FaceSnap: Game-based Courseware as a Learning Tool for Children with Social Impairment

by

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Dissertation submitted in partial fulfillment of
the requirements for the
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CERTIFICATION OF APPROVAL

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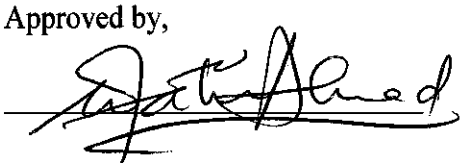

(AP Dr. Wan Fatimah Wan Ahmad)

UNIVERSITI TEKNOLOGI PETRONAS

TRONOH, PERAK

January 2011

CERTIFICATION OF ORIGINALITY

This is to certify that I am responsible for the work submitted in this project, that the original work is my own except as specified in the references and acknowledgements, and that the original work contained herein have not been undertaken or done by unspecified sources or persons.

NUR ZAREEN BINTI ZULKARNAIN

ABSTRACT

Nowadays, computer games have been seen not just as a form of entertainment but also as a source of education. Gaming has been viewed as a way of making education fun and is able to engage children in the learning process longer. Games do not only help normal children but also children with disabilities. The objective of this project is to find the most suitable game-based method for children with social impairment and to develop the courseware to see its effectiveness. This courseware will help the children to learn facial expression and social behaviour targeting children with Asperger's Syndrome. The methodology used in this project is Rapid Application Development (RAD) and the tools used for the courseware development are Adobe Flash, Adobe Photoshop, Adobe Illustrator and Adobe Soundbooth. Six children are tested playing this game to see whether there is any improvement in their score. These children are divided into Asperger's Syndrome group and control group which consist of normal children to see their comparison. The result shows that there is improvement in their scores which indicates that this courseware is effective in helping children with social impairment to learn about facial expressions and social behaviour.

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CHAPTER 1

INTRODUCTION

1.0 INTRODUCTION

1.1 Background of Study

A game has certain common characteristics which are identifiable player, set of rules, player interaction, organized method of play and desirable goals or outcome (Saulter, 2007). There are a few types of computer games such as strategy games, puzzle games, and first person shooter (FPG) games. In order to ensure that a game-based courseware could help educate children, it is important to find out about their behaviour and learning style before determining which type of games is the best for them.

Social impairment is a disorder that includes but not limited to attributes such as inability to interact with peers, lack of appreciation of social cues, socially and emotionally inappropriate behaviour and limited facial expression. Social impairment often exists in people with Autism Spectrum Disorder (ASD) such as Asperger's Syndrome as well as in people with Attention-Deficit Hyperactivity Disorder (ADHD). These people usually have an average or above average intellectual ability thus they can be educated (Myles, 2003). This project is aimed to find the best game-based method for these children and go on to actually developing the game-based software that could help instil proper social behaviour in them.

1.2 Problem Statement

Children with social impairment normally have an average or above average intellectual ability. Sometimes, their intellectual ability is so good that they are able to master certain areas and came up with breakthrough ideas and algorithm to solve certain problem. However, because of their social impairment, they have limited ability to engage in a reciprocal conversation, lack of empathy, poor non-verbal communication, limited facial expressions and tend to show socially and emotionally inappropriate behaviour. This causes them to sometimes be left out from the community resulting in them having low self esteem and their abilities and sharp minds might go to waste. Through games, these children will be able to observe and learn appropriate social behaviours and facial expressions while practicing it along the way.

1.3 Objectives

The objective of this study is to do a research on the most suitable game-based methods for children with social impairment. With the game-based methods properly defined, it is aimed that a game-based courseware be developed so that it can assist children with social impairments.

1.4 Project Scope / Limitation

Among all the disabilities that address social impairment, this study will focus on children with Asperger's Syndrome. The target age for these children is between 7 to 11 years old. The scope will be on learning their behaviour, their learning style and the best type of games that can educate them. It also focuses on teaching them facial expressions and social behaviour.

