Evaluation of "JAWS" software at the Basic Education School Specialized Blind and Deaf of Machala city

Jimmy Rolando Molina Rios[1], Mariuxi Paola Zea Ordonez[2], Fabricio Gustavo Garcia Zerda[3]

[1, 2] Technical University of Machala, Teaching Researcher, Machala, Ecuador
[3] Technical University of Machala, Student Researcher, Machala, Ecuador

Abstract— *The use of software in the educational system has significantly improve the process of learning of the students. Today most schools adopt their curriculum model using software; oriented application that educational improvements and bonding of the technological world with education.*

In this article the JAWS tool is evaluated at the Basic Education School Specialized Blind and Deaf of Machala city, in which we will present the educational contribution that has provided the JAWS software, Job Access With Speech to students with disabilities visual.

The research was conducted within the framework of a quantitative study, obtaining data through surveys and the application of standard ISO/IEC 9126 quality based on the characteristics of software usability.

The result of the research showed that students have improved their skills by using this system.

Keywords— Visual impairment, standard quality, Educational, ISO/IEC 9126, JAWS, Software.

I. INTRODUCTION

In most countries of the world in recent years began a general reorientation aimed at the pedagogical and educational updating, respecting the diversity of each region in terms of technical development levels of educational, medical, scientific and according to WHO.

However, in Ecuador they are experiencing great changes in the educational process and the inclusion of people with disabilities in this area. This is also due to rapid advances in technology and software development as tools for teaching and transmitting knowledge through computers.

The software used in the education system has transformed the world in recent decades, the use of computers in conjunction with the use of software by those exercising the profession of teaching has allowed supplement the teaching process, however, some they think this has a negative effect on the population, but if handled responsibly this will contribute to the enrichment of knowledge, considerably reducing the digital divide in the last century constitute a serious obstacle for people with special needs.

The measures implemented in educational institutions allow people with disabilities have the same number of opportunities in access to information with the use of software or educational programs.

Such is the case of the JAWS program that has become one of the benchmarks for the integration of persons with disabilities specifically the blind population. This type of adaptive technology reduces the impact of people with disabilities in their learning, influencing the development of society in which it operates.

In this particular case study, the School of Basic Education Specialized Blind and Deaf of the city of Machala, use this program as a tool for education and communication for people with visual impairments, it allows all kinds of activities through a computer.

The problem that arises is the need to know to what extent this tool has represented a contribution in the educational process by their assessment through quality metrics.

The objective pursued in this research is to evaluate the JAWS software at the School of Basic Education Specialized Blind and Deaf, by applying techniques of data collection and quality metrics knowing their educational contribution to learning and intellectual development students.

As a result it has been possible to demonstrate that the JAWS software contributes favorably both educational and personally.

II. VISUAL DISABILITY
2.1. DISABILITY
According to WHO [1], disability is a general term covering impairments, activity limitations and participation restrictions.

Impairments are problems that affect a body function or structure; Activity limitations are difficulties to execute

actions or tasks, and participation restrictions are problems to participate in life situations.

Therefore, disability is a complex phenomenon, reflecting an interaction between features of the human organism and the characteristics of the society in which he lives.

2.2. VISUALLY IMPAIRED
According to WHO [1], visual impairment is a state of limitation or less efficient interaction between individual factors and context of a less accessible.

2.3. CLASSIFICATION
The WHO [1] classifies the visually impaired to varying degrees, depending on the visual acuity and visual field:

Normal vision: visual acuity 0.8 or better / visual field 120 °.

Moderate low vision: visual acuity <0.3 / visual field <60 °

Severe Low Vision: visual acuity <0.12 / visual field <20 °

Low Insight: Visual acuity <0.02 / visual field <5 °

Total Blindness: visual acuity: no light perception / vision 0 °.

2.4. TYPES OF VISUAL IMPAIRMENT
According to WHO [1], the distribution of types of visual impairment is:

Blurred vision: visual acuity is affected in the distant and near vision. The field is usually unaffected.

Central vision: Reduced peripheral visual field. It hurts keep visual acuity in the central area

Peripheral Vision: Involvement of central visual field.

2.5. MAIN CAUSES
According to WHO [1], the global distribution of the main causes of visual impairment is as follows:

- Defectos de refracción (miopía, hipermetropía y astigmatismo) no corregidos: 43%;
- Las cataratas no operadas: 33%;
- Glaucoma: 2%.

