

Prototype computer system for teaching and reading-writing support for children with motor, hearing and visual disabilities in the state of Aguascalientes

Prototipo de sistema informático para la enseñanza y apoyo en lecto-escritura de niños con discapacidades motoras, auditivas y visuales en el estado de Aguascalientes

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Abstract

The present research aims to identify predictive relationships of an IT success model with levels of statistical significance, between a set of organizational, technological, individual and environmental variables, and variables of the individual and organizational impacts perceived by the Educators specializing in sign language of some institutions like DIF (state and municipal), Threshold of Educational Technology of the State of Aguascalientes and the Association of Deaf of the State of Aguascalientes. The study consisted in evaluating, through reliability, validity and sensitivity, a prototype of a web development created by students of stay for the Threshold of Technology of the State of Aguascalientes. The pilot study was applied with the application of the measurement instrument to 20 people between educators, directors, language experts and advanced users of the Deaf Association of Aguascalientes.

Software, Hearing disability, Sign language, Web

Resumen

La presente investigación tuvo como propósito identificar relaciones de tipo predictivo de un modelo de éxito de TI con niveles de significancia estadística, entre un conjunto de variables organizacionales, tecnológicas, individuales y del medio ambiente, y variables de los impactos individuales y organizacionales percibidos por las educadoras especialistas en lenguaje de señas de algunas instituciones como DIF (estatal y municipal), Umbral de Tecnología Educativa del Estado de Aguascalientes y la Asociación de Sordos del Estado de Aguascalientes. El estudio consistió en . El estudio piloto se realizó con la aplicación del instrumento de medición a 20 personas entre educadoras, directoras, expertos en el lenguaje y usuarios avanzados de la Asociación de Sordos de Aguascalientes.

Software, Discapacidad auditiva, Lenguaje de señas, Web

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Introduction

Currently there are students who have reached middle and higher levels without knowing how to read and write, without the purpose of analyzing this problem. The objective of this project is to analyze the existing solutions that support this problem and to design a prototype in the first instance. to an application that serves as support in the teaching-learning process aimed at "Special Children", the different techniques used in teaching special children are investigated, to develop a computer application that serves as support to reinforce the learning of the vowels, numbers, geometric figures and primary colors, these topics correspond to the educational program of children from four to six years. The design of the application will be based on the pedagogical models used in Special Education and guided by the criteria of Human Machine Interaction.

Deafness is the difficulty or inability to use the sense of hearing due to: (1) a loss of partial hearing ability (hearing loss) or (2) total (cofosis), so the deaf person will be unable or will have trouble hearing. This disability can be an inherited trait or it can be a consequence of: (a) a disease, (b) trauma, long-term exposure to noise, (c) or aggressive medications to the auditory nerve. (Wikipedia, 2019)

Justification

According to the results of the Population and Housing Census 2013 - in its expanded questionnaire (INEGI, 2011a) -, 5 million 739 thousand people (figure representing 5.1% of the total population of the country) in the national territory declared having difficulty perform at least one of the seven activities evaluated: walking, moving, climbing or lowering (hereinafter walking or moving); see, even wearing glasses (see), talk, communicate or talk (talk or communicate); hear, even using hearing aid (listen); dress, bathe or eat (take care of personal care); pay attention or learn simple things and mental limitation; that is, they are people with disabilities.

In Aguascalientes there are approximately, according to the census, 1,468 children with mental disabilities, 224 children with speech disabilities, which results in 1,692 children.

Of those deployed, those who are old enough to know how to read and write but do not have the aptitude, among those who attend schools, are 888 children. And the number of children with intellectual disabilities who are of age to go to school and do not go, are 1258 children. A 51.23% within this disability are men and 48.77%, women. To this information it is necessary to add the number of the registered ones, that their option is, is not specified.

Paying attention or learning simple things is a disability that has a greater intensity in Aguascalientes than in the rest of the Country. We have almost 3 thousand people who present it, which means an overrepresentation of 50% in this area, since with 1% of the general population and the population with disabilities, in the case of attention deficit deficiency or to learn, the values rise to 1.49% in the case of men and 1.36% in the case of women. At 3 thousand we can add another 5,500, derived from counting people with mental disabilities, thus adding 8,500.

