Implementation of DSL: didactic system of learning for children with special educational needs

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ABSTRACT
In this paper the tool DSL (SDA: Sistema Didáctico de Aprendizaje, by its acronym in Spanish) is presented. This tool was designed for the Multiple Attention Center located at Santa Ana Xalmimilulco, Huejotzingo, Puebla, with the aim to help in the in the educative process, as didactic auxiliary in the cognitive process corresponding to the subjects of math and Spanish in the center by means of automation. The main aim is the production of an educational software, focused to didactic of basic cognitive functions. This skills and abilities it is develop in an environment of special education and taking as a base the specialized bibliography of the own Multiple Attention Center. The system was done in C#, taking in advantage the object oriented programming and the interface of the environment of development. Moreover the software it was developed by means of the prototypes paradigm, using Unified Modelling Language, UML, which is a graphic language to visualize, specify, build and document a system, backed up by the OMG (object Management Group). It offer a standard in order to describe a "plane" of the system (model),including the conceptual aspects such as business process and functions of the system, and concrete aspects as expressions of programming languages, data base schemas and reusable components. The results obtained as product of the development of this system was valued by the CAM's personal. The system developed it is found currently operating in the installations of the center. It is a software with adequate characteristics to the environment, flexible, usable and verifiable that complies with the characteristics of an educational software fully. In future works it is could achieve the realization of software packages portables to other platforms and adaptable to run into web.

Keywords: multiple atention center, C#, impairment, cognitive functions, special needs, UML.

1 INTRODUCTION

In the World exist almost one billion of people that live with some impairment type that is about of 15% of the global population. In the same sense, almost 200 million experiment considerable difficult in its functioning and it is foreseen that the quantity of persons with impairment increase in the next years.

It is due to, in part the getting older of the population and the increase in the prevalence of chronical disease (Organización Mundial de la Salud [OMS], 2022).

In Mexico, 31 of each 100 older adults, report impairment, so too, 6 of each 100 adults and two of each 100 young and children, it that represents the 6.6% of the total population of the country (Consejo para el desarrollo y la inclusión de las personas con discapacidad [CONADIS], n.d.). In accord with the INEGI (Instituto Nacional de Estadística Geografía e Informática, [INEGI], n.d.), the impairments type is classify in sensorial and the communication, motorized, mental, multiples and others.

From 90s decade, Mexico promotes the educational integration directed to the inclusion of the students with Special Educational Needs (NEE Necesidades Educativas Especiales, by its Spanish

acronym) in schools, and regular classrooms, where it search that they receive the necessary support to accomplish with the educational purposes and they can integrate fully to the society (Reglas de Operación del Programa Fortalecimiento de los Servicios de Educación Especial [PFSEE], n.d.). In accord with the operational rules of the Program of National strengthening and the Educational Integration. The centers of multiple attention (CAM) they are in charges to attend the children with impairment that, by their characteristics, cannot be integrate to regular school or they are in the integration process.

The provided attention is permanent or transitory, is attend to children with any type of impairment, organizing the groups by age and grade, without taking in account their physical problem and also are issued certificates of regular school. Of this way the curricula of the CAM employs the programs of regular education of preschool and primary school, with curricular adaptations (Programa Nacional de Fortalecimiento de la Educación Especial y de la Integración Educativa [PNFEIE], n.d.).

Given the above mentioned the teachers of the CAM have to search alternatives of specifically learning that allow to the students satisfice its basic needs of learning.

An alternative that can help to the educational formation of the people with impairment are the Technologies of Information and Communication. These technologies help to the teacher in its professional practice and speed up the process of teaching-learning to special population, so too, help to reinforce the job of the teacher in the houses of the students (Sanmamed, 2007).

As a part of the TIC is the educational software that pretends obtain a product that allow give better attention and help to keep the acquired skills by the person with needs of intellectual type and with permanent character, also allow help to the teachers to obtain a better strategy to the learning of the students (Marqués, 2012).

Exists persons that they have problems to learn, because some organ of they body it does not performs correctly, causing significantly delays in their development, for this cases, the main aim of the pedagogic is provide the tools necessary to make up (Rizzo, 2005).

