E-Learning Tool for Autistic Children: Needs and Study

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Abstract

Many traditional and modern techniques are used in autism therapy, and hence E-learning is becoming an important tool to support the learning system to achieve its goals within learning process, in this paper an e-learning application were designed for autistic children. The designed application

This paper presents two e-learning applications the first one is to teach autistic children pets' pictures, sounds, and names in the Arabic language, and the other application is for teaching them basic body movements and to react to them. The application was tested in the Autism Academy of Jordan under professional supervision, and the results showed a good interaction by the autistic children with this application. The children were divided into three groups, depending on their disability level. The results of the study show that the average of attention, benefits and distraction for groups 1 and 2 relatively high. Group 3 gave bad results, because their poor communication skills and very low abilities to accept information affected their ability to interact with the application..

Keywords: e-learning, autism, autistic child, distraction, disorder.

1. Introduction

1.1 Autism disorder

Autism is a neurodevelopment disorder produced by alterations in the brain functionality which acts as developmental retardants during the first three years of the children life [5, 7, and 8]. The main causes of autism are still not clear, but there are some theories about the factors which may cause autism, such as inheritance factors, serum effects, or poisoning by heavy metals (such as mercury and lead) in polluted water and food, that produce negative effects on the respiratory and digestive systems [5,7].

Autism disorder symptoms vary from one autistic person to another, but the most widely spread symptoms are: a tendency to isolation and lack of social interaction; apathy; the establishment of a personal daily routine; an abnormal relation with toys and other objects; and strange possibly self-harming behaviors.

Some techniques used in autism therapy try to cure the negative and stereotyped behaviors by means of educational and rehabilitation programs designed especially for autistic children. Some of these programs try to make autistic children more interactive with their external environment by using images and facial expressions [1, 3, 5, and 6].

Other teaching programs take into consideration the learning difficulties that autistic children face.

1.2 Related works

Most applications and studies used in Autism therapy focus on the study of the abilities of autistic children to interact with their external environment, and their capacity to express their feelings and impressions, with the aim of helping them to become more social. Some applications have been implemented to engage the autistic child in a social atmosphere near to the real environment. In simulated real scenarios, such as a birthday party, the child chooses a suitable role.

Other applications try to teach autistic children about people interactions, by collecting images for different people in different feeling situations (sad, happy, angry) and making these expressions more familiar to the autistic child, thus providing them with additional social experiences [7].

This paper introduces an e-learning project that aims to teach autistic children of different ages some fundamental information, by taking into account the typical mental absorption of autistic children. Using this e-learning tool will be less costly and will help the parents to teach their autistic children at home.

2. Designed Applications

In order to design our e-learning application, a study has been made on the psychological aspects of autistic children, their characteristics and their ability to understand information .We consider it crucial to know which factors help increase the children responses, therefore this study has been very important in the designing phase of this project.

The project was tested at the Autism Academy of Jordan with the supervision of specialists and therapists. Some issues taken into consideration were:
- Autistic children suffer from a high level of distraction.
- Autistic children tend to be isolated and have poor interaction with people. This may cause difficulties which could affect the educational process.
- They have good abilities to deal with computers and material objects. This makes computers good tools for the teaching of autistic children.
- To improve the success of the educational process, as many senses as possible should be engaged, i.e. pictures and sounds should be used at the same time.

The mentioned factors have been taken into consideration in this project, to make it a successful and effective e-learning tool for teaching autistic children.

2.1 Application 1

The main goal of this application is to teach autistic children pet pictures, names and sounds. According to the advice of specialists, the application was designed to comply with the following features:

- Pet pictures are shown in the center of the window, to attract the highest attention to the picture and to ensure a clear reception.
- The name of the animal appears in a clear font above the pet picture.
- The picture has no background, because it may disperse attention.
- The sound made by the pet is played when the mouse cursor moves across the picture.
- The child hears the name of the pet when the mouse cursor moves across the word showing the pet name. At the same time, the color of the text changes, to attract the child's attention.

Figure 1 shows a snapshot from the application, with a cat (____) picture and its name.

Figure1. Application snapshot

All the previous steps aim to link the pet's picture with its sound and name. All these properties try to engage more than one sense at the same time, and this is done in an easy and attractive way without any distractions. This application has the ability to show several pets consecutively, to achieve the highest possible benefit.