More than 1% (1.09%) is in Aguascalientes; with a particular masculine inclination, since males represent 4.12% of the national group, but 4.29% in the case of the state level. That is, in Mexico and Aguascalientes, there is more disability among men than among women.

If we put the total number of disabled people as 100%, the population under 18 is approximately 58.63% according to INEGI statistics. This shows us that there are people who are at an early age to improve their education, through new technologies.

Children who have an intellectual disability tend to have limits when learning, resulting in a slow learning process with respect to a regular child, so you must use principles and methodologies to optimize your academic performance, and Let it develop in a better way.

Thanks to the great advance that technology has had, now it is possible to reach other sectors in which this can be a tool that, when implemented, facilitates the teaching and learning process. Technology allows integration into society for their university studies.

Problem

Students with different abilities are people with limited learning abilities and their learning is slower than that of a regular child. Therefore, methodological principles should be used to optimize their academic performance, in almost all sectors of society. a change in the education of the future is being necessary due to the presence of technology. Currently few people come to study at higher levels, most of them do not know how to read and / or write relatively enough so that it does not mean an obstacle in the culmination of their studies.

Problem Statement

More than 1% (1.09%) is in Aguascalientes; with a particular masculine inclination, since men represent 4.12% of the national group, but 4.29% in the case of the state level. That is, in Mexico and Aguascalientes, there is more disability among men than among women. If we put the total number of disabled people as 100%, the population under 18 is approximately 58.63% according to statistics. (INEGI, 2019) This shows us that there are people who are at an early age to improve their education, through new technologies.

Children who have an intellectual disability tend to have limits when learning, resulting in a slow learning process with respect to a regular child, so you must use principles and methodologies to optimize your academic performance, and allow you to develop in a better way.

Hypothesis

The use of computer system prototypes for teaching and reading support for children with motor, hearing and visual disabilities in the state of Aguascalientes as a teaching tool, positively impacts the learning of reading and writing, encouraging them to develop your literacy skills when using digital tools.

Objectives**Overall objective**

Know the impact of prototypes for teaching and reading support for children with motor, hearing and visual disabilities in the state of Aguascalientes

Specific objectives

- Know the impact of prototypes for teaching and support in reading and writing.
- Implement prototypes for each disability and measure results.

Theoretical framework

The General Assembly of the United Nations proclaimed in 1971, the Declaration of the Rights of the Mentally Retarded and in 1975, the Declaration of the Rights of the Disabled, documents that highlighted the importance of adopting measures for the protection of the political and civil rights of persons with disabilities, including the right to medical care and physical treatment, as well as the right to education, training, rehabilitation and guidance to maximize their capacity and skills.

Since then, countries were urged to recognize the rights of persons with disabilities and their families, without exception, without distinction or discrimination on the grounds of race, color, sex, language, religion, political or other opinions, origin national or social, fortune, birth or any other circumstance.

The General Education Law that regulates the education provided by the State (Federation, federative entities and municipalities), its decentralized agencies and individuals with authorization or with recognition of official validity of studies.

In its Article 39, this Law indicates that the initial education, special education and adult education are included in the national education system. Likewise, in its Article 41 it mentions that special education is intended for individuals with temporary or definitive disabilities, as well as for those with outstanding aptitudes and will serve students adequately to their own conditions, with inclusive social equity and with a gender perspective.

There are few studies that have been carried out in the world to assess the situation of persons with disabilities based on the model promoted by the United Nations Convention on the Rights of Persons with Disabilities.

An exploratory study carried out in 2004 by the International Network on Disability, documented that most of the countries of the Region of the Americas continued to use the definition of disability of the CIDDM.

According to this study, Mexico was classified in the category of “moderately inclusive” countries, because the Government has had an outstanding participation in the promotion and protection of the rights of persons with disabilities before the United Nations and, in addition, National legal framework emphasizes the equality of persons with disabilities and the non-discrimination of this group of the population in all aspects of social life. However, it is in practice that the lack of a culture of disability is observed through which society perceives this social group as part of itself and accepts it with all its characteristics. This study also revealed some contradictions, since much of the internal laws have not been updated or regulated, which indicates the enormous challenge facing our country to realize the exercise of the rights of persons with disabilities.

