Association for Information Systems
AIS Electronic Library (AISeL)

CONF-IRM 2013 Proceedings

International Conference on Information Resources Management (CONF-IRM)

5-2013

Designing of a TEACCH-based Software Prototype for Assisting in Literacy of Children with Autism Spectrum Disorders

Ezequiel Farias
Federal Institute of Education, Science and Technology of Alagoas, ezequielbatista123@gmail.com

Mônica Cunha
Federal Institute of Education, Science and Technology of Alagoas, monica@ifal.edu.br

Marcílio Souza Júnior
Federal Institute of Education, Science and Technology of Alagoas, marcilio@ifal.edu.br

Breno Jacinto
Federal Institute of Education, Science and Technology of Alagoas, brenojac@ifal.edu.br

Designing of a TEACCH-based Software Prototype for Assisting in Literacy of Children with Autism Spectrum Disorders

Ezequiel Farias
Federal Institute of Education, Science and Technology of Alagoas
ezequielbatista123@gmail.com

Mônica Cunha
Federal Institute of Education, Science and Technology of Alagoas
monica@ifal.edu.br

Marcílio Souza Júnior
Federal Institute of Education, Science and Technology of Alagoas
marcilio@ifal.edu.br

Breno Jacinto
Federal Institute of Education, Science and Technology of Alagoas
brenojac@ifal.edu.br

Abstract
Literacy is a crucial element for the conscious practice of sociability and development of a country. However, some individuals have difficulties in learning with conventional learning and need a methodology adapted to their reality in order to develop the ability for abstract thinking and thus assimilate the knowledge imparted. Autistic Children are examples of individuals with learning disabilities, presenting impairment of social and communicative skills such as hyperactivity, lack of concentration and cognitive deficits. An approach that has been used worldwide to facilitate the literacy of children with autism is the Treatment and Education of Autistic and related Communication handicapped Children (TEACCH), which consists in structuring a visual environment, materials and activities for these children. The purpose of this work is to present the creation process of the first modules of a software for literacy of autistic children, based on the principles of TEACCH. The software requirements were collected in collaboration with Friends of Autistic People Association of Alagoas (AMA-AL).

Keywords
Autism, Children with Autism, TEACCH approach, software for literacy.

1. Introduction
According Bosa (2001), autism impairs collective and communicative skills of the individual, which in turn has characteristics such as impulsivity, inattention, crises, "tantrums" and extreme

difficulty in assimilating knowledge by teaching standards processes. Due to these factors, the child with autism needs special attention on the issue of literacy.

Literacy is the building process where they are taught the basic skills needed to read and write, which is the best known method of encoding and decoding the alphabet. This concept is usually confused with another stating that literacy is the process in which the individual is taught to make competent use of reading and writing in various social practices. But both concepts are crucial for the education of the individual as well as a universal condition for human development (Lucas 2008). Children with autism often fail to learn from models and conventional methods of teaching and need programs tailored to their needs, using a support structure differentiated such as the TEACCH approach (Gary, Mesibov & Schopler 2004).

TEACCH is a literacy program for children with autism and communication difficulties based on behaviorism and psycholinguistics (Kalyva & Avramidis 2005). TEACCH works with the structuring of the external environment, weather, activities, materials, aiming to reduce the deficits that the autistic child presents and facilitate the acquisition of appropriate behaviors to social life.

However, all tasks adapted from TEACCH are prepared individually and manually, which somewhat complicates the work of professionals that elaborate them, considering that these tasks need to be constantly prepared and varied in order to monitor the levels of evolution during a child's treatment. Moreover, the dynamics of the program is based on the repetition of activities by the child with autism until the skill that is being worked on is considered acquired.

It is known that software for literacy aids the learning process of children, because the computer becomes a facilitator, attracting the attention of children causing them to become oriented to it and interested in their work (Parsons, Mitchell & Leonard 2004).

In this context, this work presents the preliminary results of a research that aims to develop software modules to assist in literacy for children with autism, bringing features different from those in existing tools, especially with regard to the most suitable interface that can accurately portray the precepts of TEACCH approach already internalized by children.

2. Methods and Material

Initial studies relied on literature survey with the clear intention to scrutinize the inherent characteristics of the autistic spectrum as well as to identify the existence of tools with similar purposes to the software that we intend to build. This investigation began in March 2012 and served as the basis for the realization of the later stages of the study, however, it can not be characterized as longitudinal study. This is a qualitative, descriptive and exploratory research, based on a case study carried out in an institution which provides multidisciplinary care for children with autism in Maceió, Alagoas, Brazil. Similar institutions exist throughout the Brazilian territory. The motivation for the research was based on the need to meet a real demand for software to assist in the treatment of children both in a specialized institution as well as at schools, and even at home.

