Find It – A New Way to Learn Through Play

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A thesis in the Department of Computer Science and Engineering presented in partial fulfillment of the requirements for the Degree of Bachelor of Science in Computer Science and Engineering

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Statement of Originality

We, declare that this thesis titled, Find It – a new way to learn through play and the works presented in it are our own. We confirm that:

- This work was done wholly or mainly while in candidature for a [B.Sc] degree at United International University.

- Where any part of this thesis has previously been submitted for a degree or any other qualification at United International University or any other institution, this has been clearly stated.

- Where we have consulted the published work of others, this is always clearly attributed.

- Where we have quoted from the work of others, the source is always given. With the exception of such quotations, this thesis is entirely my own work.

- We have acknowledged all main sources of help.

- Where the thesis is based on work done by our self jointly with others, we have made clear exactly what was done by others and what we have contributed our self.

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Certificate

I do hereby declare that the research works embodied in this thesis entitled "**Find it – a new way to learn through play**" is the out come of an original work carried out by Md. Tashfiqul Bari, Raisa Tabassum, Zubaida Ahmed, Tanvir Hassan under my supervision.

I further certify that the dissertation meets the requirements and the standard for the degree of [BSc] in Computer Science and Engineering.

_____

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Abstract

Curiosity leads human to various inventions to solve problems and cures too many diseases. Autism Spectrum Disorder (ASD) is such a term that there are many researches enduring like Magnetic Resonance Imaging (MRI), called diffusion tensor imaging, Early Start Denver Model (ESDM) to provide an easier life. After years and years of combined funding sources from public and private funding, these researches show great promises in recent years. In this paper we have tried to show a way how children with Down Syndrome Autism can learn through game therapy. These game therapies have shown an immense number of improvements among those children to learn alphabets along with developing their motor skills and memory challenges.

Acknowledgement

As it is true for everyone, we have also arrived at this point of achieving a goal in our life through various interactions with and help from other people. However, written words are often elusive and harbor diverse interpretations even in one's mother language. Therefore, we would not like to make efforts to find best words to express my thankfulness other than simply listing those people who have contributed to this thesis itself in an essential way. This work was carried out in the Department of Computer Science and Engineering at United International University, Bangladesh.

First of all, we would like to express our deepest gratitude to the almighty for His blessings on us. Next, our special thanks go to our supervisor, Dr.Swakkhar Shatabda, who gave us this opportunity, initiated us into the field of "**Find it – a new way to learn through play**" and without whom this work would not have been possible. His encouragements, visionaries and thoughtful comments and suggestions, unforgettable support at every stage of our B.Sc. study were simply appreciating and essential. His ability to muddle us enough to finally answer our own question correctly is something valuable what we have learned and we would try to emulate, if ever we get the opportunity.

Our sincere gratitude goes to United International University (UIU). The research could not have been done without the work environment of this university. There are numerous other people too who have shown us their constant support and friendship in various ways, directly or indirectly related to my/our academic life. We will remember them in our heart and hope to find a more appropriate place to acknowledge them in the future.

Last but not the least, we owe to our families for their unconditional love and immense emotional support.

Contents

Chapter 1

Introduction

Growing up as a child with autism is an everlasting challenge and hard to handle. Autism is a diffusive developmental disorder in early childhood. As parents none wants their children to have any problem but when it comes to an autism, people should give serious attention. Children with autism face immense struggles when it comes interacting with their typically developing peers and also in their learning process. It should be carefully handled both their mental and physical health in every situation. Many individuals figure children with a mental imbalance ought to invest less energy playing contrasted with non-impaired children. In reality, we should pay more attention to autistic children *[1]*.

Without a doubt ASD isn't something a child just "grows out of," there are numerous medications that can enable to secure new aptitudes and overcome a wide variety of formative difficulties. From free government organizations to in-home behavioral treatment and school-based projects, help is accessible to meet child's unique needs. With the correct treatment design, and a considerable measure of affection and support, child can learn, develop, and thrive. The most punctual indications of extreme introvert are the nonappearance of typical practices and the nearness of strange ones so they can be difficult to perceive. The earliest symptoms of autism children are as signs calm, free, and undemanding. Despite the fact that a mental imbalance is difficult to analyze before 24 months, symptoms regularly surface in the surrounding area of 12 and year and a half. If signs are distinguished by year and a half of age, concentrated treatment may rewire the mind and turn around the symptoms. Children with ASD hang loose applying what they have taken in one session from a specialist, home or others. Having a consistent way of interaction with a special child and it should stick to a schedule

which is best for them. Positive behavior can go long way with children. We should praise them what they act appropriately or learn new skill and give some reward for their performances. Creating a comfort zone at home helps them a lot. In research of ten years, it has been seen that computer-based interventions can provide extra ordinary strategies to help the children with special needs in many ways.

We are working to improve learning capacity through our designed applications *[2]*. Our examination has focused on smart phone-based applications to improve the learning skill of children with Down syndrome through playing some simple mini games in several levels.

1.1 Definition of Autism

A neuro-development issue in human that causes problems with social interactions and also monotonous is known as ASD (Autism Spectrum Disorder). Children with autism spectrum disorders (ASD) may present some difficulties in developing social behaviors, communicating with others and acquiring cognitive learning skills. The portability, elasticity, availability, and readiness of features have opened up a new opportunity for enhancing and elevating the quality of support to mitigate autistic children deficiencies and one symptom which common to all types of autism is an inability to easily communicate and interact with others.

1.2 Life of an Autistic Child

An autistic child is not able to lead a normal life and they need extra care, love, and friendly behavior. Education is not their main purpose. Learning about practical things and experience with very little content is their first and foremost purpose. Both verbal and nonverbal child it's a difficult task, for nonverbal it's a more difficult to understand. For an autistic child first requirement is knowing how to interact with them and need to identify their interests. Then instructor or mentor can train them about life. Some students can adopt things easily and rest of cannot. An autistic child's day starts dictated by child's mood to set up his/her routine according to their mood swings. Then child needs someone to dress up him/her, washing his/her face, cleaning teeth, and putting him/her on shoes. After eating child goes to school and spends there lots of time. So getting the right path in school is important. The relationship between child, teacher, and other students reflects on their mind. Keeping in a friendly environment is very important. Most of the students enjoy school so much that's the reason he/she prefers its structured routine and individualized attention more than home. After arriving home from school demanding on mood needs to serve. And they need to share a good bond with their siblings. Many parents can't afford home therapy sessions. So, in that case, they should play and talk with their child.

