Using Interactive Games to Engage Children with Autism on Visual Impairment

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Abstract – This study aims to explain on the development of an Android based application using a serious games technique, which known as Autism Kits. It's a built mobile application that functions as an autism spectrum disorder learning application. The model was followed by the ADDIE methodology. In the meantime, respondents, including autism students, educators and parents, were tested. After the application was completed, a survey was performed. Results have demonstrated that teachers and parents are willing to use the application for autistic children that has been found to be very useful.

Keywords - Android Application, Autism Tool, Serious Games, Visual Perception.

I. INTRODUCTION

According to Baxter et al. [2] reported that there are around 52 million autism spectrum disorder cases worldwide. NASM [20] has come up with a report, said that autism has been estimated to be 1 out of 150 children. In addition, the rate of ASD has been reported in 2009 to rise to 1 in all 110 children, and increased in 2013.Yet, in Malaysia, the causes of autism remain unknown [22]. Malaysia, a developing and middle-income country comprising three ethnic communities and Native tribes with multi-ethnic populations, has limited knowledge and resources available in the area of child raising with Autism Spectrum Disorder (ASD) [9][21][27]. Thus, a tremendous need more investigation for research on limited ASDs in Southeast Asia and Malaysia in specific [9] [11] [13] [21]. Further studies on special needs children and their caregivers according to Ministry of Health Malaysia [19].

In Malaysia, public is still unclear about autism disorder. According to [10], the people seems having lack of information or experience regarding the terms of autism even it has gained so much attention in the media. If people do not know about autism, it may lead to bad attitudes towards autistic individuals and families.

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Autism can be characterized or defined as developmental disorder whereby there are troubles with repetitive behavior and social interactions and communication. ASD is marked by social interaction issues, communication problems and repetitive behavioral tendency. In the first two or three years of their children's lives, fathers can usually notice their signs. These signs are developed progressively even if some children are normal and then their developmental milestones are worsening. ASD is a severe task not only for the people diagnosed with schizophrenia, but for the family, according to [23], a challenging behavior is the most distressing and stressful aspect of autism. These behaviors can often cause damage, stress and isolation on their families and employees.

[4] states that ASD can also be seen as a lifetime evolving disorder, a pervasive disorder that can have an impact on pervasive deficiency in various developmental fields. To have an awareness related to ASD is much recommended especially towards one's social-communicative abnormalities. Autism usually starts early in infants, although individuals are strongly affected by the specific beginning of autism [8]. ASD should be considered a developmental disability that requires imperative care, not a rare disease.

In Malaysia and also globally, ASD is referred as a specific knowledge deficit which contribute to existing timing and quality services inequalities. This can be used to provide individuals with information about ASD and its characteristics [25]. World Health Organization [30], has reported three main autistic children's traits, and they are impairment in communication, repetitive and stereotypical patterns of behavior. Mostly, autism children will experience in language difficulties which lead them hard to convey what they want or need. Thus, these children should be helped to build their relationship skills [12]. In addition, autistics have trouble with abstract conceptual ideas, but they can learn by rote instead of by analogy and symbolism [28].

II. VISUAL IMPAIRMENT CHARACTERISTIC

Social activities are created during a child's life year and contact with the eye is the key development role. Typical arms movement, wobbling, and placing the hands in their eyes will affect misbehavior. Non-contraction, warning, social immaturity, self-confidence,

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self-centeredness, detachment and absence and dependency may result in negatory experience in social contact [26][5][6][16]. Besides that, children lack social interactions in adolescence and fail to read non-verbal communications, which make them difficult to understand social activities. [26] and [24] reflected the impulsive and rational attitude of playing with their peers. Autism children perform and imitate their everyday routines with their motor skills. According to [24] and [15], due to only 44 percent of 101 daily life activities can be carried out alone by children with visual impairment have restricted verbal communication and show delays in obtaining fundamental skills. Inappropriately-viewed children usually play with symbolic toys. Autism Visual impairments kids are less unlikely than children with no disabilities to shift locations and toys while playing. This is because their mobility and space orientation are restricted. According to Brambring [3], echolalia is known as a phenomenon in children with visual impairment, and this has led with an increased acoustic sensitivity.

Autism has increased but to improve the understanding of ASDs, a lot needs to be done [17]. The knowledge on ASD is very worrying [10]. Thus, awareness related to these issues is much needed. People should not be aware of symptoms of the disease or ignore these early threat signs before action taken [9]. Autistic children are seen as normal people in Malaysia because of a lack of education, seeing people with selfishness from people suffering from mental illness or special needs [7]. Public acceptance of children with autism's particular characteristics [25]. So, people who cannot understand these children often regard themselves as curiously selfish and slow [10]. So, people who were unable to recognize often see these children as weird and slow egotistics [25].