It is therefore, that this research dabble into the area of the pedagogic developing an application by means of the computer, that can help in some aspects to the education of the students with differentiated capabilities, through of games and interactive animation, same that in certain times for the teacher can be hard to obtain or perform.

Inside of the state of the art it is reported applications developed as support an attention to children with special educational needs, by example Azahar, set of applications free download of communication, leisure and specialized planning in the aid to persons with autism and/or intellectual impairment (Azahar, n.d.-a), e-Mintaz is a system customizable and dynamic of communication augmentative and alternative, directed to persons with autism o with barriers of communication oral or written (e-mintza, n.d.), the project Aprenderva directed to students with learn difficulties and with some type of impairment (Instituto

nacional de Tecnólogas Educativas y de Fromaciòn del Profesorado [INTEF], n.d.), JClic is an environment to the creation, realization and evaluation of multimedia educational activities developed in the platform Java ES Calcway is a versatile calculator that speaks (zonaClic – Jclic, n.d.).

However the mentioned applications do not have the asked requirements by the personal of the CAM, by this it is designed an application to the measure.

The Center of Multiple Attention (CAM), located in the town of Santa Ana Xalmimilulco, Huejotzingo, Puebla, until the year 2014, it had not account with a didactic software as support to the learning of the students with psychological or physical problems as are autism, visual problems and Down syndrome among others

The proposal is the development and implementation of an educational software, which allow to help to the teachers in order to improve their methods of learning and to students of primary education of the center, in their learning of diverse subjects. In the first section the methodology of development and functionality of the educational software Didactic Learning System (SDA by its acronym in Spanish) is presented, adapting to the special educational needs of the students of the CAM. Subsequently it shows the discussion, the results of the learning obtained of the students with the use of the software, so as the conclusions of the proposal.

2 DEVELOPMENT

The main requirement of the software is that is totally based in the official text issued by the SEP (Public Education Secretary, Federal Government of Mexico), on express request if the personal of the CAM and its principals.

The project it is developed and implemented, is based in the model of development for prototypes, where in each iteration of the cycle of life of the software exists a feedback by part of the final user (Kendall & Kendall, 2005) namely, an essay with certain functionality is presented. Moreover, is used UML diagrams, as diagrams of case of use. For continue it is describe the stages most important the development of the software (Unified Modelling Language [UML], 2022).

2.1 SOFTWARE ANALYSIS

When collecting the requirements, it is get the following: The methods of learning, exercises, tasks and activities that teachers performs for the learning of the students with different impairment. The teachers provide books that allow to determine the functionality of the software.

In accord with the detected needs, it generate ideas to be implemented in the software development as storyteller, Puzzle, Identification of fruits, Sum and subtract, Identification of Animals and Memory.

During the design of the application was necessary consider some recommendations with respect to the multimedia elements that they are including in the system such as the text, images, sounds and colors, in order to assure the success of the communication between students and the application.

For the text it is considered that this be concise and brief, for the font and size, that system have by default.

For the images it is handled a childhood style, consistency and quality of elaboration. In the sound it is established repetitions, discretion, up, down, able or disable sound and the identification of type audience. For the color, it used shadows and patterns