1.3 ASD in Bangladesh Perspective

Autism is the most commonly found neuro-development disorder and its core deficits in three domains: social interaction, communication, and repetitive or

stereotypic behavior. It's been calculated that 1% of the world's population, suffer from an autism spectrum disorder. In many developing countries like Bangladesh also have no data to measure the summation that how many children or adults are suffering from this lifelong neurological condition. In Bangladesh the treatment related methods of autism were confined to a few Medical College Hospitals and Post Graduate Institutes and even doctors were not introduced to this term of Autism. The administrations for kids with Autism was externally reflected from 1990 in **Dhaka Shishu Hospital** and different healing facilities and later on numerous different associations like the **Society for the Welfare of Autistic Children (SWAC), Autistic Welfare Foundation (AWF), PROYASH** and others approached with their exercises for autistic children from the year 2000 and onwards. With the foundation of the Center for Neurodevelopment and Autism in kids in the **Bangabandhu Sheikh Mujib Medical University,**awareness for Autism was supported in Bangladesh.

A current 2013 pilot study think about in Bangladesh, using group wellbeing specialists, has discovered the predominance of a wide range of neurodevelopment incapacity is 7.1% . While for ASD, the examination demonstrates a predominance of 0.15% (3% in Dhaka city and 0.07% in country zone). The National Parliament of the Government of Bangladesh has declared two imperative acts to secure the rights and guarantee the wellbeing of the distinctively capable people. These are-

The Disability Rights Law, 2013

- Ensures rights and respect of the people with inabilities by stipulating 21 rights

- Rights to instructive, physical and mental change

- Rights to take an interest in social and state exercises

- Rights to get the national personality cards and be recorded in the voter's roll

- Mandates enrollment in general schools, reservation of seats on all types of open transportation, availability arrangements in every single open place (counting retrofitting), measure up to circumstances in work, and assurance of acquired property rights.

Neuro-developmental Disability Protection Trust Act, 2013

- Highlights the issues identified with giving physical, mental, and monetary help to all people with inabilities

- Their sustain, security, and recovery

- Ensures their social strengthening

- Focuses to create correlated training framework and learning world view

Bangladesh is assuming an excellent part in embraced fitting approaches, and social mindfulness and mediation projects to moderate the rising and expanding issue of a mental imbalance. The Honorable Prime Minister of Bangladesh **Sheik Hasina** has taken a unique interest to take this issue forward both broadly and all around. A portion of the star dynamic parts of the Government of Bangladesh incorporate the arrangement **of South Asian Autism Network (SAAN)** and readiness of its deed.

In July 2012, International Conference which was hosted by Bangladesh on Extreme Introverted Range Issue and Formative Inabilities in Bangladesh and South Asia held in Dhaka on 25-29 July gave another heading to the mindfulness, research and administrations for autistic children have picked up force in Bangladesh. Bangladesh can have a major effect on autistic children over the glove. It was held in 7 provincial nations. Bangladesh tabled "Determination 67/82" Tending to the financial needs of people, families, and social orders influenced by a mental imbalance range issue, formative issue and related incapacities at the Unified General Get together in 2013 which was collectively embraced. Presently the **National Counseling Board of trustees** on a mental imbalance has been shaped with **Saima Hossain Putul** as administrator, and four Teams are working under her authority.

Bangladesh was additionally the one to start the **WHO** determination titled "Thorough and facilitated endeavors for the administration of a mental imbalance range issue" proposed by the territory of Qatar to the WHO Official Executive meeting held in May 2013, which was embraced collectively. **SaimaWazed Hossain**, a school therapist and worldwide supporter for extreme introvertedness has

been effectively occupied with worldwide and residential promotion of psychological well-being inabilities. She has been a critical champion for the reason for extreme introvertedness and helped with assembling individuals on the Official Board and the WHO Secretariat to help this determination *[3] [4]*

1.4   Definition of Down Syndrome

Human body is nothing less than a miracle. How human body will develop, look and work depends on the fact known as "genes". Genes are the reason behind every characteristic of a human body. They are also responsible for any abnormalities in a human body.

People by birth have 22 chromosomes but people with Down Syndrome are born with 23 chromosomes in their bodies. Chromosomes are the set of genes, with Down syndrome, this extra chromosome causes issues that affects them for life time.

Although Down Syndrome is a lifelong problem but with the help of modern science and treatments, at present doctors are helping these patients. With proper care and education, Down syndrome issue can get a better solution.

1.5   Effects of Down Syndrome

Down syndrome occurs in about one per 1,000 babies born each year all over the world. It varies in characteristic and occurs differently in people. Some may suffer from understanding where some may suffer from interaction with surroundings. With proper care, these issues can be handled.

People with Down syndrome have some physical features in common. For example, flat noses, small ears, straight hair etc. They'll learn skills gradually but will face problems in daily activities like walking, talking, and developing social skills.

1.6   Causes of Down Syndrome

The worldwide accepted main reason behind down syndrome is to have one extra chromosome in human body. There is a higher chance that women aged 35 and older and already having a child with Down syndrome, are more likely to have another one who has it as well.

It is possible to pass Down syndrome from parent to child. Again, parents having no Down syndrome can have down syndrome child because they have correct number of genes, but their child doesn't.

1.7   Types of Down Syndrome

Three types of Down syndrome have been identified so far. They are: Trisomy 21, Translocation DS, Mosaic DS.

- **Trisomy 21:** This is by far the most common type, where every cell in the body has three copies of chromosome 21 instead of two.

- **Translocation Down Syndrome:** In this type, each cell has part of an extra chromosome 21, or an entirely extra one. But it's attached to another chromosome instead of being on its own.

- **Mosaic Down syndrome:** This is the rarest type, where only some cells have an extra chromosome 21.

The effects of all three types down syndrome are very common, so it is difficult to identify the exact type in each individual.

1.8   Life of a Down Syndrome child

Individuals with Down syndrome usually have cognitive development profiles that suggest mild to moderate intellectual disability. However, cognitive development and intellectual ability are highly variable. Children with Down syndrome often reach developmental milestones later than their peers. There may be a delay in acquiring speech. A child may need speech therapy to help them gain expressive language. Fine motor skills may also be delayed. They can take time to

develop after gross motor skills have been acquired.

On average, a child with Down syndrome will sit at 11 months, crawl at 17 months and walk at 26 months. There may also be problems with attention, a tendency to make poor judgments, and impulsive behavior. However, people with Down syndrome can attend school and become active, working members of the community.

Sometimes, there are general health problems that can affect any organ system or bodily function. Around half of all people with Down syndrome have a congenital heart defect.

There may also be a higher risk of:

- Respiratory problems

- Hearing difficulties

- Alzheimer's disease

- Childhood leukemia

- Epilepsy

- Thyroid conditions

However, there also appears to be a lower risk of hardening of the arteries, diabetic retinopathy and most kinds of cancer.

1.9 Down Syndrome in Bangladesh Perspective

Bangladesh does not have studies to say how many people are suffering from the chromosomal disorder Down syndrome at this moment. But organizations who work with these special children said they were at least 200,000 in number, crying in silence.

