Technology and Special Educational Needs:
Let’s Play “Doing Good Deeds!”

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Abstract— “Doing Good Deeds!” is a game directed to
children with special needs, in pre and elementary school age that
aims to promote the development of social skills in different
contexts. Structurally, this game has available a set of Avatars
that players can choose to represent them. To adapt the game to
each child, an administration module was developed,
corresponding to the back office of the game, which allows the
educator to create or change contexts, difficulty levels and
sequences. This module includes also the visualization of the user
performance, in particular the duration of each game, the
number of attempts with and without success, allowing the
educator to analyze the progress of each player.

Keywords— Special Education Needs; Social Competencies;
Serious Games; Children.

I. INTRODUCTION

This work is focused on the contribution of new
technologies in the teaching-learning process of children with
Special Education Needs (SEN). A child with SEN shows
specific conditions, social and emotionally, that may need the
support of special education services during the entire (or part
of) his/her school years to facilitate the academic and personal
development [1]. Playing is an activity that is part of
childhood. It is the first contact with the surrounding world. By
playing and more specifically, playing computer games, the
child has the possibility to develop and enhance the
psychosocial, cognitive and communicative functions, while
simultaneously answering challenges and acquiring knowledge
spontaneously [2; 3]. So, the game can become a
complementary instrument, facilitating the diagnosis and
intervention in children with SEN [4].

The Information and Communication Technologies (ICT)
can be considered fundamental tools for the improvement of
the quality of the educational processes, increasing the
creativity and innovation in the teaching/learning process [5; 6].

The development of new technologies, and with the support
of specialized technicians, it was possible to build specific
equipment for children with SEN, which promote opportunities
regarding interaction, sharing, knowledge and the accessibility
improvement [7].

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There are several platforms in the Internet which provide
games for children with special education needs, for example,
Aiello (source: www.jogoseducacionais.com), whizkidgames
(source: www.whizkidgames.com), Laureate Learning Systems
(source: http://www.laureatelearning.com), 4kidz (source:
http://4kidz.org), Smart Tutor (source: http://www.smarttutor.com) or Social Skills Builder (source:
http://www.socialskillbuilder.com). These platforms include
games for helping children with the spectrum of autism,
disorders to language impairments, Down's syndrome, self-
confidence, delayed developmental disabilities, attention span,
hand-eye coordination, reading and math, social skills, among
others.

However, we did not find any game that had, as an
objective, the development of sequences of actions that could
be personalized and adapted to the children level of
complexity. The proposed game has two different ways to play,
creating sequences and identifying the right sequence. In order
to facilitate the usage of the game, we present two completely
characterized contexts (school and the general environment)
where the undertaking of good actions is encouraged. It is the
authors’ opinion that games can be a useful tool for children
with attention and concentration difficulties, enabling learning
and social promotion. So, with this project, we aim to design
and develop an interactive game, “Doing Good Deeds!”, to
allow children with SEN to learn and/or improve some social
skills. At the same time, an administration module was
developed, the back office, responsible for managing,
administering and maintaining the application. This module
will allow the personalization of the game. With this
functionality, the tutor can easily include new sequences and
challenges adapted to the specific special needs of the child to
increase its motivation and focus on the need being developed
with the game.

The paper is structured in 4 sections: Section II, Game
Development, describes the technologies applied in the
development of the game; Section III, Game “Doing Good
Deeds”, presents the game operation, story board and back
office and finally, Section IV, “Discussion and Final Remarks”,
ennounces some final comments and future work developments.
II. GAME DEVELOPMENT

The game runs in Web environment. The WAMP (www.wampserver.com) development environment was used. WAMP is a conjugation of different technologies (Windows, Apache, MySQL and PHP) which allow the creation of dynamic Webpages.

Apache allows showing the Webpages when these are remotely requested [8]. MySQL allows saving and updating the dynamic content of Web applications [9]. PHP is a language that it is used in the development of Web applications [10; 11]. WAMP integrates the PHP Hypertext Preprocessor server, which is used by Apache to process commands in PHP language. Additionally, WAMP enables the PHP MyAdmin application, which allows for the management of the MySQL database, in order to create tables and manipulate their content.

In order to allow the creation of animations and incorporate the dynamic elements of the game, a graphic interface was developed using the Adobe Flash software [12]. Using the ActionScript 3.0 programming language, property of Adobe, Adobe Flash can incorporate dynamic elements from the game, accessing content from the MySQL database by integrating commands in PHP language, as shown in Fig. 1.

HTML (Hypertext Markup language) and CSS (Cascading Style Sheets) (source www.w3.org/Style/CSS) are the base technologies used in the development of the Webpages. HTML defines the structure and CSS sheets define the appearance [13] [14].

Ajax (Asynchronous JavaScript and XML) allows the exchange of information with the server without having to reload the HTML page [16]. AJAX was used in the development of the authentication on the administration panel.

III. GAME “DOING GOOD DEEDS”

The main purpose of the game is to be a form of entertainment, and also to act as a promoter of the development of social skills.

