes, meses y números, implementado imágenes de ideogramas y dactilologías, el propósito es ofrecer una opción para mejorar la comunicación e impulsar la autonomía de los niños del CAM No. 8 con su entorno familiar y escolar.

Inclusión, Hipoacusia, Señas, Afonía

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Introduction

The Multiple Attention Center No. 8 (CAM No. 8), offers basic education and job training for children and young people, these centers seek the integration of minors to regular educational services, through the development of autonomy, self-care and learning basic school concepts.

One of the situations that this sector faces is the little or no access to technological resources by the educational community, made up of the vast majority of people with limited economic resources, of indigenous extraction, whose parents have no training. that allows them to support them.

In the various visits that were made to the facilities, the staff mentioned that the sector that could benefit the most from the use of IT in their training, are precisely children with hearing loss and / or aphonia, given that their mental capacities are whole; However, there are no didactic resources or internet services to access various training resources, so the alternative is to offer a website through an intranet that offers an interactive and intuitive experience in the Mexican Sign Language (LMS).

Theoretical framework

Disability is understood as the interaction between people who have a health problem (WHO, 2021), for example, cerebral palsy, Down syndrome and depression, as well as personal and environmental factors (for example, negative attitudes, transport and public buildings inaccessible and limited social support).

Types of disability

- Physical disability: It consists of lack, deterioration or functional alteration of one or more parts of the body, and that causes immobility or decreased mobility.
- Sensory disability: It is divided into hearing impairment and visual impairment.
- Hearing disability: It consists of the deterioration or lack of the sensory function of hearing (partial or total deafness, difficulties in speaking).

- Visual impairment: It consists of the deterioration or lack of the sensory function of seeing (decreased vision, blindness).
- Intellectual disability: Consists of significant limitations in intellectual functioning and adaptive behavior, which is manifested in conceptual, social and practical adaptive skills.
- Mental disability: It consists of alterations or deficiencies in mental functions, specifically in thinking, feeling and relating. It is also known under the term "Psychosocial Disability". (Fundación Integralia, s.f.)

In Mexico, according to the 2018 census, the percentages of each activity with disabilities are walking 52.7%, seeing 39.0%, moving 17.8%, learning 19.1%, listening 18.4%, bathing 13.8%, speaking 10.5%. disability the activity of walking, going up or down using your legs. As shown in Table 1.

Activity with difficulty	2014 (%)	2018 (%)
Walk. Raise or lower using your legs	50.2	52.7
See (even if I wear glasses)	39.2	39.0
Moving or using arms or hands	17.0	17.8
Learn, remember or focus	19.0	19.1
Listen (even if you wear a hearing aid)	19.0	18.4
Bathing, dressing, or eating	14.0	13.8
Talk or communicate	11.4	10.5
Emotional or mental problems	11.7	11.9

Table 1 Percentage of the population with disabilities, by activity with difficulty, 2014 and 2018
Source INEGI

According to the results of the ENADID (INEGI, 2018), of the 124.9 million people in the country, different types of disabilities are shown, of which 39.0% their problem is seeing (even if they wear glasses), 17.8% are move or use arms or hands, 19.1% is learning, remembering or concentrating, 18.4% is listening (even if they use a hearing aid) and 10.5% their difficulty is speaking or communicating, as shown in Figure 1.



Figure 1 Structure by age and sex of the population with disabilities and those without disabilities according to ENADID

Source: INEGI

Language acquisition: sign language, written language and reading.

Language is one of the inherent qualities of the human being and as already mentioned, it constitutes a right; however, the criteria for defining the concept of language are varied since they depend on its number and scope. (Sacoto Macias, 2017) The basic characteristics of this, as alluded to by Roger Brown are:

- Productivity, that is, the ability to create new statements, combine them and even expand them to build new things. This characteristic has other names according to the author, for example: recombination, recursion or generative capacity.
- Symbolism or semanticity, this refers to the symbolic way in which ideas, events and objects are represented.
- Displacement, that is, the messages do not have the need to relate to the immediate context. (Brown, 1973)

The acquisition of language, then, is framed as a process that has attracted the attention of several scholars for decades, starting from the philological perspective, moving to the Boasian study until reaching the paradigm reasoned by Noam Chomsky (Chomsky, 1957) where it was established by the first time that the rules of grammar and language must be innate in the brain, this; due to the complexity that implies that a child learns the linguistic structure of a language from what he hears.

Thus, language can be understood as a system of symbols used to carry out cultural activities of a specific group. (Trager, Smith, & L., 1957) in this way, a postulate that opposes universal grammar is theorized (Stokoe, 2004)

Reading is a complex process, which also raises a perceptual drawback that psychologists call the problem of invariance, that is, we must be able to identify words, no matter how they appear, regardless of their size, typology or shape. In this sense, one of the first steps for reading is to learn the immense variety between these superficial forms, and then to be able to move on to understanding and meaning. Although the fovea absorbs visual information, not all of it has the same precision because as the reader moves away from the center of attention, the visual relays of the thalamus and the cortex gradually decrease the number of cells assigned to it; which generates a gradual decrease in visual precision.