Association of Medical Doctors of Asia, Japan-Bangladesh Friendship Hospital, and Cardiff International School Dhaka presented this estimate while observing World Down Syndrome Day with rally, workshop, and discussion in last year.

The estimation has been made based on the global trend that one in every 800 children born with this chromosomal abnormality.

But it is a matter of great sorrow that, these unfortunate people remains neglected in the society. Even parents do not know how to manage them. In Bangladesh, most of the parents are aware of ASD but very little know about Down Syndrome. Most Often people mix these two disorders and named as autism. There are many misconceptions about these Down Syndrome patients.

There is a significant difference between ASD and Down Syndrome, most importantly Down Syndrome children are way more intelligent than any other autistic child. They can learn and understand very easily if they are guided in proper ways.

At present, many organizations are working for Down Syndrome children in Bangladesh. Many therapy, and training centers are also available now. People who can afford are taking these treatments and having good results. But the rest of the people are not fortunate enough due to lack of financial supports from government.

Chapter 2

Understanding Down Syndrome

2.1   Sign and Syndrome

There are various types of a person with Down Syndrome autism and there are many forms of disorder which cannot be described easily *[5]*.

It's easy to fall into thinking that everyone with Down Syndrome looks similar but in reality, Down syndrome affects people both physically and mentally very differently in each of them. And there's no prediction how it will affect anybody in the long run. For some of them, the effects are normal, they can even have an easier life style. But for others it is impossible to do daily activities without the assist of anyone else.

2.1.1   Physical and Mental Symptoms

Some common physical features that are seen in down syndrome children are given bellow:

- Flatter faces

- Almonds shaped eyes

- Small ears

- Small hands and feet

- Short neck

- Small head

Some common mental symptoms that are seen in down syndrome children are given below:

- They may suffer from **Hearing Loss**

- They may have **Heart Problems**

- Suffer from **Obstructive Sleep Apnea**

- Most common **Eye Sight Problems**

- Also develop several **Blood Conditions and Infections**

2.2 Treatment Strategies

2.2.1 Applied Behavior Analysis (ABA)

Applied Behavior Analysis (ABA) is the direction of learning and encouragement from Behavior Analysis, and the strategies and innovation got from those standards to the arrangement of issues of social centrality. The thought process of this technique is advance. This technique enhances such huge numbers of issues, for example, correspondence, creative energy, discretion, self-observing. It is organized and regular practice process which helps to enhance over the long haul. A child can response in three ways of any method. Behind every child, they need individual therapy which is given by the instructor. So many dynamic benefit of a package of ABA methods in Comprehensive, Individualized and Intensive Early Intervention projects for special children. Comprehensive mention the skill of day to day life for children and self-control and motivation. Early intervention designed the entire beginning program before age 4. Intensive refers to the total program per week 30-40 hours for 1-3 years children *[6]*.

2.2.2 Discrete Trial Training (DTT)

Discrete trial preparing (DTT) is a strategy for instructing in which the grown-up utilizes grown-up coordinated, fortifies decided for their quality, and clear possibilities and duplication to educate new abilities. DTT is a particularly solid technique for inspiring for another reaction to an incitement. Its restrictions are

absence of fortification of student immediacy. Using DTT this learner follows some steps. In 1st step teacher or instructor decide for learners what are the objectives can be taught using DTT and summarize the results. 2ND step teacher completes the student analysis task and lists what to do and how a student can do that task. 3rd step is about Setting up the Data Collection by teachers. In 4th mentors designed the location which can take place. 5th is teacher gather the materials which will be used in practice. In 6th teacher assists the learner and gather all the attention. In 7th massed the trial of the learner. 8th is what teacher conducting with the learner and lastly means in 9th mentors give a review and modify the results *[7]*.

2.2.3 Functional Communication Training (FCT)

Functional communication training (FCT) is an effective finding of behavior problems. This method described by Carr and Durand (1985), differential reinforcement is used for this method. People who have lots of aggression, people who hurt themselves, vocal problem, stereotypy participants are applicable for this therapy. A variety of response targeted in FCT, including vocal responses, picture exchanges, sign language, gestures, and activation of voice or text output devices *[8]*.

2.2.4 Incidental Teaching

Incidental teaching creates an environment for special children which introduce children interest. This method used to add fun to children life. Six principle serves this method. First is early intervention is essential and proper time to develop this method between the ages 15 to 30 months. Second is the improvement is not going to show you in one day it's just they should engage with minimum 30 hours per week. The third is home and company with parents is most important of upbringing them. 4th is they should interact with socially and for that need to plan how can they interact. 5th is children need to learn to speak in a discrete trial. And final is depending upon incidental teaching procedures within the environment *[9]*.

Chapter 3

Related Works

In past decades, many researches are conducted on the issue of autism and how to solve this issue with the help of technology. On the internet we can find numerous serious games, casual games and program are made to help the autistic children. Hanan M. Zakari analyzed a huge amount of these games and tried to categorize them based on their primary goal *[10].* This category helped us to define that specific sector, Down Syndrome we want to improve. From our research, not all of these games are highly effective. In fact, a little of them are effective in real life scenario.

One of the most common problem with Down Syndrome children are delayed language and speech development. Some children cannot pronounce the word or sentence correctly and find trouble to express their thoughts. Rahman and his team tried to solve this problem by playing an e-learning iterative game to the children. The teacher will choose some picture of different things and pass those pictures through LAN. The autistic children will receive them in their computers. These pictures will show at the left of the screen and begin to move to right of the screen. In this time, the children will pronounce the meaning of those pictures loudly and clearly so that the system can record that. Now the system will analyze the speech and if it is correct, that child will get the score *[11].*

Related to our previous reference, another interesting game was made to help children speak properly. Many autistic children speak so fast that other person can not understand them. To control their speaking, M. Goodwin and his team created a turtle race serious game. Children have to speak in proper speed, loudness and clearness to win the race. They can not speak very fast nor very slow. To win the

race, they have to maintain the moderate speed of speaking *[12]*.

Another major difficulty autistic children face is the poor emotion recognition of other people. LIFEisGAME is a serious game that help children to understand facial expression of a person in different levels. Tech giant Microsoft formed a group with specialist from Portugal and University of Texas to develop this game. This game have multiple stage. The very first one is the "Recognize the expression" . A 3D cartoon model will be shown in the screen and children have to recognize the emotion of that model by reading its facial expression. In the next stage "Build a Face" , children have to rebuild a face on the basis of emotions on cards given. The final stage of this game is "Live the Story" , where the children will play a sort story of a cartoon character. The main goal of this story is to express emotions correctly in certain scenarios *[13] [14]*.