CHAPTER 2

LITERATURE REVIEW

2.0 LITERATURE REVIEW

2.1 Gaming and Asperger's Syndrome

Play has an important role in educating children. Nearly half of a child's mental capacity has developed before the age of 4, another 30 percent before the age of 8, and the remaining 20 percent by the time he or she reaches 17 (Saulter, 2007). At the early age, most education comes from play. For example, a game of Hide-and-Seek can teach a child to overcome separation anxiety. Using the same concept, play and activities are also used to improve the social skills of children with Asperger's Syndrome.

Myles (2003) describes Asperger's Syndrome as a cluster of related symptoms primarily involving problems with social interaction despite average to above-average intellectual and expressive language ability. A lack of social understanding, limited ability to have a reciprocal conversation and an intense interest in a particular subject are the core of this syndrome (Attwood, 2007). Though this syndrome was first recognized by Hans Asperger more than 60 years ago, it is not highly recognized by the society until lately where more efforts are being put in to create awareness.

It is important to recognize whether a child has Asperger's Syndrome so that it can be treated fast. Albert Einstein who provided the theory of relativity also had Asperger. When he was inducted as an American, he attended the ceremony without socks (Botham, 2006). In a fictional movie, My Name is Khan (2010) the director, Karan Johar portrays the life of an Aspie through Rizvan Khan. In the movie, when his son died because of Rizvan is a Muslim and Muslim is seen as a terrorist after the September 11 incident, his wife asked him to tell the people of the United States, and the President that his name is Khan and that he is not a terrorist. He took her words literally and a lot of things happened until he even got arrested by the Federal Bureau of Investigation (FBI).

From the examples above, it can be seen that Aspies does not have much problem intellectually. However, their social impairment may make them seem different and be left out from the society. Thus it is important to educate them at an early stage so that they can treat their social impairment. Currently, some materials used to educate these children include books such as Exploring Feelings: Activities for Young Children, Social Skills Activities for Special Children (Attwood, 1998) and A Quest for Social Skills for Students with Autism or Asperger's (Cumpata and Fell, 2010) which provides activities that could help these children overcome their social impairment. In these books, teachers are provided with a set of activities that could help develop social skills in children with Asperger's Syndrome. It uses the traditional method which is using paper and pen for children to jot down their feelings or for them to play simple games.

However, Jayakantham (2002) stated that in comparison to gaming, traditional education-learning as it is imposed upon students in traditional atmosphere is simply not a "fun" activity. It is important to get children with Asperger's Syndrome

interested in education. Min (1996) explored the impact of interactive multimedia use on young children's behaviour and found that it could engage children for a longer time period. When children play video games they can experience a much more powerful form of learning than when they are in the classroom (Gee, 2003). With these reasons, the study is aimed to find the best game based method to teach children with Asperger and actually developing it. This game will later allow these children to learn social behaviours in a more fun way.

2.2 Theory of Mind

Some of the characteristics of people with Asperger is they have lack of empathy, poor non-verbal communication and limited facial expressions. In order to create a game-based courseware that could help overcome all these problems, it is important to first understand what causes it. Szalavitz (2009) in her article believes that the problem starts with the complexity of empathy itself, which has at least two critical parts. The first part is the ability to see the world from the perspective of another while the second part is more emotional – the ability to imagine what the other is feeling and care about their pain as a result. The first part is known as theory of mind.

According to Sodian and Kristen (2010), a Theory of mind is the ability to attribute mental states (thoughts, knowledge, beliefs, emotions, desires) to oneself and others. It is important to have a theory of mind as it allows one to express their thoughts and intention to others. Having a theory of mind also helps in predicting or explaining the action of others. Normal people develop the theory of mind since birth and through out growth. However, people with Asperger develop this theory a bit later in life. Markram et al. (2007) describes the theory to involve two elements. The first element is the ability to attribute mental states to one self and others, to be able to distinguish

between oneself and others and realize that others have independent minds and may pursue different goals from oneself. The second element is the ability to express an appropriate emotional reaction to the other person's mental state, thus to be able to empathize with the others' mind.