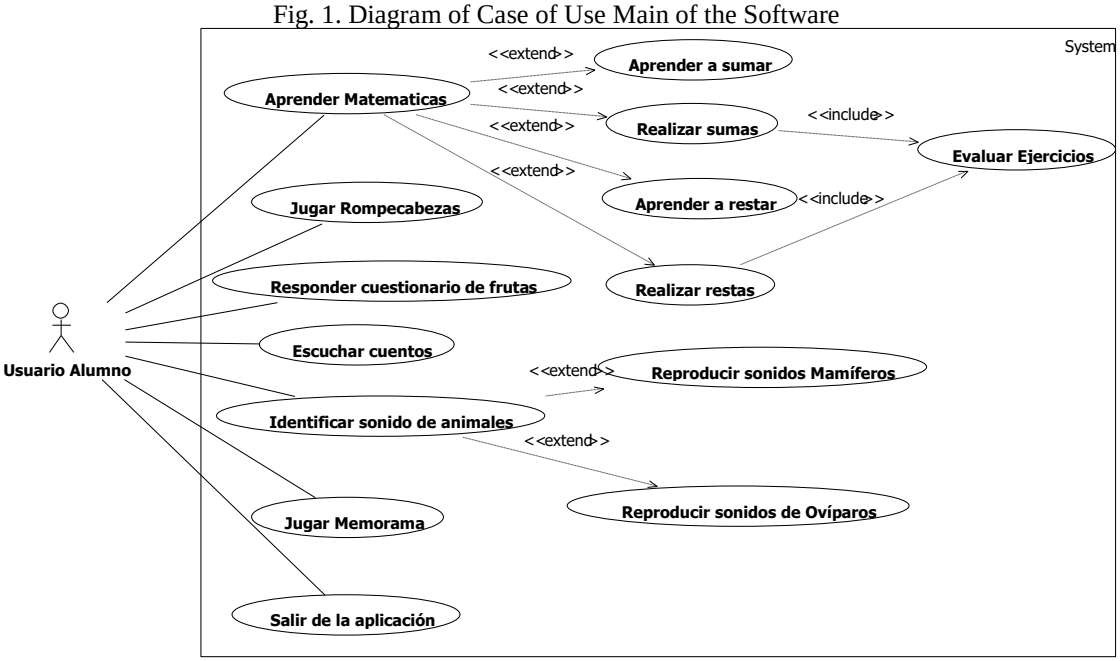
2.2 DEVELOPMENT OF THE SYSTEM

2.2.1 System Design

The design of the software SDA, is in direct function of the results of the stage of the analysis of the information and it is developed with base to the recommendations of the teachers. The design it is done in accord to the methodology oriented objects following diagram UML.

The SDA, can provide to the student the possibility of to control the sequence and the velocity of the exercises, abandon and restart them. In another hand, it can offer to the teacher the possibility to edit the exercises or the explanations, carry out the records of the students that use the material and verify the advances of learning that they demonstrate by means of the record on the time in finish the exercises. As a result of the design of the system it is obtained the diagrams of case of use where it shows the functional requirements (see Fig 1).

Fig. 1. Diagram of Case of Use Main of the Software



The user student in the main case of use will must turn on the equipment of computing, open the application SDA for its respective use, choice the option of the activity that he wish perform, to choice an option he must perform in accord to the instructions of each activity, will choice the option of exit to finalize the activity.

2.2.2 Implementation

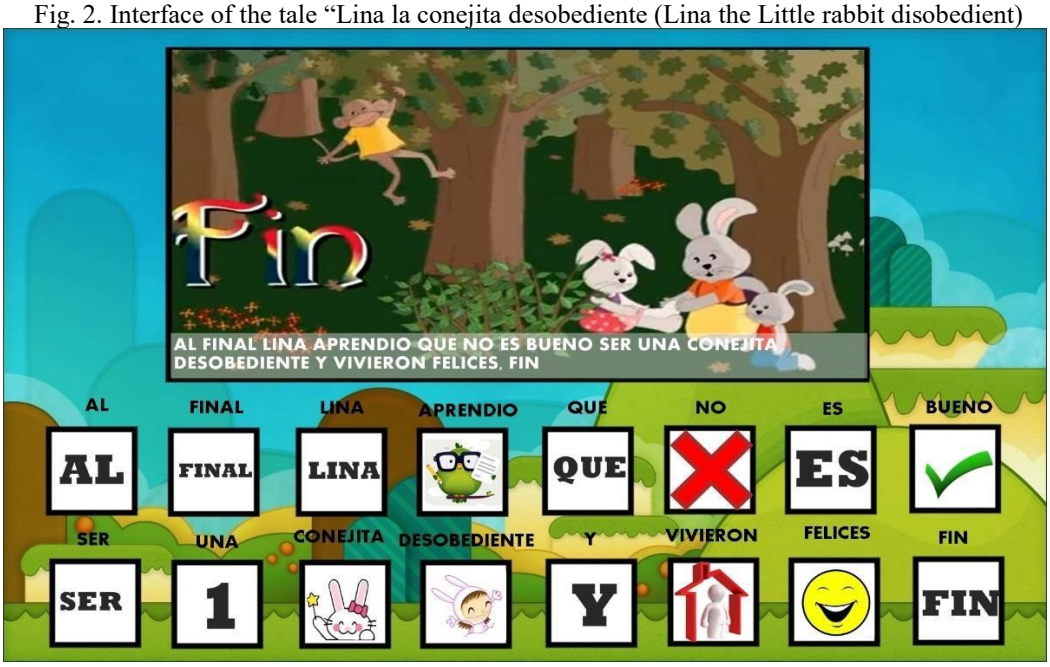
In accord with the available resource inside of the Multiple Attention Center of Xalmimilulco, it was decided use the tool Visual Studio 2010(Ceballos, 2007). This application allowed development the software, to install in personal computers as: laptops and PC Desktop.