Modern technology opened a door to solve the problems of autism more efficiently. Virtual Reality (VR) is one of the most promising among of these technologies that can help us greatly to solve many of these problems. Marco Simões and his team develop an interesting game to help not only the children but also the young adults. With the help of VR, they created a game that will help ASD patient to give the experience of bus journey. They staged a small scenario where the player have to complete a bus journey. Player have to perform some small tasks like buying the ticket, waiting for the bus, choosing a sit in the bus, get down on the stoppage etc. With the VR headset, this game can give them almost the real feel of a true bus journey. This will help them to deal with the real life scenarios **[15].**

Chapter 4

Methodology

4.1 Procedure

"Find It" is a cross platform serious game that has been developed with an intension of teaching its user in a fun way to develop their certain skill set. The game has been developed for both Android & iOS platforms to reach the maximum user in the industry.

4.2 Gameplay

- After Installing and opening the application, user have to log in by the email ID in order to get track on their performance report. The user can logout or switch between accounts with the different email.

- After the login process complete, user simply have to tap on the "Play Button" .

- The game will start with one of the mini game that has been available to play.

- If the game is "Balloon Pop" , the user has to tap on the balloon with the targeted "Letter" that has been displayed as the target. If the targeted letter is "A" , the user has to tap on the balloon consist of letter "A" and avoid tapping on other balloon.

- At the end of "Balloon Pop" game, the performance will be stored in firebase cloud database based which is based on accuracy.

- If the game is "Matchmaking" , the user has to match the two same card with the same letter in order to complete the board. So if the targeted letter is "A" , user has to match all pair of "A" at the board in order to complete the level.

- At the end of "Matchmaking" game. The performance will be stored in firebase cloud database which is based on time.
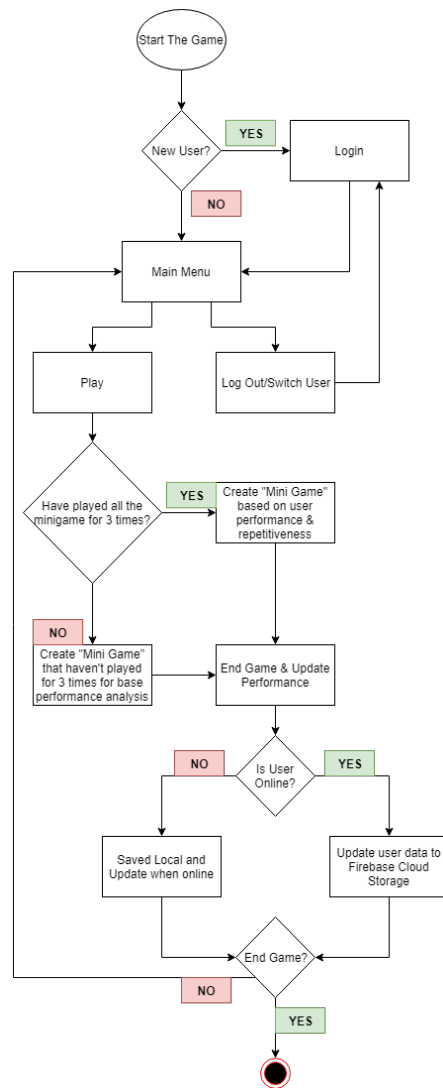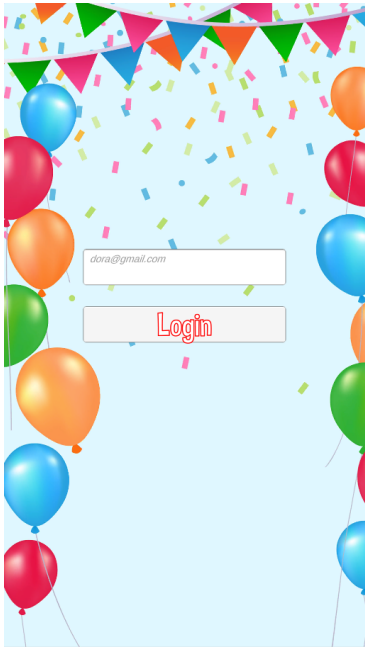

Fig 4.1: Flow chart of gameplay

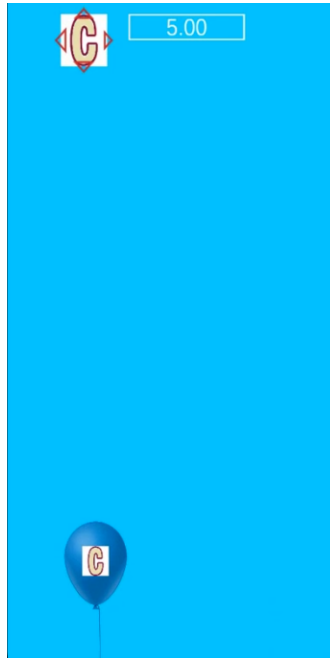Fig 4.2: User login window

Fig 4.3: Main menu for logout and play

Fig 4.4: Gameplay scene of balloon pop
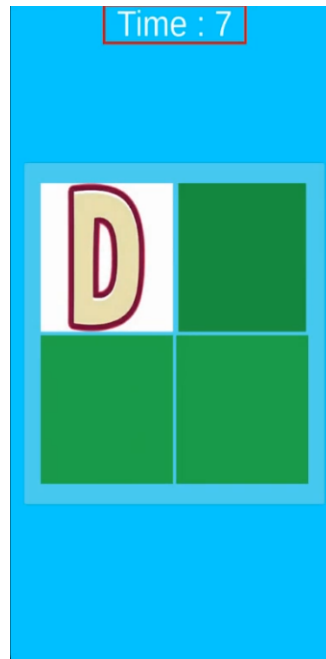
Fig 4.5: Gameplay scene of matchmaking

4.3 Entertainment Goal

Involving user to an environment that is comfort to explore with the learning material ensuring that player is not always engaged with the less performance game, but also engaging with the most perform game in order to keep the "fun vs. challenge" curve consistent.