Today, it is necessary to be able to provide support in terms of learning refers to people with motor, hearing and visual disabilities. For this reason and in search of joint progress so that its integration in the student and later labor sector is possible, joint work has begun between the UTA (ICT Academic Corps) and the IEA, especially the area dedicated to “Special Education ”To carry out these actions that contribute to the educational growth of this area.

Research carried out in the area about the existing software and hardware for this purpose has led us to find that the sale of software and hardware that supports the learning of children with diverse disabilities is currently available in the markets, and that in addition They are extremely expensive, however, it has been found that for the attention to the area of hearing impairment there is no development of software and devices that can support this problem. It was then sought to start with software developments, through the CETIC (UTA), which support the orientation of the efforts towards the "Reading and Writing Learning" of people with hearing disabilities. There are some images of the prototypes obtained in the final annex.

Research Methodology

The method of data collection used in the research is quantitative and was the questionnaire (measuring instrument) structured via surveys via the Internet through a sample of the population. For the purposes of this investigation, the descriptive and correlational statistical method was used. Because the study presented falls in the field of Information Systems, the PLS (Partial Least Squares) package [4] will be used.

PLS is a second generation multivariate technique that facilitates the testing of psychometric properties of the scales used to measure a variable, as well as the estimation of the structural model parameters [5]. This study considers only the questionnaires applied to twenty people taking into account the objectivity and proximity with the ICT and the usability of the system.

PLS generates a multivariate analysis by incorporating multiple dependent constructors, explicit error recognition, and integrating the theory with empirical data. PLS is mainly oriented to predictive causal analysis in situations of great complexity but with little theoretical information; It is recommended for research of predictive models where the emphasis can be mainly on the development of theory [4].

PLS allows testing the relationship between the variables / builders of the research model and the hypothetical relationships between the variables / builders simultaneously. The model is analyzed and interpreted in two stages:

- The assurance of the reliability and validity of the measured model.
- The assurance of the structure of the model.

In relation to descriptive statistics, a T-means test was used through the SPSS statistical package to see if the means are significantly different from each other.

Below is a summary of the validity of each variable that makes up each constructor, as well as the validity of the latter:

Constructor	Variables	Reliability	Validity
C1. System Quality	V1.1. The information system adapts to the new conditions or demands. V1.2. You have access to the system when you need it. V1.3. It's easy to use. V1.4. The system shares information with other functional areas or with other systems. V1.5. The answers to your requests are adequate in time.	0.92	0.75 to 0.93 Only the range of validity results of all variables was specified
C2. Quality of the information	V2.1. Provide accurate information. V2.2. The information provided by the system is exactly what you need. V2.3. It is enough to perform the task. V2.4. You are satisfied with the answers. V2.5. It is clear enough. V2.6. The options offered by the system to visualize the information are sufficient.	0.88	0.88 0.89 0.85 0.67 0.60 0.45
C3. Service Quality	V3.1. Communication with the system is effective. V3.2. The service time in which the service staff attends your requests is adequate. V3.3. The relationship with the service staff is cordial. V3.4. The training received for the use of the system was adequate. V3.5. Staff training and capacity is adequate.	0.87	0.64 0.79 0.77 0.73 0.78
C4. Utilization	V4.1. Use the system with children	0.7	0.75
C5. User satisfaction	V5.1. You are looking for the use of the system to do your job. V5.2. The system provides greater value to the organization. V5.3. You get personal benefits from the system. V5.4. The system really improves the performance of your work.	0.77	0.72 0.74 0.63 0.86
C6. perceived usefulness	V6.1. The use of the system allows you to perform your activities faster. V6.2. The use of the system improves		0.80 0.89