In the implementation it was choose all the components to the application as digitalization and edition of images, sounds, creation of draws and transcription of the text that it will be visualize, among others.

Below to it is show the exercises that forming part of the educational software:

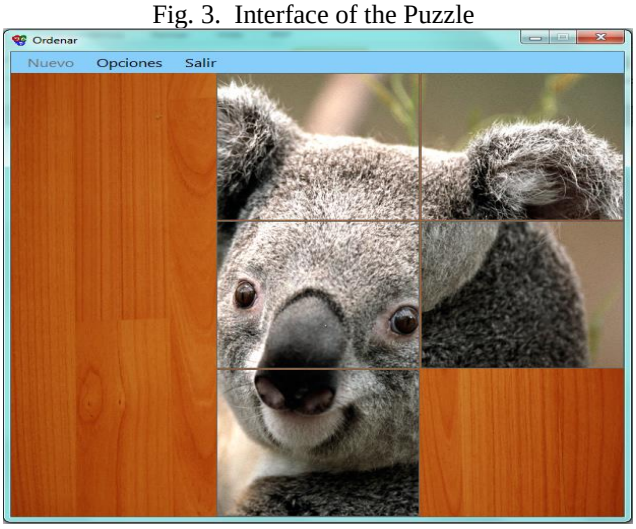
StoryTeller: Is an interface where by means of pictographs it reads the tale, by each word, it is performs a pictogram with which to select it say the indicated word (see Fig. 2)

Fig. 2. Interface of the tale “Lina la conejita desobediente (Lina the Little rabbit disobedient)



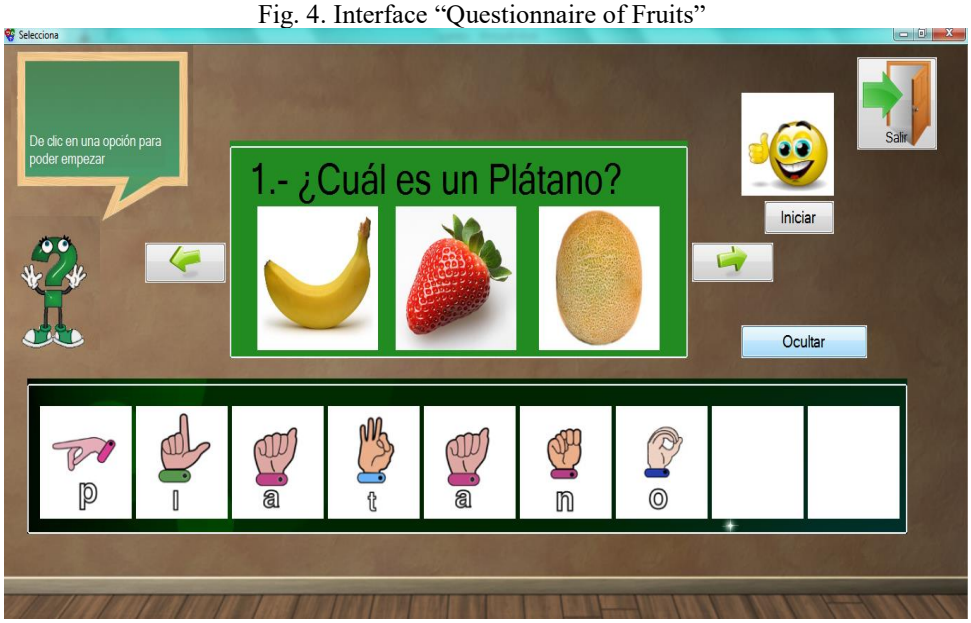
Puzzle: To difference of the conventional puzzle in where it is use any image, the teachers of the CAM make the images to create the puzzle that they serve as support to learning of the students and the same time can play (see Fig. 3).