Ideograms

Ideograms represent a word with a single hand configuration. (CONAPRED, 2011)

Dactylology

Sign language is the manual representation of each of the letters that make up the alphabet (Vilches Vilela, 2005). Through it, any word that you want to communicate can be transmitted to the deaf person, however complicated it may be.

Spelling is an important part of the communication system of deaf people. It is simply the writing of the Castilian alphabet executed in the air instead of on paper.

There are twenty-nine positions with their variations of hand movement, some of which are the exact representation of the letter. Fingerspelling is used in combination with sign language for nouns, proper names, addresses and words for which there is no ideogram or sign created or is little known by the signatory community, as occurs with recently created signs (neologisms). or unusual words. Its importance cannot be underestimated; It is therefore essential for the newcomer to sign language to concentrate on developing both receptive and expressive skills in order to gain experience.

The dominant hand is used (right for right-handed and left for left-handed) to carry out sign language. It is executed mainly at the level of the chin. Its implementation is complemented by the oral articulation, so it is necessary that the face and mouth are visible, as shown in Figure 2.

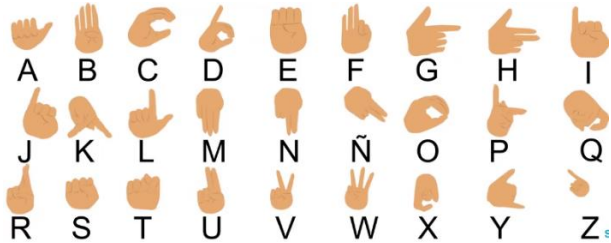


Figure 2 Representative alphabet with sign language
Source: National Pedagogical University UPN

Problem Statement

Currently the teachers of CAM No. 8 communicate with people who have hearing loss, deafness or hearing impairment through nonverbal expressions, facial expressions and gestures using the hands based on the Mexican Sign Language, but relatives, psychologists and some educators are not related to this form of information transmission.

Within the student population there are students with hearing loss, deafness or hearing impairment, educators establish a communication channel through nonverbal expressions, facial expressions and gestures using the hands based on the LMS, but in their environment the transmission of information is difficult since relatives and even the staff of the same institution are unaware of this means of communication.

For these reasons it is that the Academic Body of Information Technologies makes the decision to work with a mobile version of the Dilo project with signs, which after having carried out usability tests (experience in mobile applications, identity, content, navigation, graphic environment, searches, feedback and utility) aimed at the teaching staff and students of the institution that resulted in the need to implement a web environment because the institution does not have the necessary infrastructure to offer connectivity or mobile devices to its students, for For this reason, it is determined to implement the migration of said application to a local web environment that allows making use of the contents of "Say it with signs within a computer laboratory".

Method

In the project named Migration of the Web Application Dilo con Señas for the Multiple Attention Center Number 8, Huejutla, Hgo, the Web Engineering methodology was used (Solís Ramos, 2016), which is a methodological proposal that works with the World Wide Web and the Internet.

This methodology consists of six stages that handle an incremental and evolutionary process, which makes it an efficient model for the development of web systems. The following sections provide a detailed description of each stage, as seen in Figure 3.

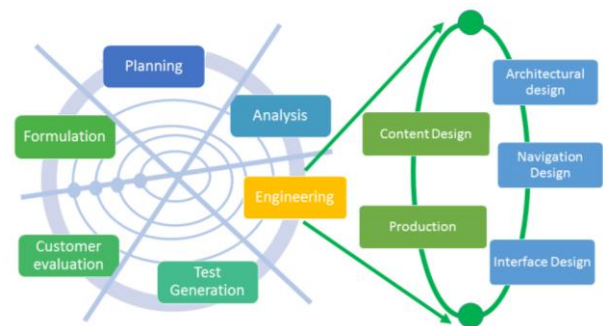


Figure 3 WEB Engineering Methodology (IWEB)
Source: Own elaboration, Solis 2015

Results

Formulation, in this phase the objectives and user profiles that the application will contain were identified, leaving the following:

- Administrator, this can create categories within the application, add content, add new users and login.
- User (Students, Parents and staff), could log in and consume the contents of the application.

In the planning stage, it was determined to carry out an analysis of the technical hardware and software requirements for the development of the project that allow to identify the feasibility of the web application (technical, economic and legal).

In the Analysis process, CAM staff and the academic body came to the conclusion of creating two main categories of content within the application illustrated in Table 2.

Category: Alphabet	
Content	Justification
Letters	Static and dynamic images were implemented, using the complete alphabet. A, B, C, D, E, F, G, H, I, J, K, L, M, N, Ñ, O, P, Q, R, S, T, U, V, W, X, AND Z.
Category: Learn	
<ul style="list-style-type: none"> Family Colors Numbers Fruit Toys Animals House School Weekday Months 	The Learn category is made up of subcategories that are mentioned in the content section, each content has its respective static image.

Table 2 Categories that make up the source web page Academic Body in Information Technology

In this same phase, the modeling of the database is created taking into account the categorization of the contents, as well as the use case diagrams that represent the interaction processes of the users with the application.