When speaking of persons with visual disabilities should know who refer us. Regarding related to technology, those with total or partial blindness cannot manage programs or computer software using the mouse, much less monitor, directly because these people do not see practically nothing or their vision is so limited that simply they perceive light and shadow around him.

Children with visual disabilities when they are about to enter its educational stage, pass a crucial time as they should have some knowledge to make contact with their environment and gain experience to understand the world in which he lives, interacting with him form interactively.

JAWS
"It is a program that is responsible for reading the screen visually impaired people to know the option in which they are placed and the actions to be taken to continue." [2]

The JAWS software was designed and developed to operate only under the platform of the Windows operating system, ie it is a proprietary software, which has a cost in the market, being a software developed for Windows, this is coupled reliably to programs like the Office package, also coupled to web browsers which allow a better experience when surfing the global network.

2.6. READER SCREEN
"Suitable for blind or visually impaired people, generate a text-only version of the page and transmit it to the user via speech synthesis or braille." [3]

The software allows JAWS screen reading, ie converts the content presented on the computer in sound so that the user can navigate more easily without the need to observe the interface on which it is located.

2.7. BRAILLE SYSTEM
"The Braille system is an alphabet by which grapheme may represent a language. It is a simple and logical code." [4]

The JAWS software is used by commands (key combination), to perform activities desired by the user, there is also a Braille keyboard that serves as an annex to conventional keyboard, and allows the display information in Braille language appears through this peripheral.

III.   EDUCATION AND SPECIAL EDUCATIONAL NEEDS
"Teaching people with special educational needs in different areas of development is the essential aim correction and / or compensation of the defect. Compensation is considered the universal ability of the organism in one way or another is able to compensate for the defect or impairment of certain heart function. "[5]

Teaching visually impaired requires the use of different resources to facilitate the process of student learning, it is essential the use of all kinds of teaching materials; from three-dimensional objects to the most varied representations in relief that would foster perfection and dexterity intact. That is why manual activity must be combined with verbal methods when there is an absence of sight, to correct deficiencies presented in perception.

The School of Basic Education Specialized Blind and Deaf in the beginning used traditional methods of teaching, which only allowed providing knowledge in basic science, however, given the growing technology upgrade and innovations created by man in the educational, institutions today are betting these resources as complementary tools for continuing education.

In this case, within the educational environment for persons with visual disabilities they have developed a

number of software that have contributed deficiency suffered by these people, allowing all kinds of activities in this way to lead a life as normal as possible.

The JAWS software is one of the most known and used at the level of education and communication in people with this type of disability, thanks to the various features offered, rapid adaptation of people, spoken and availability of various languages installation tools.

IV.   VISUAL DISABILITY AND NEW TECHNOLOGIES

People with visual disabilities also have the right to join the learning of all kinds; one of the issues most impact has been adapting to the computer world, lead a disability does not mean having fewer opportunities or abilities to learn, these people may be able to do the same or even more activities a person without disabilities.

The loss or severe decrease in visual capacity produces people to develop their other senses for the reception and transmission of information as sense of touch and hearing.

It is here that play a major role called screen readers. They are named programs that interface between the video cards, systems of voice synthesis and / or terminals read Braille, and computer user, who hopes to get them reading or interpretation of the maximum possible elements that make the screens of each work environment.

The use of a screen reader, in this case the JAWS software has a leading role because it ensures the exchange of information between the computer and the student, using the touch when using the keyboard and ear to capture information through speech synthesizer.

Students should get accustomed gradually to the use of this tool with the help of the teacher or tutor responsible because it will be the means by which they will learn varieties of knowledge through the use of computer.

V.   METHODOLOGY
5.1 RESEARCH METHODOLOGY

"Non-experimental methodology can be defined as research that is performed without deliberately manipulate variables, is responsible for observing phenomena as occur in their natural context and then analyze them." [6]

Owing to type of research that developed, we opted to choose a non-experimental methodology transversal and descriptive design, this is due to the evaluation of JAWS software and input in learning that allows students with visual impairments use the software within and outside the school as part of their academic and personal development.

It applies the transverse design because we collect data at one time and one time, in order to describe and analyze one or more variables, their impact and interaction at that time applies.

