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Development of Educational Software for Teaching Daily Life Skills to Students in the Spectrum of Autism

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ABSTRACT

This paper describes an educational software that is currently under development, aiming to enhance the social skills of children in the spectrum of autism. The learning scenarios involve authentic tasks designed to assist students with autism with their daily living skills (such as preparing a shopping list, making payments, etc). This work draws on previous research which acknowledges the benėficial role of computer-assisted instruction and structured teaching for the education of students with autism. The development of the software adopts the principles of user-centred design (e.g. following an iterative design approach) and specific emphasis is given to the usability of the user interface. Preliminary results through expert-based evaluation have provided very positive comments for the learning effectiveness and the usability of the educational software.

KEYWORDS: *Autistic spectrum, Social skills, Educational software*

INTRODUCTION

Autism has been recognized as a pervasive developmental disorder, best described as the triad of impairments in (a) social interaction, (b) communication and (c) imagination (Wing & Gould, 1979; Howlin, 1998). Individuals with autism spectrum disorders (ASDs), regardless of their intellectual ability, share common features, such as difficulties in relating and communicating with other people, persistence in following repetitive activities and displaying stereotypical behaviours (Wing, 1996). For persons with autism, regardless of their cognitive level, the social domain is a major challenge in their life, due to their poor level of social understanding (Frith, 1989).

In response to the persistent social difficulties faced by students with ASDs, a variety of educational interventions have been developed with significant gains for them (Rogers, 2000). Among other approaches, computer-assisted instruction (CAI) and virtual reality (VR) have been found to have positive effects for teaching specific social skills and their communication competencies, since people with ASDs seem to respond positively to computer-based tasks (Hetzroni & Tannous, 2004; Parsons & Mitchell, 2002). A possible explanation can be that the interaction with the computer is a safe, predictable with minimal social demands, offering convenience to them (Moore & Calvert, 2000). In addition, related literature suggests that computer-based tasks can be highly motivating for students with autism, facil-

itating an enjoyable learning experience (Parsons et al., 2004). Besides, computers can offer a controlled visual context, accommodating the needs of students with ASDs for visual structure and clarity (Mesibov, Shea & Schopler, 2005).

Despite these encouraging research findings, the number of educational software developed for teaching social skills to students with ASDs remains limited. This is mainly due to the fact that the target group is rather limited (it is estimated that 5:10.000 children in the general population fall in this category of persons with special needs), which has a direct effect in the cost-effectiveness of the respective software. The same issue applies to most categories of people with special needs (e.g. people with visual or hearing impairments). However, during the past few years extensive R&D efforts have been initiated for addressing the needs of these user categories, mainly due to the fact that ICT usage changes rapidly. As described by the IMS Global Learning Consortium: "*the term disability has been re-defined as a mismatch between the needs of the learner and the education offered. It is therefore not a personal trait but an artifact of the relationship between the learner and the learning environment or education delivery. Accessibility, given this re-definition, is the ability of the learning environment to adjust to the needs of all learners.*" (IMS, 2004). This, however, applies to a lesser extend to people with ADSs, and therefore developments in this area are limited.

DESCRIPTION OF THE EDUCATIONAL SOFTWARE

Learning Scenarios and Activities

The software ("Learning to Shop") addresses three main skills through respective learning scenarios, reflected in authentic tasks. The 1st scenario assists students to prepare a shopping list for the super market. The 2nd scenario describes through video and animations the preparation of the money needed with the use of a wallet, while, the 3rd scenario shows the selection of the items in the shopping list from the super market shelves, and their payment at the cashier.

For each learning scenario, the software addresses the needs of students in the autistic spectrum by including four levels of visual representation, through respective levels of difficulty. The 1st level is designed for low-functioning users that can only understand authentic sources of information, such as photographs and videos. The 2nd level is appropriate for users that can, in addition, recognize iconic depiction of information, such as pictures and animations. The 3rd level includes the information depicted in the previous level, enriched with additional written words for users who are capable to read. The 4th level is appropriate for higher-functioning students with ASDs, who can read efficiently words and sentences.

In addition, the instructions at all levels are accompanied by audio information to cover the whole spectrum of users.

User Interface Issues

As described above, the software consists of three main parts. In Part I, the user drags and drops the photos/images of four (4) products (from a collection of nine (9) products) in a list, and then prints the list so as to take it with her/him in the

super market. In Part II, the user watches a video/animation that depicts the preparation of the wallet and s/he is prompted to imitate it. Finally, in Part III, the user either watches a video showing the appropriate actions in the super market, or interacts with an animation so as to collect from the shelves the products put on the list of Part I.

The learning context has been based on a number of fundamental aspects that have been used to develop the application. An inventory by special education teachers was held so that we chose the products included in the Part I. The collection of images was pre-tested with autistic students and has been proven to be effective. The flow of information on each screen is set up in the same direction (from the left of the screen to the right). The menu is on the upper-left part of the application, so as to be easily visible and is the same between the screens maintaining the consistency of the application. The written instructions appear in the bottom of the application as they work additionally to the audio instructions. The colour differences of the buttons specify the navigation point where the user is found.

Emphasis was also given to support navigation, to consistency between the screens and to error tolerance. It was, also, very important that the user interface facilitates a match between the system and the real world and it keeps an aesthetic and minimalist design. Two screenshots of the software are shown below:

***Figure 1**: Starting Screen*

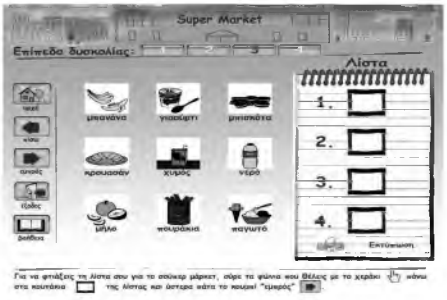

***Figure 2**: Preparing the shopping list*

CONCLUSIONS AND FUTURE WORK

This paper presents our current on-going work for the development of educational software aiming to teach social skills to students with ASDs. The software employs authentic learning scenarios of varying difficulty, to address the wide spectrum of students with ASDs. Specific emphasis has been also given to ensure the usability of the resulting software. As mentioned in the abstract, as for the time being evaluation has been mainly based on experts' opinion, and the results have been very encouraging. The next step of the work involves the large-scale deployment and evaluation of the software by students with ASDs. Our future work involves the extension of the software in a number of dimensions, including addi-

tional social skills (through respective learning scenarios), communication and collaboration capabilities, etc. Our overall aim is to develop a fully functional system including a large number of scenarios, which can form the basis for investigating the effectiveness of educational software for teaching effectively students with ASDs.

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