Once acquired the conceptual foundation necessary for understanding the problematic, during May 2012 visits were made to the Friends of Autistic People Association (AMA-AL), Alagoas, Brazil, in order to observe how the TEACCH methodology is used to treat children and what kind of activities are produced and made available to the children, and the difficulties faced by therapists and educators in relation to the preparation of these activities. It was possible to compare the data collected from observations of children´s consultations with those raised by the bibliographical study, seeking support all currently held practice in that institution. The results obtained from this qualitative analysis were further validated with professionals working in the AMA-AL, and transformed into features in software.

As a support for this step, interviews were conducted with the body of professionals that comprise the visited institutions, with the intention of understanding the daily routine of practice. Thus, we recorded many testimonials brought by those who deal daily with the children, since besides emphasizing all the necessary theoretical knowledge to better serve them, most said that the contact is the best way to learn how to deal with such children, because each presents peculiar way to behave, manifesting the characteristics of autistic spectrum disorder in a subjective way (Kalyva & Avramidis 2005).

Preliminary results obtained in this step, which will be described in the next section, will provide support for the development of the tool, providing real dimensions of each feature, the links between the classes and objects, as well as the scope of each. The evolutionary prototyping method of software engineering will be adopted (Pressman 2004).

3. Results and Discussion

With an understanding of all requirements, we started the design process of screen models, in order to represent the manipulation interface, both from the professional who prepares and selects activities as well as the child that performs them. These models were built based on the principles adopted by the TEACCH methodology and had the supervision of professionals who deal directly with the construction of activities that currently are prepared manually in a process that takes time and compatible craftsmanship.

For purposes of general understanding, the initial three modules corresponding to the interfaces designed for use by the professional (therapist, educator) and the child during the tasks will be described. We will present some characteristics of each prototype screen below, trying to associate them to the particular issues concerning literacy of children with autism. In this respect, we shall show that the basis used for the design of the software. We consider it is not enough just to create a model of the system; it has to fit the needs of your target audience, in this case, the autistic child.

The Interface Prototype for the registration of new activities screen shown in Figure 1, is the option of constructing activities. Flexibility is one of the most attractive features of the proposed software, once the practitioner can now interact with the tool in order to create new activities and available in the collection, and not just use the ones already registered. The process activity construction begins with the registration of the constituent elements, which are loaded by the system from a set of images, drawings or pictures provided by the system. This initial loading

will be subject to filters, provided by the interface to ease the process of choosing the image that best represents the purpose of the task.

The interface will also feature a field that will allow the completion of a survey about the images previously stored in the system database; simply entering a word or part of word that represents the figure registered. All these features will be made available to the professional seeking to streamline the process of elaboration of the activities as well as increase the chances of saving time and improving quality.

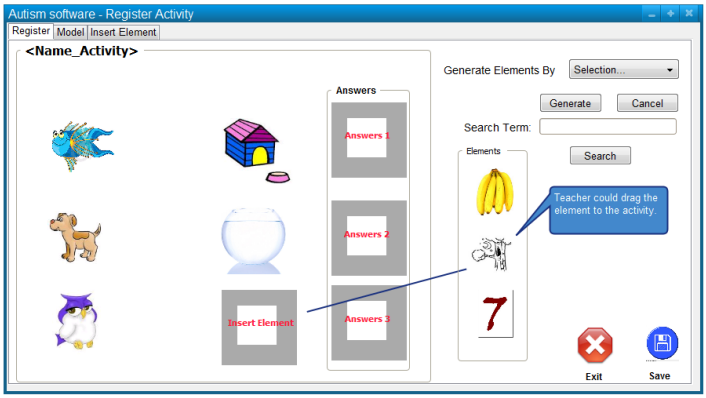

Figure 1: Interface Prototype for the registration of new activities in the system

Another model of activity development is shown in Figure 2, which represents a process of constructing a puzzle dynamics. The idea is to offer the professional options that allow him to choose the order of the intersection of words and indicate which letter the association should happen.