"The ISO / IEC 9126 standard model defines software quality in terms of a set of features and sub-features that provide a list of topics related to software quality." [7]

There are several methodologies and metrics that allow us to evaluate the quality of software generally, but not to measure specific characteristics. Those characteristics and / or sub-features that are really relevant in a given situation will depend on the purpose of the evaluation and shall be identified by study specific quality requirements.

For this reason the ISO / IEC 9126 standard was chosen because it is an international standard for software quality assessment; This standard consists of six characteristics of application, which we focus on the characteristic of usability, it allowed us to determine how easy it is for students to learn to use the system, measuring the ease of understanding regarding its operation, determine whether it can be used without much effort and verify how attractive the JAWS software interface.

5.2 DATA COLLECTION TECHNIQUE

"The data collection techniques are the measurement or collection procedures by which data can be collected or accurate measurements." [8]

That is, the data collected must be valid, reliable and objective then can be used in scientific order to solve the question posed in the investigation.

"The survey is a procedure that allows you to explore issues about subjectivity and at the same time get that information from a large number of people." [9]

For the process of data collection the survey technique was used, making two types of these, the first applied to students of the institution and the second teachers responsible, in the latter type of survey Likert scale was used, measuring the level of agreement or disagreement of the respondent.

The survey was structured and based on the ISO / IEC 9126 quality in its usability feature with respect to learning, understanding operability and attractiveness of the software tool with students.

VI.   DESCRIPTIVE STATISTICS

6.1 PLACE OF PERFORMANCE

The School of Basic Education Specialized the Blind and Deaf it is located in the streets Tenth West "B" and North fourth, corner, October 18th district, in the city of Machala, province of El Oro.

6.2 POPULATION AND SAMPLE

The School of Basic Education Specialized the Blind and Deaf has a total of 56 students with disabilities, of whom 15 have visual impairment and the remaining carry different types of disabilities, for this reason has not come to make a sample calculation because the number of the population is very small, therefore, the total population was considered for research study.

6.3 HYPOTHESIS

Using the JAWS tool will represent a contribution to the development of teaching-learning process in students School of Basic Education Specialized the Blind and Deaf city of Machala.

6.4 STATISTICAL ANALYSIS

He proceeded to organize and tabulate the data collected in the survey, of which two key questions were considered.

These questions relate to the time it takes the student to become familiar with the system and the percentage of improvement that has been about learning.

Table.1:Tabulation surveys of students regarding the sub-features of understanding and usabilidad

Lit	How long did it take you as a student to become familiar with JAWS software?	Total
a	Less than a week	0
b	More than a week and less than two weeks	2
c	More than two weeks and less than three weeks	13
d	More than 1 month	0
	Total	**15**

The data shown in the tables denote that students take time to adapt to the application between periods of three weeks.

Table.2:Tabulation of surveys of teachers with respect to sub-features of understanding and usability

Lit	How long does the student become familiar with the JAWS software?	Total
a	Less than a week	0
b	More than a week and less than two weeks	0
c	More than two weeks and less than three weeks	2
d	More than 1 month	0
	Total	**2**

After analyzing the data obtained by the teacher it is I can corroborate that students usually take three weeks to become familiar with JAWS software environment and the use of its basic commands.

This indicates that the JAWS software complies satisfactorily with two of the sub-usability features of the ISO / IEC 9126 standard, as are understanding and operability.

Table.3:Tabulation surveys students about the sub-learning feature

Lit	On average, what percentage believes that improved their learning process using the JAWS tool?	Total
a	Less than 25%	0
b	More than 25% and less than 50%	0
c	More than 50% and less than 75%	5
d	More than 75%	10
	Total	**15**

It was verified that most students believe they have improved their learning in more than seventy-five percent (75%) after using this tool, a third of the population specified that have improved between fifty (50%) and seventy-five percent (75%) of their learning.

So also it proceeded to survey the teachers responsible for this group of students, reflecting a similar response regarding the survey was conducted learners.

Table.4:Tabulation surveys of teachers regarding the sub-learning feature

Lit	On average, that percentage represents the student's progress regarding the use of JAWS tool in the learning process?	Total
a	Less than 25%	0
b	More than 25% and less than 50%	0
c	More than 50% and less than 75%	0
d	More than 75%	2
	Total	**2**

The data obtained after tabulating surveys respectively teachers and students have a bearing on the progress that has been obtained through the use of this tool.