4.4 Learning Goal

"Find it" is a mobile application that has been specially designed and developed for Autistic children. The game consists of two mini game. The game "Balloon Pop" will help to develop your skill for fast letter recognition while "Match Making" will help you by challenging your memory to solve the different board puzzle. Our adaptive learning AI, will challenge the user based on their performance. While their performance gets stored to our Firebase cloud database for our further research and performance analysis.
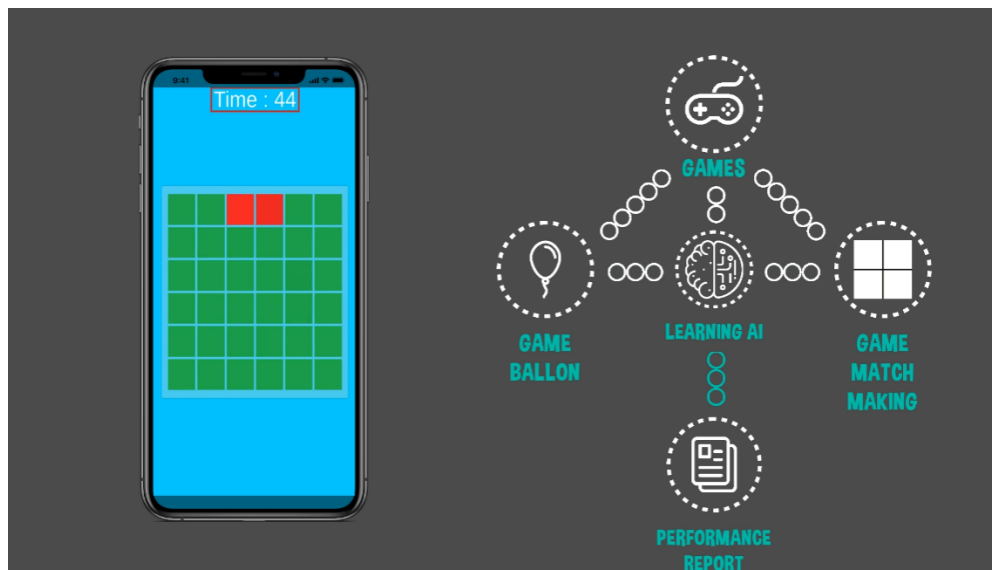

Fig 4.6: Game backend working diagram

4.5 Technology

We used "Unity" as cross platform game engine to develop our game to reach out the maximum user on different platform. We used "Firebase" to store our user data which handle the both offline & online situation of our application. We also have deployed "Vuforia" , an "AR" sdk for both "Android" & "iOS" platform which we will discuss in our future work.

Chapter 5

Experiment and Result

It was a very momentous and memorable event for us to be a part of our experiment conducted upon the ASD children in Smiling Special Children School for Special child. The happiest moment was for us to see the smiling face of the children and their fervor to solve the puzzle given in the game.

5.1 Survey

We gathered experience with the autistic children and teachers of Smiling Special Children School for survey purpose.

Survey Analysis of Teacher of Smiling Special Children School

Result and Analysis: After collecting all the data by surveying, we did an analysis of the data collection in according each questions perspective.

A. Terms and Policy agreement:

This part was important before doing the survey; there might be many issues that participants have. So if they ask about the survey privacy, the agreement will be bought out. Also it is like a defensive law for the participants, so if any participant wants to take any step against the survey they can use the agreement as their proven report.

- **The survey for:** The reason behind the survey.

- **Purpose behind the survey:** The purpose of the survey.

- **How the data is being collected:** What kind of data being collected from the participants.

- **How the data will be used:** How the data will be used and what will be the future use of the data.

- **Privacy and security that will be maintained:** How we are maintaining the privacy and security of the random participants information.

- **What will be the benefit participating in the survey:** From the participants perspective what will be the benefit if they participate in this survey.

- **Access on provided data:** How participants can access their data if they want to change or erase the data from the survey.

5.2 Result

Among 3 teachers of the school read and understood the survey purpose and they "Agreed" with the survey response form that they are going to provide all the information which is asked in survey form. All of them agreed on it.

Fig 5.1: Flow chart of gameplay

Analysis: After receiving the result it is confirmed that almost everyone understood our survey purpose and agreed with the agreement form. It is also to be mentioned that all the participants know what they are doing.

B. Personal Information:

This section contains three questions. This will gather all the personal information that is required for the participants. This will include –

a. Name: We have taken their names, but we can't show that because of some privacy issue.

b. Gender: Three teachers were responded on the survey form, 70% of them were female and 30% of them were male. Male teachers are taken care of little mature boys. Female teachers are taken care of early intervention boys and girls.
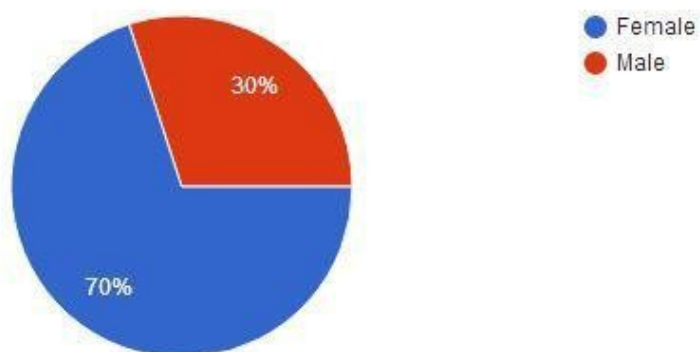
Gender

10 responses

Fig 5.2: Gender summation of teachers

c. Age: Age range of teachers are maximum in between 21-29 which is 80% and 20% of them are around (30-39). It means maximum teachers are young, hardworking and potential.
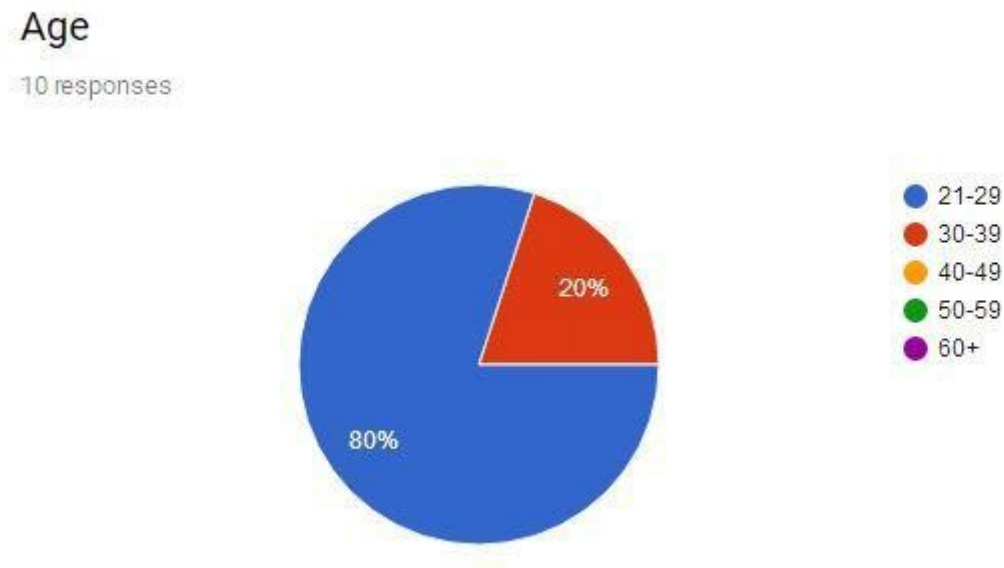

Fig 5.3: Age summation of teachers

C. Experience:

In this section we will discuss and gather the information about participants experience in school, with children, strategies etc. Which is required-

Question 1: The participants have to answer the question that "How many years you have been taught autism children?" This question asked the individual like multiples choices. All the participants filled up this form and graph shows the result which is given below.