	performance in your work. V6.3. The use of the system improves your efficiency in your work. V6.4. Using the system makes your job easier.	0.96	0.94 0.88
C7. Speed in decision making	V7.1. You can make quick decisions. V7.2. The speed of special attention decision making is increased. V7.3. Reduces the time of the channeling decision making. V7.4. The decision time in meetings is less.	0.85	0.79 0.80 0.86 0.72
C8. Communication	V8.1. Decreased time in organizational communication. V8.2. Increase in organizational communication. V8.3. Help to exchange inter-organizational information	0.8811	0.63 0.82 0.84
C9. Organizational effectiveness in decision making	V9.1. Effectiveness in decision making has increased. V9.2. Quality improvement in organizational decision making. V9.3. Organizational decisions can be implemented more quickly.	0.83	0.75 0.68 0.82
C10. Goal achievement	V10.1. Support for setting organizational goals and objectives. V10.2. Support for the fulfillment of organizational goals and objectives. V10.3. Support for monitoring and evaluation of compliance with organizational objectives	BFL: Budget for literature (Torkzadech and Doll 2001)	BFL: Budget for literature (Torkzadech and Doll 2001)
C11. Size	V11.1. Number of employees currently working in your company.	ND: No availability of the constructor or validity of the variable in the studies	ND: No availability of the constructor or validity of the variable in the studies
C12. Maturity	V12.1. The rules and procedures are well defined and enforced for the system and software factory. V12.2. The administrative practices of the system and the development cell are well defined and carried out in an appropriate manner. V12.3. The development cell is conducted properly.	ND: No availability of the constructor or validity of the variable in the studies	ND: No availability of the constructor or validity of the variable in the studies
C13. Resources	V13.	ND: No availability of	ND: No availability of

	Amount of resources invested in the system and in the software factory.	the constructor or validity of the variable in the studies	the constructor or validity of the variable in the studies
C14. Dynamism	V14.1 It is quickly or intensely changing your marketing practices to maintain the software.	0.85	0.7
	V14.2 The degree of obsolescence of SW products is fast.		0.66
	V14.3 It is easy to predict the actions of changes in the SW.		0.6
	V14.4 It is easy or difficult to predict the demand and tastes of users.		0.74
	V14.5 The changes in this type of technology are intense.		0.71
C15. Heterogeneity	V15.1 There are big differences between existing products.	0.85	0.84
	V15.2 There are technological differences between the SW developed.		0.82
	V15.3 There are advantages in the SW developed.		0.74
C16. Hostility	V16.1 The cost benefit is profitable.	0.82	0.68
	V16.2 The degree of acceptance is adequate.		0.76
	V16.3 The opposition is strong..		0.71

Table 1 of validity and reliability of each variable

Results

The results presented below were obtained using the SPSS statistical package. Reliability is reported for each builder by calculating Cronbach's alpha and the validity of its variables through a correlation and an analysis of the factor load.

Constructor	Variables	Validity	Reliability
C1. System quality	V1.1	0.887	0.733
	V1.2	0.615	
	V1.3	0.661	
	V1.5	0.772	
C2. Quality of the information	V2.1	0.810	0.8433
	V2.2	0.910	
	V2.3	0.705	
	V2.4	0.770	
	V2.5	0.738	
	V2.6	0.674	
C3. Quality of service	V3.1	0.804	0.8549
	V3.2	0.771	
	V3.3	0.840	
	V3.4	0.790	
	V3.5	0.835	

C5. User Satisfaction	V5.1	0.816	0.8292
	V5.2	0.917	
	V5.3	0.767	
	V5.4	0.825	
C6. Perceived profit	V6.1	0.954	0.9545
	V6.2	0.924	
	V6.3	0.958	
C7. Speed in decision making	V7.1	0.931	0.9183
	V7.2	0.879	
	V7.3	0.925	
C8. Communication	V8.1	0.962	0.8494
	V8.2	0.940	
	V8.3	0.716	
C9. Organizational effectiveness in decision making	V9.1	0.937	0.9488
	V9.2	0.963	
	V9.3	0.952	
C10. Goal achievement	V10.1	0.942	0.9376
	V10.2	0.960	
	V10.3	0.928	
C12. Maturity	V12.1	0.913	0.7719
	V12.2	0.950	
	V12.3	0.616	
C14. Dynamism	V14.1	0.709	0.6219
	V14.2	0.508	
	V14.3	0.572	
	V14.4	0.663	
	V14.5	0.767	
C15. Heterogeneity	V15.1	0.719	0.7245
	V15.2	0.918	
	V15.4	0.788	
C16. Hostility	V16.1	0.931	0.8987
	V16.2	0.812	
	V16.3	0.932	
	V16.4	0.807	