The engineering phase includes the design of content (static and dynamic) that will form part of the project, the site navigation map and the production of the graphic interface design that is illustrated in the following image of Figure 4.

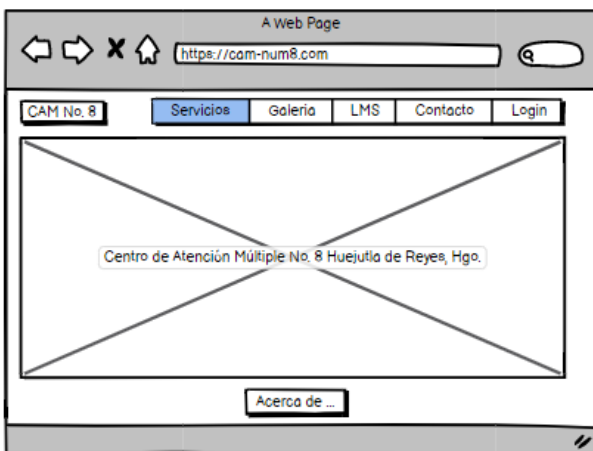


Figure 4 Initial interface design, Home screen representation
Source: Academic Body in Information Technologies

The web application displays static images of the symbols, as seen in Figure 5.



Figure 5 Still images, examples of the alphabet, animal, color, day of the week, number and fruit
Source: Academic Body in Information Technologies

On the other hand, the web application shows dynamic images of the symbols through videos, as seen in Figure 6

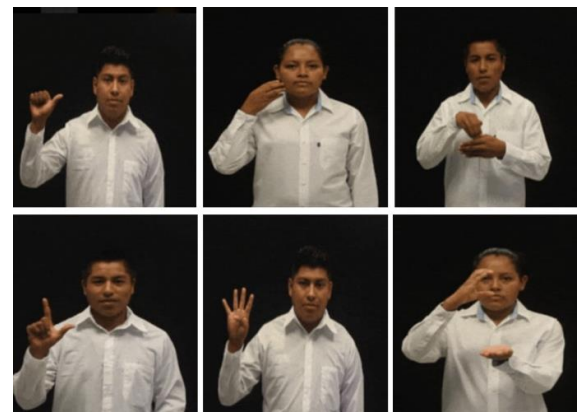


Figure 6 Dynamic images. Examples of alphabet, animal, color, day of the week, number and fruit. Source Academic Body in Information Technologies

The page generation and testing phase served for the development as such of the web application in which various web development technologies were used (MySQL, HTML5, CSS, JS, REAC JS) that were implemented to generate the user interface of the application, as seen in Figure 7.



Figure 7 Capture of the home screen of the web page
Source: Academic Body in Information Technologies

In the test section, various questionnaires were applied (experience in web applications, identity, content, navigation, graphic environment, searches, feedback and usefulness) that allowed to determine the usability of the project before the possible end users of the application.

In this project, the expected objective was achieved, the purpose of which was to develop a web application through the IWEB methodology that allows contributing to improve the learning of the Mexican Sign Language in order to expand the opportunities for inclusion and autonomy of people with hearing loss. hearing loss or aphonia of CAM No.8.

The objectives and goals of the system were identified, considering the results of the usability tests in terms of experience in web applications, identity, content, navigation, graphic environment, searches, feedback and usefulness for development for migration to the web application.

The technical, economic, operational and legal analyzes were carried out to determine the viability of the project, as well as to establish the sketches based on the requirements for the development of the web page modules, specifying as a goal to elaborate the interface and navigation designs.

A web application was built using the react js framework that allowed the development of dynamic web applications, establishing the goal of building the website by creating the categories of: alphabet books, learn, practice, toy, numbers, family, animals, using fingerprint and ideograms. As a result, the web portal was started with its respective modules and the dynamic and static images were selected.

A usability testing protocol was applied again, aimed at staff, students, and school environment.

After concluding the project, it is intended to deliver the web application called web application development say it with signs, for the Multiple Attention Center (CAM) number 8, Huejutla de Reyes, Hgo; This will allow many people and parents to have a tool that serves as support material to strengthen the knowledge of students with deafness, hearing impairment or hearing loss and in this way they can obtain better communication through Mexican sign language.

Conclusions

The project was born out of the need to support people with deafness, hearing impairment or hearing loss, since there is a high percentage of disabled people in the country. Its purpose was to carry out the migration of the mobile application “Dilo con señas” o a local web environment using IWEB technology to contribute to the improvement of the learning of the Mexican sign language, thus expanding the opportunities for inclusion and autonomy of people with hearing loss, hearing loss or aphonia of CAM No.8.

The methodology used for this project was Web Engineering, which allowed keeping a chronological order for the creation of the project, as well as optimizing errors and times that occurred during its development.

This project benefits the community that make up the Multiple Attention Center (CAM) number 8, Huejutla de Reyes Hidalgo. This application helped CAM students to have ease of acquiring knowledge through the use of the alphabet categories and learn, since in each image the sign language and ideogram are represented.

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