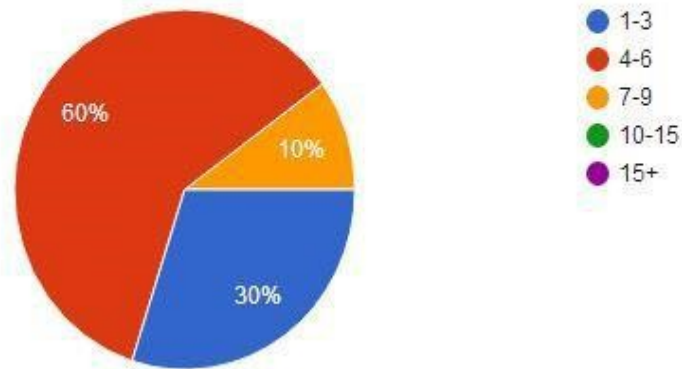## How many years you have taught autism children ?

10 responses

Fig 5.4: Teaching experience

Result and analysis: The result shows that 60% among the participants are teaching around 4 to 6 years and 30% participants are teaching around 1 to 3 years and also 10% participants are teaching around 7 to 9 years. It is shown that most of the teachers are teaching around 1-6 years. So, they have enough experience about teaching to autistic children.

Question 2: The participants have to answer the question that "What strategies/materials do you use when teaching students with autism?" It's a short question.

Result and analysis: Different participant answered differently. But they all are want to give them practical treatment. So that children can develop them easily.

Question 3: The participants have to answer the question that "Environmental setting where you most often teach?"

- Virtual Classroom: Which is required a classroom where children can learn about their behavior, action, how to speak fluently etc.

- General Educational Classroom: Where autism children can learn about alphabets, words, objects etc.

- Playground: In these section children are influenced to play some outdoor games like jumping, ball throwing, frog jump etc.

- Others: In these section teachers are answered different answers whether they go out with children for refreshments or learning.

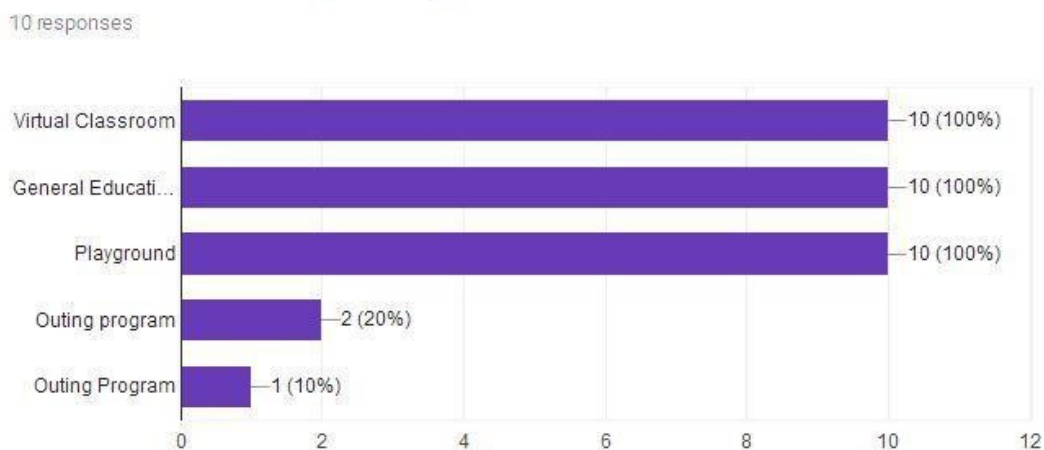## Environmental setting where you most often teach?

10 responses

Fig 5.5: Survey of Teaching Environment

Result and analysis: As participants can choose multiple option at a same time we will calculate the result as the total preference.

Among all participants 100% of them prefer virtual classroom, general educational classroom and playground which is most required as their preferences. In other section 30% of them prefer outing program which is included shopping, picnic, tour etc.

Question 4: The participants have to answer the question that "Subject area (s)you currently teach?"

The answer was Multiple Checkboxes, so participants could choose all the options and also choose nothing at all. In answer option there were 7type of options. The result is given below:
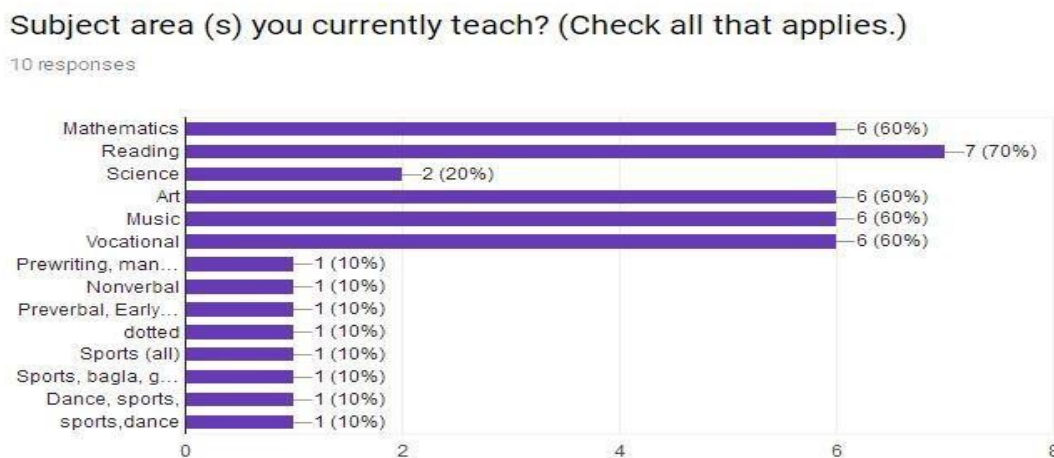

Fig 5.6: Area of teaching

Result and analysis: Among all of the participants 60% of teachers teach Mathematics, 70% teacher's practices reading to children which are very important. 20% of them teaches science, 60% of them teaches art, music, vocational and in other section 40% of them teaches sports, 20% of them dancing and 10% of teachers teaches prewriting, nonverbal act and dotted training to write alphabet.

D. Responsibility:

In this section we will discuss and gather information about outside of the classroom work, how many children they handle and relationship between parents and teachers with the autistic children.

Question 1: The participants have to answer the question that "With whom children share good relationship?"