In comparing the theory of mind of a normal children and a children with Asperger's Syndrome, a classic experiment using two puppets are used. The first puppet puts some marbles in a box and leaves the stage. The second puppet takes the marbles and put it in her pocket while the first puppet was away. The children are then asked, "Where will the first puppet look into, to find the marbles?" Normal children will know that the first puppet did not see the second puppet moves the marble. So, they will say that the first puppet will look into the box. However, children with Asperger's Syndrome will say that the first puppet will look into the second puppet's pocket because they do not realize that not all people share their knowledge. This is also the reason why children with Asperger like to talk about their interests as they do not realize that other people might not like the same thing.

2.3 Facial Expressions and Human Emotions

Each and every human being has emotions. These emotions are being expressed through words, actions and also facial expressions. Children with Asperger's Syndrome and other Autism Spectrum Disorder (ASD) have problems in expressing and understanding emotions through facial expressions and this puts barrier in their social life. Ekman (1992) suggested that there are six basic human emotions which are happiness, sadness, fear, anger, disgust and surprise. Each emotion is represented with its own facial expressions.

Normal people learn to understand which facial expression is showing which emotions through out their growth. This knowledge is acquired naturally without really needing to have any formal classes about it (Ekman, 1999). Normal people can also guess how another person is feeling even if the other person does not express it because they have theory of mind. However, this is different with Aspies. They could not read what other people are feeling even though it is being expressed through facial expressions. This is because they lack theory of mind. They lack the ability of reading people's emotion based on situation rather than expressions.

There are several ways to display the facial expressions to teach children with Asperger's Syndrome regarding facial expressions and the emotions they signify. This includes using real photograph or video of a human being or using an animation. However, which of these two is more effective? Based on a study by Elzouki et al. (2007), it shows that each child is individual in their ability to recognise emotions. For example, Kareem, one of the children in the study manage to recognize all expressions in the photograph but struggles with computer generated faces. However, Nahla can recognize expressions better in computer generated images. Thus, the effectiveness of both ways is dependent on the children itself. Grossman et al. (2000) hypothesized that AS facial emotion processing strategies would require greater processing time. Thus, this is expected to be seen when the game is tested with the children.

2.4 Recognizing Facial Expressions

Facial expressions are nonverbal communicator that results from one or more motions or positions of the muscles of the face. It is used to represent various states of emotions. Sad expression for example has the mouth muscle relaxed while happy expression has the mouth muscle to work so that the mouth will curve upwards

towards the ears. Different people have different facial expressions when they express certain emotions. However, the facial expression usually follows certain guidelines provided by facial cues from our eyes, eyebrows and mouth. Normal people usually look at a face and can simply guess the emotion. Aspies on the other hand, recognize facial expression by looking at these facial cues.

Shah (2008) in his lecture has explained the way to recognize emotion by looking at the facial clues given by the facial expression. In this project, three emotions are being used which are happy, sad and angry. To determine a happy expression, Shah said that the eyebrows are relaxed and the mouth is open with its corners pulled back toward ears. Sad expression on the other hand can be seen with the inner eyebrows being bent upward, eyes slightly closed and the mouth relaxed. If the inner eyebrows are pulled downward and together with the eyes wide open and lips pressed against each other or opened to expose teeth then, it is giving out an angry expression.

It was hypothesized that individuals with Asperger's Syndrome would perform best at tasks related to verbal content when asked to identify emotion and perform poorly with regard to prosody and facial expression (Lindner and Rosen, 2006). This resulted in their biased recognition towards emotion as verbal content only would not give the truth. A person could verbally say he is happy but his facial expression may differ.

2.5 Educational Game Design

Game fosters play, which produces a state of flow, which increases motivation, which supports the learning process (Paraz and Bizzocchi, 2005). The challenge for a game

developer to develop an educational game that actually educates is in making the game as interesting as possible to motivate the children to play at the same time teaching the children what they should learn. In order to do this, the game should be properly designed to ensure that the learning goals are achieved and the children are happy with the game. Thus, it is important to consider a few factors before developing the game. These factors include the genre or style of game, the learning activities, and proper feedbacks.