Fig. 3. Interface of the Puzzle



Questionary of Fruits. Questionnaire of Fruits. Is a questioner where the student have to select the image that indicates the question. (see Fig. 4).

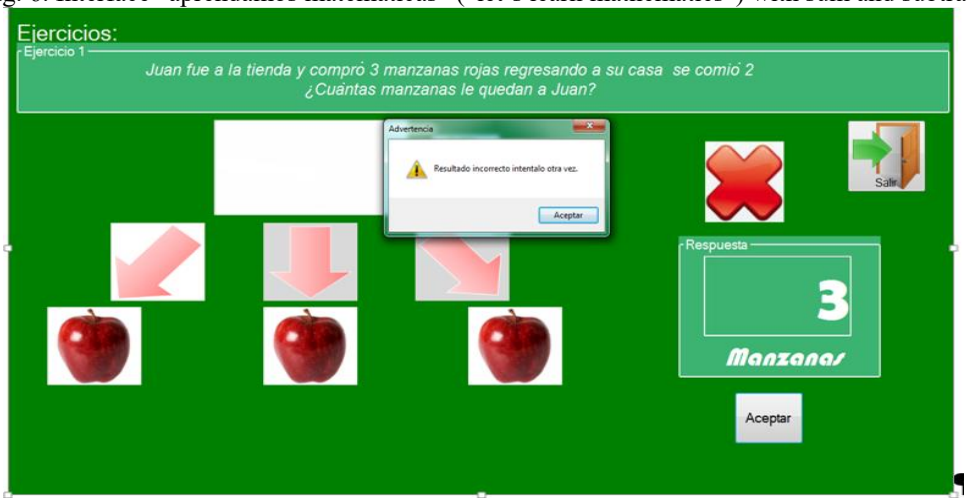
Fig. 4. Interface "Questionnaire of Fruits"



Sum and Subtract. They are exercises allow them learning to sum (See Fig. 5) and subtract (See Fig. 6) In the software they will appear numbers for to choice and this return the result. The program will generate automatically exercises where the student has correct all, it is handled a time in order to verify the advance of learning of the student.

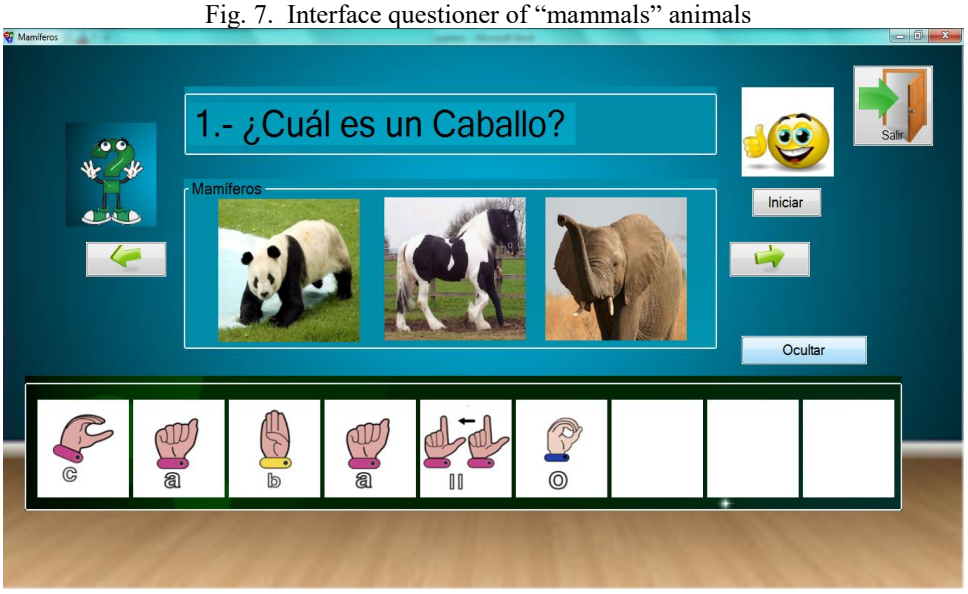
Fig. 5. Interfaz "aprendamos matemáticas" con operaciones suma