In the design phase of the game, the teachers of children with SEN and the psychologist were involved. There was a kick-off meeting with the research team to define:

- the skills the game should improve;
- the way to promote the defined skills;
- the definition of positive feedback;
- to implement a collaborative game;
- the performance indicators the Back office should save;
- to implement the possibility to create and edit new contexts and sequences.

A. Game Operation

The game is divided in two categories: the “sequences game” and the “game of the right and wrong”.

The first task is the creation of a virtual character. The definition of an Avatar can increase the confidence of the user, enabling an improvement on the process of interaction between him/her and the computer [16]. By selecting the “Play” button, Fig. 2, a set of Avatars is shown, which correspond to the images presented in Fig. 3a). The player should choose his/her Avatar as an in-game representation of himself/herself. Next, the player should write his/her name, as shown in Fig. 3b).

As it is shown on Fig. 4, the user should select which type of game he/she wants to play, the Game of the Right or Wrong, or the Sequences Game, Fig. 4a). In each game type, the user selects the desired context, Fig. 4b): School and Environment. In each game environment, three difficulty levels are set, according to the number of images that are presented: 2, 4 or 6.
In the Sequences Game, there are two good deeds to sequence for each level. The sequences consist of paired images, in order to make each player sort out the same number of images (due to the number of players being even). In the easiest level, there are just two pictures to be sequenced, in the intermediate level there are four images, and in the hardest level, there are six images.

As it can be seen in Fig. 5, the images appear in the first line, in a disorganized way, while in the second line several blank squares will appear (to which the players must move the correct image to organize an action). The order by which the user play, appear inside each square, represented by the Avatar, and chosen in the beginning of the game. The game only continues when both players can successfully complete the good deed.

In the Game of the Right or Wrong there are also two good deeds for each level. In the easiest level, sequences of two images appear, in the intermediate level there are sequences of four images, and in the hardest level there are six images, Fig. 6.

For every good deed, two sequences of images appear: one is the right sequence, the other is the wrong sequence. The players must move the “right” and “wrong” symbols, respectively, to the orange rectangles adjacent to the sequences. The order in which each player can play is indicated by their Avatar. The game can only continue when the players identify the correct and the wrong sequences.

The game has a module that performs the back office operations. Through an authentication procedure provided by the administrator, it is possible to create and edit new contexts and sequences.

The administrator can access these statistics, as for example, the period of time that it took for each player to make a run, and the number of failed attempts, which allows an analysis of the evolution of the players. It is worth mention that the two contexts, Environment and School, cannot be altered.
Figure 6 – Levels of the Game of the Right or Wrong, in which there will be presented both a right sequence and a wrong sequence, with images from the chosen context.

B. Storyboard and Back office

The storyboard [17] aims to develop the story of the game by having a sequential set of images. The storyboard for the two contexts that are available in the game were also developed.

In each context, several tasks are defined. In the level 1 of the School context, two tasks were designed: “do not scratch the tables” and “do not push”. On level 2, there are the social skills “do not throw garbage on the ground” and “respect your turn”. The 3rd level includes the options “sharing snacks”, presented in Fig. 7, and “helping the wheelchair-bound friend”.

Regarding the Environment context, two actions were defined in level 1: “helping the pregnant lady exiting the car” and “giving our seat to an elderly person on the bus”. On level 2 the programmed action was “recycling”, that is presented in Fig. 8. Finally, in level 3, “helping an elderly person to cross the street” and “do not step on the garden” were the selected activities.

The game contains a back office module for administration, Fig. 9, which allows the management of contexts and sequences, consulting statistics and designing new functions.

The administrator can check the data related to the games that were played, the duration of each game and the number of successful or unsuccessful attempts. This functionality can be useful on the critical analysis of the evolution of each player.

The objective of allowing the introduction of new games/functions is to enable an adaptation of the game to each student, depending on the specific objectives of the
intervention. The educational agent can manage the game, creating or altering contexts, levels of difficulty and sequences.

The learning method principle applied in these game is based on the “Learning-by-Doing” which is a methodology with proved efficiency [19].

IV. DISCUSSION AND FINAL REMARKS

The main objective of this work was the development of a didactic game which allows the support of children with special education needs on their educational, social, and personal development processes. The platform allows the professionals to change the game, enabling the design of new contexts and respective sequences, taking the specific individualized needs of each children into account.

The ease and aptitude of the younger generation to the use of technology allows for its application on a ludic manner to teach rules, concepts and practices.

The target skills of the game were prior defined in a meeting with the research team and the teachers for special education and psychologist. During the development phase, the game was tested in laboratory by adults and children without special educational needs to validate the correct operation of the game.

As the game is particularly focused on children with special needs, further tests are necessary to evaluate the usability of the game.

In the near future work, we intend to test the game in a real school environment, with children with special education needs. With this test it will be possible to analyze the reaction of the children to the game and to study the performance of each player, as well as studying the knowledge extraction processes through data mining. Also, the addition of different activities by the teacher will be analyzed. The goal is to test if the teacher is able to include new actions in a friendly and easy way.

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