There are many different types of game genres. Apperley (2006) have described a few genres which are simulations, strategy, action and role playing. The simulation genre is described as games which simulate the real world like racing games and town-building games while strategy genre see games like chess which is more traditional or games like Need For Speed: Undercover (2008) which is much more modern. Action genre on the other hand can be of a first-person shooter or third-person games (Apperley, 2006). First-person shooter lets the player view the game through their eyes while third-person are played with avatars which can be seen by the gamer. An example of an action game would be Counter-Strike 1.6 (2003). A role playing genre is usually associated with fantasy. The gamers are allowed to play a role of certain somebody in the game and interact with other players in the games. One of the famous role playing games would be World of Warcraft (2004). Though Apperly have described these four genres, it can be further broken into smaller genres like sports, puzzles, adventures and fighting games. The relationship between learning content, learning activities and possible game styles can be seen in the table 1 below.

In order to ensure the children learns while playing the games, proper feedbacks should be given each time so that the children now whether what they did was correct or wrong. Fisch (2005) suggested that the feedback should not be designed to simply

reveal the right answer after children's first wrong guess, since that would prevent them from continuing to try to figure out the right answer. Thus, it is appropriate that it is being revealed after a few guesses. Some hints or help guides are also equally important in enhancing the learning process.

Table 1: Relationship between learning content, learning activities and possible game styles (Source: Rapeepisarn et.al, 2008)

Learning Content	**Learning Activities**	**Possible Game Styles**
Facts : laws, policies, product	Questions, memorization, drill, association	Game show competitions, flashcard types game, mnemonics
Skills: interviewing, teaching, management	Imitation, feedback, coaching, continuous practice	Persistent state games, role-play game, detective games
Judgment: management, decisions, timing, ethics	Reviewing cases, asking questions, feedback, coaching	Role-play games, multiplayer interaction, adventure game, strategy game, detective game
Behaviors: supervision, self- control, setting example	Imitation, feedback, coaching, practice	Role-play game
Theories: marketing rationales, how people learn	Logic, experimentation, questioning	Open ended simulation games, building game, construction games
Reasoning: strategic & tactical thinking, quality analysis	Problems, examples	Puzzles
Process: Auditing, strategy creation	System analysis & deconstruction, practice	Strategy games, adventure games
Procedure: assembly, bank teller, legal	Imitation, practice, play	Timed games, reflex games
Creativity: invention, product design	play	Puzzles, invention games
Language: acronyms, foreign language	Imitation, continuous practice, immersion	Role-play games, reflex games, flashcard games
Systems: health care, markets, refineries	Understanding principles, graduated tasks	Simulation games
Observation: moods, morale, inefficiencies, problems	Observing, feedback	Concentration games, adventure games
Communication: appropriate language, involvement	Imitation, practice	Role-play games, reflex games

2.6 Existing Game-based Learning Material

2.6.1 FaceSay™ Game

One existing game-based courseware available in the market now is FaceSay™. Developed by Symbionica L.L.C., FaceSay™ provides interactive practice in facial recognition for children with Autism Spectrum Disorder (ASD). Usually, children with ASD do not look at a face as a whole. Through FaceSay™, children with ASD are thought to recognize expression by looking at the eyes, nose and mouth of a person. Since its development, FaceSay™ has been proven to improve the ability of children with ASD to read facial expression. University of Alabama at Birmingham (2007) has reported that through a study, it is found that children with Asperger's Syndrome who used FaceSay™ scored an average score of 18.4 compared to 15.4 by the control group on a facial recognition test. On an emotion recognition test, children with Asperger's Syndrome who used FaceSay™ scored a mean test score of 8.7 compared with the control group score of 6.79.

Figure 1: One of the games available in FaceSay™

Though FaceSay™ has been proven to help children with ASD to better read facial expression, there are a lot more improvements that can be done. Using the demo of the game, two normal children aged 6 and 9 years old are asked to try it and their gaming experience are later asked. Firstly, they found that the voice used in the game sounded a bit strange. Though the graphics are animals and a baby, the voice that came out of them sounded robot. They also felt that the graphics are weak and unappealing and the colours are rather dull. However, they find the game interesting but better sound and graphic will make it better.