The answer was Multiple Checkboxes, so participants could choose all the options and also choose nothing at all. In answer option there were 4type of options. The result is given below:

34

With whom children share good relationship?

10 responses

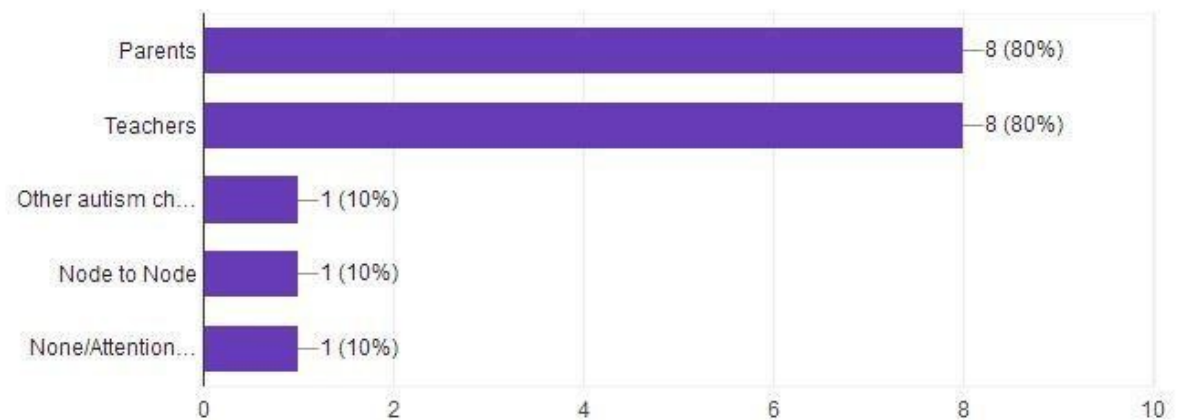|	
Parents	8 (80%)
Teachers	8 (80%)
Other autism ch...	1 (10%)
Node to Node	1 (10%)
None/Attention...	1 (10%)

Fig 5.7: Survey of good relationship

Result and analysis: Among all the participants 80% participants answered that children relationship is very close with parents and teachers ,10% participants said that children relationship with other autism children is also good. 10% of children is nearly happy with everyone and 10% participants said that children do not share good relationship with none of them and they also attention seeker.

Question 2: Participants have to answer the question that "Number of students you are responsible for in a typical day?" The result is given below:

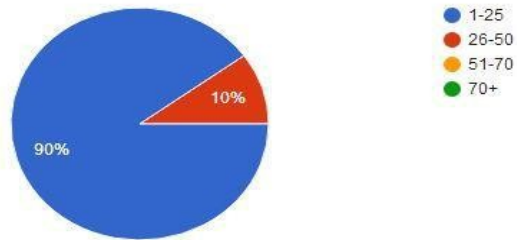Number of students you are responsible for in a typical day?

10 responses

Fig 5.8: Number of students for a teacher

Result and analysis: Among all of the participants 90% participants said that they are responsible for around 1-25 autistic children and 10% of participants said that 26-50 children. In maximum case they provide one to one teaching service to the students so that they can improve the children with care and love.

Question 3: The participants have to answer the question that "Is there any specific talent in children?" The result is given below:

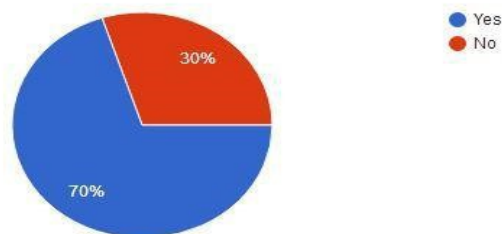Is there any specific talent in children?

10 responses

Fig 5.9: Talent in children

Result and analysis: Among the participants of teachers answered that 70% of the children has some specific talent and 30% of the children has no specific talent.

Children who have some specific talents these are:

Some children have crafting talent, they can make some object like alphabet, words with those things. Some children have dancing talent, they love to do dance. Unusual singing sometimes, drawing, painting etc.

E. Teaching procedure:

In this section we will discuss about participants professional background, teaching style and training.

Question 1: The participants have to answer the question that "Have you received formal training about autism?"

The answer was Multiple Checkboxes, so participants could choose all the options and also choose nothing at all. In answer option there were 7 types of options.

- Never, they didn't take any training or professional references about autism.

- Never, but heard it mentioned in undergraduate/ graduate coursework

  They didn't take any training but knows about it in undergraduate and graduate coursework and they have done some works in it.

- Completed autism-specific undergraduate class: They have taken training from an institute and get certification from that instituted.

- Read books/articles on autism: They read books, articles and magazines about autism and get prepare all time for autism children.

- Surfed the internet for information: They search about autism and get information about whole world.

- Others: They have taken formal Sports training and Organizational training from the school where they have been taught children.

Have you received formal training about autism? (Check all that applies.)
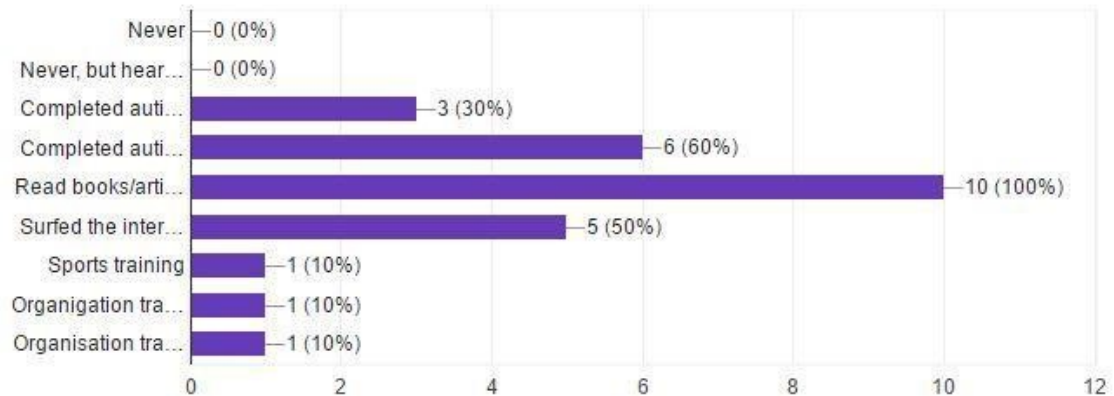
10 responses

Fig 5.10: Survey of formal training

Result and analysis: Among all participants, 100% of participants read book and article about autism. 90% of participants have completed autism-specific undergraduate class. 50% of participants surfed internet to gather knowledge, 20% of participants have taken organizational training under that school where taught. And 10% of participants taken sports trading from another institution.