VII. RESULTS

Based on research done by implementing quality metrics it has been found that the JAWS software represents a significant contribution to the teaching and learning of students and faculty of the School of Basic Education Specialized Blind and Deaf.

It was proved the hypothesis by statistical results obtained from surveys, which are the structured under the feature usability of ISO / IEC 9126 standard, allowed to assess correctly the JAWS software within the School of Education Basic Specialized Blind and Deaf.

Students generally take two or three weeks to adjust to this tool will be part of their academic development, which will support in all its activities where a computer intervenes.

The staff responsible for this group of students strongly agree that the JAWS software helps improve teaching-learning process, and that is a complementary tool that improves productivity and efficiency in academic students with visual impairment.

The implementation of this software provides functionality needed for teaching representing a great contribution in the process of education.

It should be noted that students with visual impairment, before venturing into the computer field must first meet fully the structure of the keyboard that will work, as this is an intermediary tool that will allow them to communicate with the computer.

VIII.   DISCUSSION

School of Basic Education Section for the Blind and Deaf continues to use the JAWS software despite the Executive Decree No. 1014 issued on April 10, 2008, which provides for the use of free software in computer systems and equipment of the Public Administration Ecuador; this because students need this tool for academic process.

It is noteworthy that the institution laboratories already have a free platform as it is Linux, but still keep computers with the Windows operating system to use the JAWS software, which is indispensable use.

The alternative is available for free software is known ORCA program, is a software running on Linux operating system, which has the functions of reader and screen magnifier for people with a certain degree of visual impairment.

Currently the Ministry of Education plans to implement the ORCA system in education centers for visually impaired people, however, this is still being evaluated by experts in the use of this type of assistive technologies, it is estimated that within six to twelve months this system is put into motion prior to training teachers of each institution.

IX.   CONCLUSIONS

- The technology has proven versatility and ease of use with regard to the development of unique for visually impaired software, this is because the tool emphasizes student learning through sounds and despenando the interest of students in relation to the management of a computer.
- Throughout this article, said the impact of the use of JAWS software, assimilation performance and the degree of satisfaction of students and teachers which stated that the use of this tool has allowed students they can handle the computer and perform their tasks or make virtual teaching activities.
- Through research in the above-mentioned software the significant contribution that gives the tool the

students was found, allowing students to use various computer applications including Internet browsing, this is because the application provides a reader screen that turns your sound content, thus we can say that this tool is helpful both educational development and communicative development of young people with visual disabilities. The Ministry of Education is currently responsible for providing the resources necessary software and hardware for the use of this tool, the same that is implemented in all schools of people with disabilities, thus facilitating these public institutions give their students learning faster than turn is reinforced by educational activities manually. It is worth mentioning that for the development and implementation of JAWS software requires coordination between the competent authorities and teams that ensure the quality of the tool and a proper transfer of knowledge on how to use also verify the contribution the tool gives the student.

ACKNOWLEDGEMENTS

REFERENCES

[1] OMS, «Organización Mundial de Salud,» 25 Junio 2016. [En línea]. Available: http://www.who.int/topics/disabilities/es/.

[2] Discapacitados Online,» [En línea]. Available: http://www.discapacidadonline.com/jaws-lector-pantalla-invidentes.html. [Último acceso: 25 Junio 2016].

[3] Gonzábal, Aplicaciones técnicas de usabilidad y accesabilidad en el entorno cliente, Madrid: Ediciones Paraninfo, S. A., 2015.

[4] R. García y M. Sánchez, Interrelación, comunicación y observación con la persona dependiente y su entorno, Machala: Ediciones Paraninfo, S. A., 2013.

[5] Rodríguez, «Aprendizaje de la informática por parte de los discapacitados visuales,» *ENFOQUES,* pp. 48 -54, 2008.

[6] M. Gómez, Introducción a la metodología de la investigación científica, Córdoba: Editorial Brujas, 2011.

[7] C. Calero, M. Á. Moraga y M. Piattini, Calidad del producto y proceso software, Madrid: RA-MA Editorial, 2010.

[8] K. Heinemann, Introducción a la metodología de la investigación empírica, Barcelona: Editorial Paidotribo, 2013.

[9] L. Grasso, Encuestas. Elementos para su diseño y análisis, Córdoba: Editorial Brujas, 2012.