2.6.2 The Transporters DVD

The Transporters is a series of stories created with eight different vehicle characters. Each vehicle has their own expression and emotion being shown throughout the stories. After each story, the children will be given a quiz controlled using the remote control to assess their understanding. The Transporters chooses vehicles as their characters because children with Autism love those which are predictable and vehicles' moves are predictable. Based on a study by Golan et. al (2010), children who watches three episodes in a day shows improvements in facial recognizing skills over a period of four weeks. The only drawback is that parents will need to be with their children throughout the series to help them to navigate the remote control. The DVD is also less interactive if were compared to games.

Figure 2: Scenes from The Transporters DVD

CHAPTER 3

METHODOLOGY

3.0 METHODOLOGY

3.1 Software Development Methodology

The software development methodology that is used in this project is Rapid Application Development (RAD). RAD is a methodology that will go through iterative development with rapid prototype making. One of the reasons for choosing this methodology is because it reduces cost and development time and increase the probability of success (Shelly et al., 2008). It also involves user early in the project and in each step of the development thus ensuring that the game-based courseware meets the needs and requirements of the user. Based on user input, the prototype is modified and the interactive process continues until the game-based courseware is completely developed and user is satisfied (Shelly et al., 2008).

Figure 3 below shows the step by step process of RAD. Each process or stage will have user involvements. The first stage is the planning stage. After proper planning has been done, the analysis, design and implementation stage will follow. Each repetition of these stages will produce a prototype. This prototype is used to show the users what the end product will be. After the prototype is shown to the user, feedbacks will be taken and changes will be made to the prototype until the user is satisfied with it. Then, the prototype is made into the end product and will be implemented.

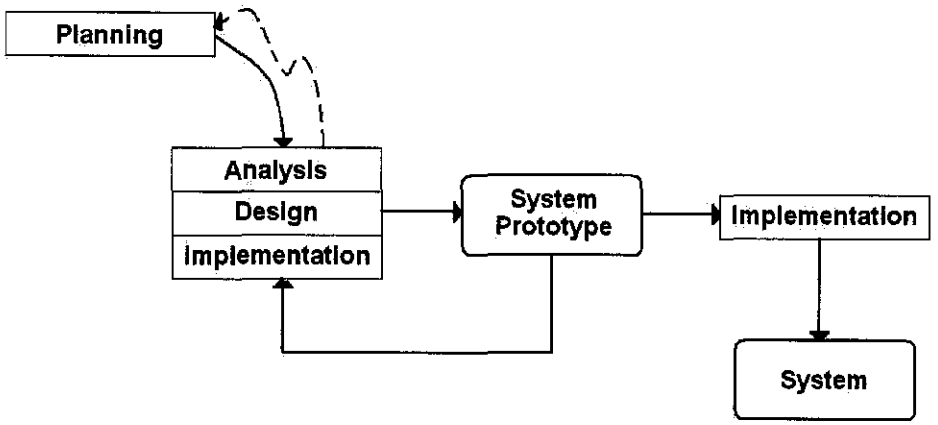

Figure 3: Rapid Application Development (RAD) model

3.2 Software Development Tools

This game-based courseware is build using several tools. For graphic designing and editing, Adobe Photoshop CS4 and Adobe Illustrator CS4 is used. As for the game development, Adobe Flash CS4, formerly known as Macromedia Flash is used. Adobe Flash uses an object-oriented programming language called ActionScript to program the game. This language is quite easy to learn and basic programmers will have no problem learning it. In producing the voice-overs and sound editing, Adobe Soundbooth CS4 is used.

3.3 Research Methodology

In conducting this study, a few research methodologies are taken to gather the necessary data to understand the subject. Before developing the game based courseware, it is important to first understand the behaviour and learning style of children with

Asperger's Syndrome. This is because all these data will help in determining the best game method for them whether it is strategy games, role playing games (RPG) or other type of games. In order to get these data, a few research methodologies are used. Firstly, a few interviews are done with those associated to children with Asperger's Syndrome such as their parents, trainers, doctors and experts. These interviews are aimed to share their experience with children who have Asperger's Syndrome in order to understand these children. The interviews are also to get their opinion on the best game method and to know the learning style of these children. With all the data gathered, the game will be designed based on the best method.