2.2 Application 2

The second application shown in figure 2 focuses on teaching the Autistic children some basic body movements such as to stand up, set down and touch the ears .to make sure that the Autistic child will learn the movements correctly and efficiently the application will:
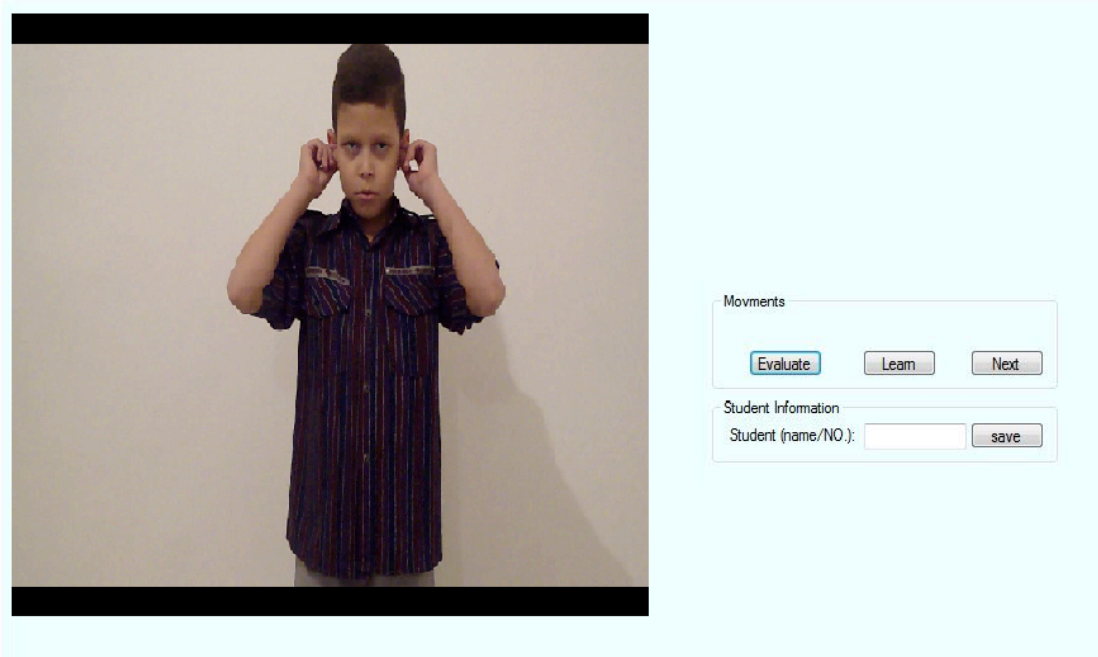
Figure 2. Application interface

1. A voice telling the child the name of the movement will be played.
2. After step 1, a video of a child performing the movement will be played, see figure 3.

Letting the child hear the name of the movement before seeing it through the video is to make sure that the autistic child will connect each movement sound with the behavior of the child in the video which represent the required movement.

Figure 3. A video of a child performing the action of touching the ears.

Taking into consideration the properties of Autistic children, like distraction, the previously mentioned applications must be tested in a special environment to assure reaching all our goals from this learning process.

3. Testing and results

To ensure that the project achieved the main objectives it was tested in **Autism Academy of Jordan** along three weeks; three hours per a day. Based on testing and the results the will be discussed next ,and based on an official report of the Autism Academy of Jordan, the specialist approved this project as a successful e-learning educational tool for a specific group of autistic children with specific characteristics.

3.1 Application 1 testing and results

Through the experiments, the specialists were monitoring the children behavior and their interactions. The first e-learning application was tested on 43 children with different disability levels and ages, 40 boys and 3 girls with age range between 7 and 14 years old. The test period was 20 days and each child goes through a 10 minute test.

The designed application emphasizes those issues that should attract most the autistic children, avoiding distraction factors; the test results were positive and show that autistic children have the ability to understand new information, when all these issues have been taken into consideration.

The children were divided into three groups, based on their communication skills and attention levels:

- Group1: A very good level group (22 children).
- Group2: A good group (11 children).
- Group3: An acceptable group (10 children).

The behavior of each group looks as follows:

Group1:

- Attention: Very good, but the attention percentage varies depending on each child's ability. The total ability of attention was rated at 86%.
- Benefits: The benefit percentage for this group was good, rated at 67%.
- Distraction: there was a low level of distraction, caused by the testing location and other external factors.

Group2:

- Attention: Good. The average was rated at about 73%.
- Benefits: Depending on the personal requirements and the academic and psychological characteristics of the children. It was rated at 52%.
- Distraction: There were different types of children in this group: some were very hyperactive, others were inactive and listless. Because of external factors, there was a high distraction percentage, rated at about 72%.

Group3:

- Attention: Approximately null, because of their poor mental abilities and low communication skills, rated at a percentage of 7%.
- Benefits: The attention of this group being poor, the benefits percentage was rated at 0%.

- Distraction: high as expected, because of their low realization and poor abilities to interact with the external environment. It was rated at 97%.

The attention level was measured as a function of the time that the child was focused with the application. For instance, if one child was focused with the application for about seven minutes in the ten minutes test, the corresponding attention percentage was rated at 70%.

Benefits were measured taking into account several aspects, such as the fact that some children kept repeating the pet name when they see the picture, while others, who have speaking difficulties, would repeat the pet sounds. Benefits were measured taking into account all these factors.

According to the specialist reports, the distraction factors were external spurs in the place the test was held.

3.2 application 2 testing and results

This application was tested on eleven autistic children; ten boys and one girl. Those children have different disorder levels, so the testing results differed according to these variation levels. The testing results measure the interaction of autistic children with the e-learning tool. The interaction ratio calculated by comparing the number of all showed videos with number of movements that done by all children correctly.

The number of movements that done by the children; comparing with all showed movements gave the ratio 68 %.

The first impression may consider that this value is not high, but there are some factors behind giving this ratio:

- Some children have poor communication skills because of having a high level of autism disorder. This factor affect in the interaction ratio with the system.
- Some distraction factors in the environment was attracting the attention of the children, making them not to interact with the system properly. These factors conclude some furniture pieces, toys and the attractive lights.

It is preferable for the child to use these e-learning applications in an environment that is clear of any distraction objects, in order to let the child attention be focused on learning the movements and performing them.

4. Conclusion

E-learning is becoming an important tool to support the learning system to achieve its goals within the learning process. So in this paper and based on a study of the autism disorder, its symptoms, causes and therapy techniques, two e-learning applications have been designed and tested at the Autism Academy of Jordan, having been applied to an average of 40 students for 21 days. The children were divided into 3 groups, based on their communication skills and attention levels. And the results discussed in this paper have shown a clear improvement in their responses and interaction levels.

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