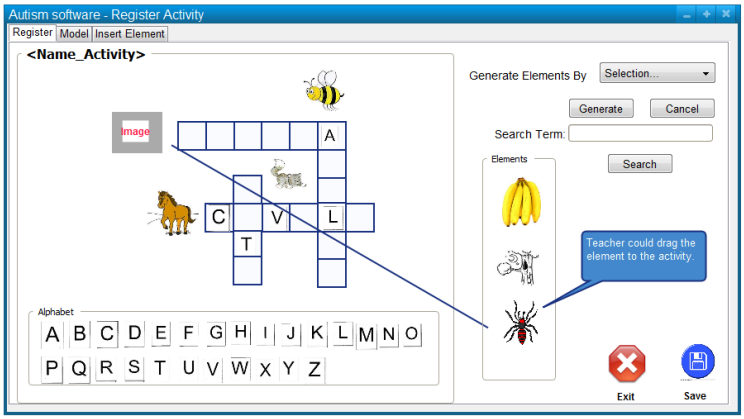

Figure 2: Prototype screen for constructing a crossword activity

Also worthy of attention is the display model shown in Figure 3, which describes the environment of the child's interaction with the activities mounted. The interface design seeks to familiarize the child with an environment in the classroom. The few existing elements help to prevent distractions from the child, allowing it to concentrate efforts solely to perform these tasks in line with the principles used by the TEACCH methodology, which cares for an

organization with well defined areas of the environment presented to the child with well-defined areas of storage, execution and disposal (completion) activities.

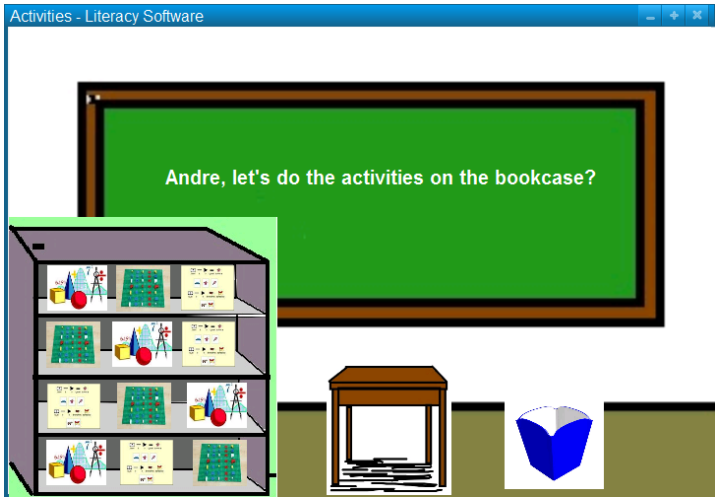

Figure 3: Execution Environment Prototype Screen of the proposed activities

When the child clicks on the first task of the proposed sequence, the software refer to the screen to perform the activity, which in turn simulates the concrete model of activity, with simplification of details and guidance in order to facilitate understanding by the child. The order of task execution obey the precepts of the TEACCH methodology that recommends: perform tasks from left to right and, when completed, place the disposal area for the autistic child, means that the task was over. At the end of the execution of the activity, the system will display a kind of message or animation in an attempt to reward the child for successfully completing the task and even to stimulate the sequence of other activities.

As seen above, the principles adopted for modeling the interface is simple but quite decisive in treating a child with autism spectrum disorder, because if applied correctly significant gains in cognitive development of these children can be provided, helping them to achieve increased autonomy and security to deal with life's challenges.

4. Conclusions

The proposed software enables a better fit to the real needs of the autistic child than those found in the literature. It is believed that the major difference is in the construction of a prototype aligned with the principles of TEACCH methodology.

The prototype software presented here will soon move to the implementation phase, with the support of the software factory that is being assembled at Federal Institute of Alagoas, Brazil. As an addendum to what has been stated above, there is an interest to develop modules that perform statistical calculations to monitor the performance of each child. This feedback will enable professionals making changes in the level of activities based on the reports generated, indicating the number of hits and misses in the execution of each activity.

Similarly, discussions are taking place among professionals in order to raise requirements required to implement algorithms to automate changes in levels of TEACCH system, according to the number of hits obtained by the child in carrying out various activities as well as other parameters considered important for professionals in determining such changes.

References

Bosa, C. (2001) "As relações entre autismo, comportamento social e função executiva", Psicologia: Reflexão e Crítica, (14)2, pp. 281-287.

Gary, B., V. Mesibov and E. Schopler (2004) The TEACCH Approach to Autism Spectrum Disorders, Clinical Child Psychology, Springer, 1 edition.

Kalyva, E. and E. Avramidis (2005) "Improving communication between children with autism and their peers through the 'circle of friends': a small scale intervention study". Journal of Applied Research in Intellectual Disabilities, 18, pp. 253-261.

Lucas, M. (2008) Os Processos de alfabetização e letramento na educação infantil: contribuições teóricas e concepções de professores. (Doctoral dissertation), Faculdade de Educação, Universidade de São Paulo.

Parsons, S., P. Mitchell and Leonard, A. (2004) "The Use and Understanding of Virtual Environments by Adolescents with Autistic Spectrum Disorders", Journal of Autism and Developmental Disorders, 34(4), pp. 449-466.

Pressman, R. (2004) Software Engineering: A Practitioner's Approach. McGraw-Hill Science, 6 edition.