Table 2 Reliability results by calculating Cronbach's alpha and the validity of its variables by means of a correlation and an analysis of the factor load

Finally, questionnaires were distributed to 189 people, above the initial sample of which 124 answered instruments were recovered, obtaining a response rate of 66%. The purification was done and the invalid ones were discarded, 116 questionnaires were left for the statistical analysis and the following results were found.

Higher quality of the system is associated with greater use of the system, there is no statistical evidence to show that higher quality of the system is associated with greater user satisfaction, there is slightly significant statistical evidence to state that there is a relationship between the quality of information offered by the system and the use of information systems and user satisfaction. None of the institutions are accustomed to continually use commercial software to support reading and writing for hearing impairments and therefore although it is reflected that there is greater speed in decision making, fieldwork does not fully certify this statement. The individual impact of the software affects an individual impact, as well as the dynamism.

The positive aspects of the software are its portability and accessibility from any platform, including mobile devices. The videos were made by personnel of the Technological University of Aguascalientes with the contribution of personnel of the deaf association of Aguascalientes, which are the only ones that can authorize their release.

As negative situations we find the lack of dissemination of the software due to situations of intellectual property, copyright and somewhat political situations within the State of Aguascalientes. In addition there were problems related to hosting and support and maintenance.

Finally, in order to raise the level of reliability or representativeness of an environment, it is recommended to explore possible independent variables that may increase the reliability of the model, as well as contribute to new knowledge about the success of information systems, as well as updating the model. It was found that there is sufficient statistical evidence that a higher quality of the system is associated with a greater use of it, a higher quality of information is associated with a greater use of the system and user satisfaction, there is a correlation between the quality of service and user satisfaction, greater use of information systems is associated with greater individual impact.

Conclusions

The most important aspect for user satisfaction is the information provided by information systems. Although the use of the systems and the quality of service were also found, this last aspect considered as a fundamental component for user satisfaction [6]. In addition, statistical evidence was found that reflects an influence of the environment in which the organization is immersed in the individual but especially organizational impact derived from the use of the system.

Measuring the degree of acceptance and advantages of software developed and implemented by the Technological University to be used in the educational processes of reading and writing of children with hearing disabilities is being implemented in the primary schools of the municipality of Aguascalientes.

It was difficult to establish the same process with other disabilities such as motor, visual and intellectual due to factors such as lack of cooperation between institutions and the very nature of disabilities.

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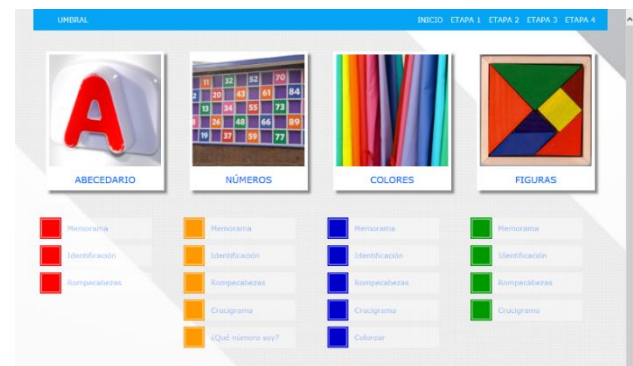
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Annexes

Web system screen for reading-writing learning



- The software consists of a website that contains several sections (by families) by levels that measure the learning of children with disabilities in the reading-writing process through games (puzzles, completing the words, finding and ordering the phrases, etc. .) and was developed with HTML, CSS, JQUERY and JQUERY UI.
- Compatible with IE6 and later versions, Chrome, Firefox, Opera and Safari.
- Not adaptable to mobile devices with minimum resolutions at 1024x600 pixels.
- Made up of four modules, each module contains specific semantic topics that help children with different ages learn to read and write.