Observations are also done on students of National Autism Society of Malaysia (NASOM) training centre to learn more about them. NASOM is a non profit organization that helps giving intervention to people with Autism including Asperger's Syndrome. The observations are aimed to understand the behaviour of these children by looking at their interactions with friends and instructors as well as on how they react in every situation. Books and related materials such as journals and articles are also used to gather more information on children with Asperger's Syndrome as well as information on games development using Adobe Flash and Adobe Photoshop.

3.4 Testing Methodology

3.4.1 Participants

Six children have participated in this testing. Their aged ranged from 7 to 11 years old with a mean of 8.75 and a standard deviation of 1.26 years. Three children have Asperger's Syndrome while three children are normal. These three children are put under the Aspies group while the other three are put under the control group. Each of the three children with Asperger's Syndrome has different level of thinking and motor skills

capabilities. They also have different amount of experience in playing computer games. Child A has Asperger's Syndrome but also has good motor skills. He has a lot of experience in playing computer games and had always play computer games at home. He is able to control the mouse and other basic computer tasks. Child B and C on the other hand, have Asperger's Syndrome and less motor skills. They have no experience in playing computer games before and find it hard to control the mouse. For these two children, assistant is given when they play the game. Child D, E and F which are in the control group does not have Asperger's Syndrome and has been playing computer games for a few years already. These children have no problem in controlling the mouse or other computer related task.

3.4.2 Method

Each child is given FaceSnap for them to play. In the first testing session, the children are being given explanation throughout the game. This is so that they understand the objective of the game and knows which button to press. Each mini game in FaceSnap has different ways of assessing the children's knowledge. For example, the first mini game, 'Happy Slide', assess the children's understanding about happy expression by recording the time the child need to finish the game. In the second game, 'Sad Swing', different way is used whereby points are collected within the time allocated.

In the second testing session, the children are left alone with the game. No instructions are being given only a few assistances to the two children who have problems with controlling the mouse. They were observed from far to see their interaction with the game as well as recording their result for each game. After they finished played FaceSnap, they were asked about their gaming experience and they are also asked to mimic the expressions that they have learned in the game.

CHAPTER 4

RESULTS & DISCUSSION

4.0 RESULTS & DISCUSSION

4.1 Interview Results

4.1.1 Interview 1: Dr. Membunga @ Siti Meriam Yaacob

In order to understand people with Asperger's Syndrome and get to know the way they learn, play and grow up, an interview has been done with Dr. Membunga who is a parent of an Aspie. Dr. Membunga has a son who is diagnosed with Asperger's Syndrome. Her son, Fahrul is already 22 years old now. Though Fahrul has shown some of Asperger's characteristics when he was younger, he is only diagnosed of having Asperger while he is in secondary school because his parents does not realize that Fahrul's behaviour might indicate any syndrome.

When asked about Fahrul's behaviour during childhood, Dr. Membunga said that since he was small he does not like to play or communicate with other people. Usually, Fahrul will play using a chalk or any other objects and imagine that it is a car. Then, he will drive the object across the wall while making car sounds. Whenever his brother tries to play along, he will stop playing and move to another wall to start playing again. Other than that, Fahrul also chooses the people he likes. If he likes someone, he will play with that person and can have conversation with them. However, if he does not like someone,

he would not talk to that person. As a child, Fahrul also gets bored easily. His main interest is in Formula One and history.

Fahrul started reading since he was 3 years old. This is actually earlier than normal children where the average age they started reading is 6 to 7 years old. Dr. Membunga said that though Fahrul started reading at 3 years old, he could not converse very well. He stammers when he speaks and does not really understand what he reads. As he gets older, he converse better. When asked about his education, Dr. Membunga said that Fahrul was sent to a normal school. This is because he is intelligent enough for that school and Dr. Membunga wanted his son to have normal life and learn in a normal environment. At school, Fahrul does not have any friends because of his behaviour. He also often gets bullied by others because he always follows what other people ask him to do without any question. For example, when someone asks him for money, he will give it to that person.