Fig. 6. Interface "aprendamos matemáticas" ("let's learn mathematics") with sum and subtract



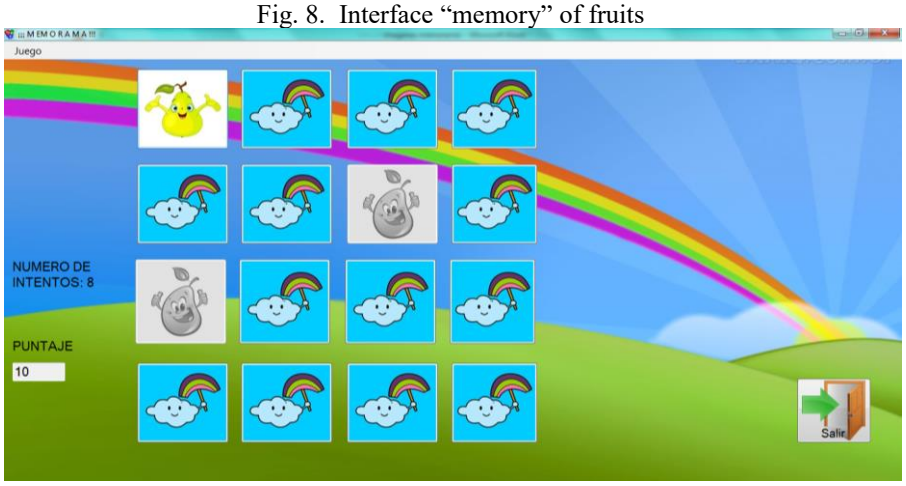
Animals This exercise will help them to the students to identify the sounds that the animals emit, as the mammals and oviparous, by means of questions that the program generates to listen a sound that the same program emits. For the students with hearing problems it is will implement images with the dactylographic language, that allow them the students read the name of the animal (See Fig. 7).

Fig. 7. Interface questioner of “mammals” animals



Memory In this exercise the student will can, by means of a click spin the image and choice another until he finds the image that correspond with the first that he had chosen, in this it is they included images of numbers, fruits and animals (See Fig 8)

Fig. 8. Interface “memory” of fruits



Test

It is had done a set of tests in two phases, an oriented to the final user and another with respect to the software.

The tests corresponding to the final user it is was done in each prototype and to each exercise by the teachers that teach the different subjects. So as too, is validated by means of the test, the pedagogical procedures, logical and of learning structure. Moreover, it will be include a program of training to the teachers and the involved personal in the handle of the software.

The tests corresponding to the aspects of the software encompass the functionality, the specification and the verification of the system, so as too, the tests of stress, of white box and black box.

As result of this tests, the installed software, currently is used in the CAM and it does not needed modify it in its structure.

3 RESULTS

After of the development and implementation of the software and the training, is proceed to the installation in the computers of the educational institution. Is was done a survey to the five teachers that collaborate in the grades of primary, with the objective of know its commentaries and evaluate the use of the system in the CAM.