Question 2: The participants have to answer the question that "Does autism impact a student's life on a scale of 1-5?" This question asked the individual like multiples choices, they have to choose one. All the participants filled up this form and graph shows the result which is given below.
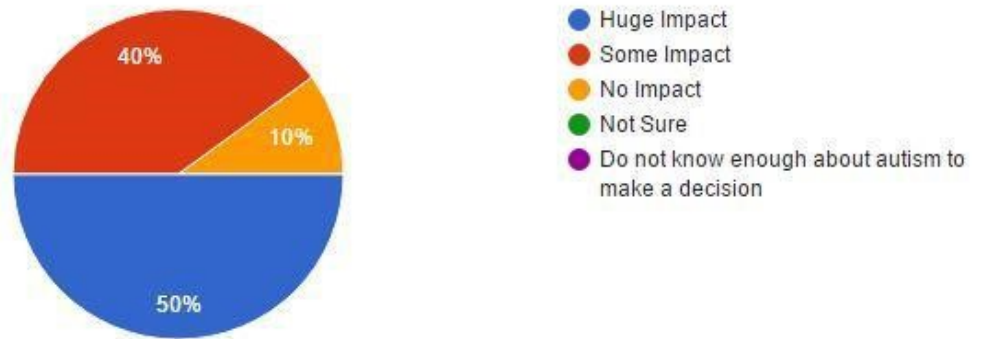
Fig 5.11: Life scale

Result and analysis: Among all the participants 50% of teachers answered that autism has huge impact on student life because some children can't even spent day to day life without any help. 40% of participants answered that there are some impact because those autism children can lead day to day life but they have problem to learn new things. 10% of participants answered no impact because those children doing well and they are improving.

Chapter 6

Conclusion and Future Work

6.1 Conclusion

By play testing and survey. We have come to the point that the autism children are more likely to accept the digital media as they find it more interesting than their real life toys and exercise elements. The benefits of engaging in digital media is helping them to their learning curve but removing intension of social communication as they feel more comfort of being alone. The teachers gave us an amazing point that if the digital media can also communicate, it will help them to encourage in social communication as well.

6.2 Future Work

We already deployed "Vuforia" to inspire the user to detect letter from the real word, such as books or stickers to make them more interactive with environment. Also we are planning to add virtual agents to help them with speech exercise.
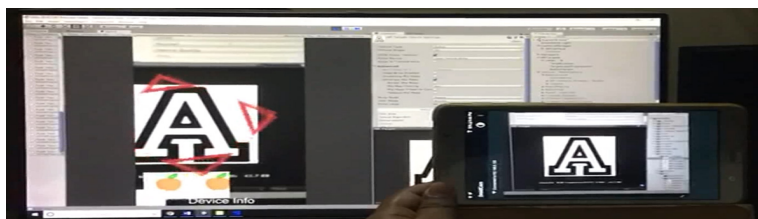

Fig 6.1 : Future work

Bibliography

[1] Stone, W., Lemanek, K., Fishel, P., Fernandez, M., & Altemeier, W. (1990). Play imitation skills in the diagnosis of autism in young children. Pediatrics, 86(2), 267–272

[2] Hourcade, J., Bullock-Rest, N. and Hansen, T. (2011). Multitouch tablet applications and activities to enhance the social skills of children with autism spectrum disorders. *Personaland Ubiquitous Computing*, 16(2), pp.157-168.

[3] Editor, W. (2017). *Global Autism Movement and Bangladesh*. [online] CRI. Available at: http://cri.org.bd/2014/09/03/global-autism-movement-and-bangladesh/ [Accessed 25 Nov. 2017].

[4] Report of Ministry of Health & Family Welfare, Government of the People's Republic ofBangladesh 2014, *Actions Speak Louder than Words: Bangladesh Unique Approach toAddressing the Public Health Challenge of ASD*, 2014.

[5] M. Edelson, S. (2017). *Research: Overview of Autism | Autism Research Institute*. [online] Autism.com. Available at: https://www.autism.com/pro_research [Accessed 25 Sep. 2017].

[6] Baer, D., Wolf, M. and Risley, T. (1987). Some still-current dimensions of applied behavior analysis. *Journal of Applied Behavior Analysis*, 20(4), pp.313-327.

[7] J Sullivan, B., Rogers S, L. and A, S. (2010). *STEP-BY-STEP INSTRUCTIONS Steps forImplementation: Discrete Trial Training*.Csesa.fpg.unc.edu. Available at: http://csesa.fpg.unc.edu/sites/csesa.fpg.unc.edu/files/ebpbriefs/DTT_Steps_0.pdf.

[8] Carr, E. and Durand, V. (1985). Reducing behavior problems through functional communication training. *Journal of Applied Behavior Analysis*, 18(2), pp.111-126.

[9] McGee, G., Morrier, M. and Daly, T. (1999). An Incidental Teaching Approach to Early Intervention for Toddlers with Autism. *Research and Practice for Persons with SevereDisabilities*, 24(3), pp.133-146.

[10] HananMakkiZakari , Minhua Ma, and David Sim, "A Review of Serious Games for Children with Autism Spectru m Disorders (ASD) ," Digital Design Studio, Glasgow School of Art, Glasgow, UK, Glasgow, UK, Paper 8778, 2014.

[11] Rahman, M., Ferdous, S., Ishtiaque Ahmed, S. and Anwar, A. (2011). Speech development of autistic children by interactive computer games. Interactive Technology and Smart Education, 8(4), pp.208-223.

[12] M. E. Hoque, J. K. Lane, R. el Kaliouby, M. Goodwin, R. W. Picard, Exploring Speech Therapy Games with Children on the Autism Spectrum, In Proceedings of InterSpeech, Brighton, UK, September, 2009.

[13] Tiago Fernandes, SamantaAlves, José Miranda, Cristina Queirós, and VerónicaOrvalho. (2014, -) LIFEisGAME:A Facial Character Animation System to Help Recognize Facial Expressions. Paper.

[14] Porto Interactive Center. (2014, Dec.) LIFEisGAME - A game about emotions.Online]. http://www.portointeractivecenter.org/lifeisgame

[15] Simões M, Bernardes M, Barros F, Castelo-Branco M, "Virtual Travel Training for Autism Spectrum Disorder" : Proof-of-Concept Interventional Study, JMIR Serious Games 2018;6(1):e5

List of Acronyms

ASD= **A**utism**S**pectrum **D**isorder

ABA= **A**pplied**B**ehavioral **A**nalysis

MRI= **M**agnetic**R**esonance **I**maging

ESDM= **E**arly**S**tart **D**enver **M**odel

NAS= **N**ational**A**utism **S**ociety

TEARC= **T**reatment and **E**ducation of **A**utistic and **R**elated **C**ommunications

HSAAN= **H**andicapped**C**hildren **M**ethod **S**outh **A**sian Autism **N**etwork

WHO= **W**orld**H**ealth **O**rganizatio