III. OBJECTIVE

The objective of the study to develop an android based on visual impairment for autism students' as early detection detect tool using serious games. Serious ASD games have been thought to assist educators and learners in the teaching and learning process. Various researchers carried out many autism researches, but most only concentrated on autistic children and families of autistic children.

IV. METHOD

A. Ethics
For the purposes of this study, the data is kept confidential without public access.

B. Procedure
The quantitative method was employed and the opinions from the samples were also gathered.

C. Respondents
Participants were chosen five (5) Special Education Teachers, (10) Special Education Students who participated in a experimental group and control group. The students were provided by SEAMEO SEN Melaka Malaysia and the testing was conducted in the computer lab.

D. Instrument
The instrument used in this study was mobile apps.

V. DEVELOPMENT OF APPLICATION

Five fundamental phases have involved in the development of the Autism Kits apps including Analysis, Design, Development, Implementation and Evaluation (ADDIE). In Vi-Per Games there is five (5) major modules. Figure 1 shows the login interface of the games. User must login to the user ID and password. Teachers and parents need to assist students to key in their details such as student name, mykid, gender and teacher's name.

Fig. 1. *Login Interface*

Once click login, it will go to the montage as shown in Figure 2.

Fig. 2. Montage of Autism Kits

Game 1 is shown in Figure 3. Visual Discrimination Game 1. Game 1. The objective of this game is to recognize the pictures in this game in the same way.

Fig. 3. *Game 1 Visual Discrimination*

Game 2 is shown in Figure 4. Games 2 is a game for Let's go fishing Game 2 that focuses on spatial relationship. Game 2's goal is to define differences in images.

Fig. 4. Game 2 Spatial Relationship

Game 3 for Form Constantly illustrates in Figure 5. Game 3 aims to identify the various sizes of the pictures provided.

Fig. 5. Game 3 Form Constantly

Game 4 is displayed in Figure 6. Game 4 is Form Memory Visual. The purpose of Game 4 is to determine the various dimensions of the pictures.

Fig. 6. Game 4 Form Visual Memory

Game 5 is displayed in Figure 7. Jigsaw Puzzle that focuses on Visual Closure is Game 5. The goal of this match is to define the visual closure challenges and wrap up the image. The last game is Game 5. Students cannot skip the games. They need to complete the games starting from game 1 until game 5.
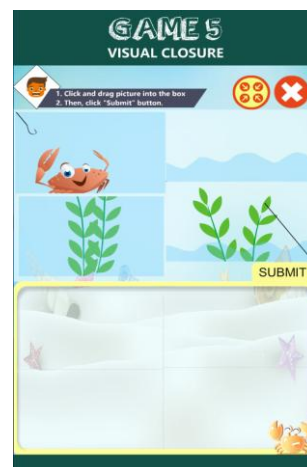

Fig. 7. Game 5 Visual Closure

VI.   RESULTS

Percentile scoring was used as the basis for the five (5) games. The diagnostic score level, based on the percentage score results is shown in Table 1:

Table- I: Diagnostic Score Level

Score	Level
0-29	Low
30-79	Medium
80-100	High

Ten (10) ASD students thoroughly tested the test. Table 2 shows apps that are based on the percentage score result before and after using the application. The teacher or parents can see throughout their application the progress of student results. They would have records of the activity tests passed by the children. Based on results, ASD students positively shown from low to medium and low to high. More students are extremely motivated after the experiments have been performed.

Table-II: Before and After the Treatment

Students	Before	After
A	Low	Medium
B	Low	High
C	Low	Medium
D	Low	High
E	Low	Medium
F	Low	Medium
G	Low	Medium
H	Low	High
I	Low	High
J	Low	High

There are some limitations that this experimental study should address in future studies. The present experiment for the broader study design is found to be useful, based on the results. The ADDIE model was implemented as a methodology, and in the first phase of a small quantitative method. Furthermore, researchers acknowledged that the identification of behavior and functioning difficulties by the participants are challenges during this experiment. It is informed that the larger project has selected appropriate, targeted quantitative measures. In recognition of perspectives provided by various experts and of frequent parenting issues in terms of education, the researcher may be extended to include multi-disciplinary researchers such as special needs, medical and social sciences.

VII. CONCLUSIONS

Autism Kits games, which is an early detection instrument for children with autism rather than traditional or conventional methods. The primary goal of this studies is to help children with ASD by creating a game app, particularly in their daily lives, to improve their knowledge and skills. To conclude, the development of the game app can be concluded that its effectiveness and usability becomes more promising. People may feel responsible if they have a better knowledge of autism itself to foster relationships among people and extend support with complete trustworthiness. Potential collaborating together between each party to ensure accurate diagnosis of ASD while at the same time providing autism to individuals with the greatest possible lives. Teachers, clinicians from outside nonprofit organizations or foundations, university graduates, family and people with learning disabilities themselves should be engaged in the collaboration [23]. As we know, autism diagnosis not only impacts ASD's life, but also impacts family members.

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