The questions of the survey are the following:

- Do the students use the didactical and technological resources that it is provided as brochures, books, etc.?
- Do you think so the use of the educational software would help to that the students will have better academicals performance?
- Do you think that the educational software SDA it was developed for the institution have the requirements necessary for its use?
- Do you use the educational software for teach your classes?
- Do you consider easy or difficult the handle of the educational software SDA?
- Do you consider that the software SDA will awaken in your students the interesting of using it?
- Do you consider that the educational software SDA is an innovation idea in the institution?
- Do you consider that the educational software accomplish with the needed functionality for help you in your teacher work?
- Is important the use of the technology and the traditional didactical resources for improve the scholar performance of the students?
- Is it increased the performance of the students when they perform the test period of the software SDA?

The total of the inquired persons answered “YES” to all questions of positive way, moreover they emitted positive commentaries with respect to the developed software.

As for the students of the 3 groups that attends the level of primary education, with a total of 19 children, of which 5 attends first-second grade, 8 attends third-fourth grade, and 6 attends fifth-sixth grade. All the students had used the SDA software, without problems so far y with good references of the same inside of their scope of action.

Given the nature of the students of the CAM, the results of the evaluation, they are in function of several factors among they are found, the scholar grade and the type of impairment, so that the

measurement with which it is evaluated in this case, is with respect to the personal achievement. Even a student can be promoted once that the proposed achievement it had been achieved. The above mentioned it result in a dedicated undefined time for this goal

4 DISCUSSION

Derivate of the experience of the students for to solve a specifically problem, good delimited, united to the answers of the survey that it has been carried out they are concluded three important facts:

- The functionality of the system is considered adequate by completely of the teachers that teach in primary, as the specifications done by the teacher has been verified. The usability of the system by consequence it had been accomplished totally.
- The validation of the results it was done by part of all the teachers of the school that they use the software every day and that they used it tool as a didactical and pedagogical tool that meets with the standards of educational software.
- A solution by software is an innovating idea by part of the educational institution. However the text books does have not stopped using, it is used the system that has been developed in additional form. Firstly it is used the book of text in the subjects of Spanish and Math. Next it used the software in order to reaffirm and repeats the exercise that they are automatized, so this software is as a tool that appear for all teachers as important auxiliary in the everyday labor.

Given the answer and the practical use of the computational tool it is considered a educational software totally, due to that is instructional because by means of the design and the materials included in the software will help to the student to develop the capacity for solve mathematical problems, so as too, it will help him in the knowledge of Spanish language and reasoning by means of its content.

The software is evaluative so that it is can be observed the advances of learning of the students in the solving problems, it helps to enforcement the verbal and mathematical reasoning by means of the feedback due to the activities of the software can be done in repetitive form or according to the rhythm of the student.

Moreover, it is developed with base to the recommendations of the OMS for the accessibility to the impairment persons to the electronical media (Discapacidad y Salud, n.d.). Also it was developed following the model of prototypes that says: “The developers will can build and test against the specifications, but the users accepts and reject against the current realities operational and true in software (Pressman, 2010).

Following this model, it is done a first evaluation of the computational tool by part of the teacher and principals of the CAM, in which it is commented about the visual part, audio among other aspects.

Once done the suggested modifications by the teachers and principals of the CAM it was redesigned and it was developed a last version of the software.

5 CONCLUSIONS

In this paper the system called SDA, that it was developed and implemented in the CAM of Santa Ana Xalmimilulco, Huejoztingo, Puebla, has been presented, as an important auxiliary in the process of teaching-learning for the students in the same center.

The methodology of prototypes used resulted adequate for the construction of a totally educational software. Moreover it has been analyzed, designed, implemented and tested with help and guidance of teachers of the same center of attention

The use of UML and the diagrams has resulted of a lot utility so that each iteration of software is has verified and approved by the users of the system. The platform that it was has used has exploited the flexibility and the graphic elements of the environment of development.

The functionality of the system has been specified and verified by the personal that used everyday way this system. It is deal of a system that it was has developed taking as a base the material that there was inside of the institution, achieving the automation of these and adopting them to the grades where it will be teach.

In future Works it is can generated packages of software with greater functionalities and it can be implemented in other platforms and even to migrate to the Web environment. Moreover if it is enlarged this software to other functionalities for sure will help of better and greater way to the labor of the teachers with a major number of institutions of this and others types.

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