Even though Fahrul does not do well socially, he is quite good academically. He got 2Bs and 3Cs for UPSR and as for PMR and SPM; he did not fail any subjects and managed to get A for the subject he likes which is history. After finishing his SPM, he even continued to do his form six. For STPM, he failed economics but still manage to get B for history. Dr. Membunga said that Fakhrul have a good memory. However, whenever he learns, he needs to be guided and sometimes forced. He needs to repeat what he learns over and over again so that he remembers what he learns. If he likes a subject, he will study it a few times but if he dislikes the subject, he will just ignore it. From this interview, it can be concluded that children with Asperger's Syndrome are able to learn if it is done the proper way. It is also clear that it is important to teach children with Asperger's Syndrome proper social behaviour so that they are not being left out from the community and being taken advantage by others.

4.1.2 Interview 2: Dr. Subash Kumar Pillai

Dr. Subash Kumar Pillai is an Associate Professor in the Department of Psychological Medicine in Universiti of Malaya. His area of expertise is psychiatry focusing on child psychiatry and first episode psychosis. He also has experiences in doing interventions with children with Asperger's Syndrome. The interview done with him is aimed to understand Asperger's Syndrome based on the medical expert's perspectives. Dr. Subash first explained that Asperger's Syndrome is the mildest form of Autism. The biggest difference between this two is that children with Asperger's Syndrome can speak though monotonous while children with Autism could not. He explained that most of the cases of Asperger's Syndrome in Malaysia are children and some of them have other learning disorders and problems in attention and concentration.

When asked about the learning style and ability of an Aspie, Dr. Subash explained that most of them are usually intelligent but they only did well in subjects they like. The best way to teach them is on a one to one basis as this proves to help. Dr. Subash also said that these children though have delay in speech acquisition but once they start, they pickup fast. They also are typically good with computers so they should not have many problems in playing computer games. When asked to describe his normal sessions with an Aspie, Dr. Subash said that he usually starts with ice breaking in a few sessions so that the Aspie sees him more like a friend than a doctor. He usually teaches them problems skills and social skills. He also did a few sessions with the family to provide them with necessary parenting skills. His sessions are usually in English but sometimes he does speak in Bahasa Malaysia too.

In the interview, Dr. Subash said that it is important to treat children with Asperger's Syndrome so that they can live a life that is as normal as possible. If it is untreated it will

lead to problems in socialization styles. They might be segregated in the community and end up becoming alone without friends. He sees a lot of potential in them so he hates for this to happen. When asked about games that are suitable for children with Asperger's Syndrome, he said that a game with lots of interaction is best. It would also be good to reward the children as to motivate them. The interactions would be best if being done by real human but he said that it will be interesting to see a game that could teach children facial expressions and emotions. Based on the interview with Dr. Subash, there is a lot of factual information gained and it can be concluded that children with Asperger's Syndrome have great potentials in life. Thus, they should be treated so that they would not be isolated by the community.

4.1.3 Interview 3: National Autism Society of Malaysia (NASOM)

National Autism Society of Malaysia (NASOM) is a non profit organization that helps giving intervention to people with Autism. This includes Autism Spectrum Disorder such as Asperger's Syndrome. The interview was done in NASOM's Penang branch with its coordinator, Mrs. Gengespari Ramakrishnan. Mrs. Genges, as she prefers to be called, said that NASOM Penang is divided into a few classes. For example, the vocational class teaches children to do skill works such as sewing and cooking. These children are being placed in these classes based on their ability. Each of these children will go through a test before they are assigned to a class. However, each child will be given motor skills, behaviour skills and social skills even though they have different abilities.

There are also children who have the ability to study like normal children. Thus, these children are put in a special class where they are prepared to go to normal school. In the normal school, a teacher from NASOM will accompany the children. When they

finished school, they will return to NASOM and discuss with the teacher about what they learned that day. Mrs. Genges also explained that in NASOM, children are not only given normal education but also social skills and necessary living skills. During the interview, the children are also observed to see their behaviour. Basically, these children have problems with their behaviours. They sometimes smiled to themselves and knock the table without reasons. They also sometimes like to seek for attention from the teachers. Mrs. Genges said that it is important to know when to be strict and when to be lenient to these children. When told about this project, Mrs. Genges introduced a child who has Asperger's Syndrome. The child was seen always reading and based on Mrs. Genges, the child is very clever. However, he has problems with his behaviour. He often refused to do some of the activities given to him. He also sometimes chose the instructors whom he wants to teach him.

During the interview, a parent was also asked about his child's activities. She explained that her son likes to play the computer but does not like people to instruct him. She also said that her son likes to hear people telling him stories. Ms. Leong Su Qing, a previous trainee in NASOM was also interviewed. She said that everyday, the children will do routine tasks. For example, she taught this kid to recognize colours. She started off with three colours first and matched the colours with its words and make him repeat them a few times. Ms. Su Qing said that this helps to get him familiarize with the colours. Later, she will test him out. She'll show him the word "orange" and he has to pick the colour orange. This was done many times before more colours are added. Then, the child will be asked more questions based on all colours he had learned. Based on the interview and observation, it can be seen that these children learns best one-to-one and repetitively. Thus, the game should also be developed with these characteristics so that the children can get the best of the game.

4.2 Game Design Consideration

4.2.1 Game Genre and Storyline

After careful considerations and research, it is seem that the best way to tackle children with Asperger's Syndrome is by using stories. Thus, the chosen genre for this game-based courseware is role-play game with a hybrid of puzzle and strategy game style for the mini games. This game will be called FaceSnap as the game gives the children a chance to play the role of a photographer to help another character in the story to collect pictures for her book.

Figure 4: FaceSnap logo

The game will start in a playground with a character explaining to the child that she is making a story book. However, she does not have enough pictures and need the help of the child to snap the pictures for her. Then, the child will see a map of the playground displayed in Figure 5 and the locations where he can get the pictures. Each location in the map will teach the children a facial expression and it will later be followed by a game regarding the facial expression taught.

After he had finished the game he will be able to snap a picture of another character expressing the facial expression. After all pictures have been taken, the child will go to the last location and meet the first character again. There, he will give all the pictures he snapped and will help the character finish up the book. Through this, the child will hear a social story. He will later be rewarded for his goodwill.

Figure 5: FaceSnap Map Screen

4.2.2 User Interface and Language

In designing the user interface for FaceSnap, a few considerations need to be addressed. It is important to bear in mind that a child with Asperger's Syndrome need simple but understandable interface and instructions. They do not like surprises, so each lesson and games should be predictable. The design should also look good and have vibrant colours in order to attract the attention of the child playing the game. The target audience for this

game is 7 to 11 years old, so majority of the audience can only read simple words. Thus, simple words should be used throughout the game and a lot of narration and voice-overs should be available so that the child would not need to read so much. The game should be easy for the child to navigate so that they would not give up when they do not know how to do something.

FaceSnap will also be of the first-person view. The child will not see an avatar representing them in the game instead they will see in the interface what their eyes would see if they are in the real situation. This is so that the child will feel like he is really in the game and would encourage his interaction. From the interview with Dr. Subash, it can be concluded that Malaysian children with Asperger's Syndrome mostly are able to read and converse in English. Thus, the language that will be used throughout the game is English.

Figure 6: The children can snap a picture before continuing their journey

4.2.3 Learning Content

To achieve our objectives, it is important to make sure that the children does not only play and have fun but also learn. This game focuses on three basic human expressions which are happiness, sadness and anger. The reason that only three expressions are being used is because of the time constraint. More expressions can be added up in FaceSnap later on. In order to teach the children, they will need to follow the route in the map. The first location would be the 'Happy Slide' where the children will learn about happiness and the facial expression corresponding to it. The next location which are the 'Sad Swing' can only be played after the child played 'Happy Slide' and 'Angry Seesaw' can only be played after the child had played both 'Happy Slide' and 'Sad Swing'. The reason for this is so that the child needs to go through all games and learn all three expressions. If they are able to choose the location, they might like the 'Sad Swing' and play just that repetitively.

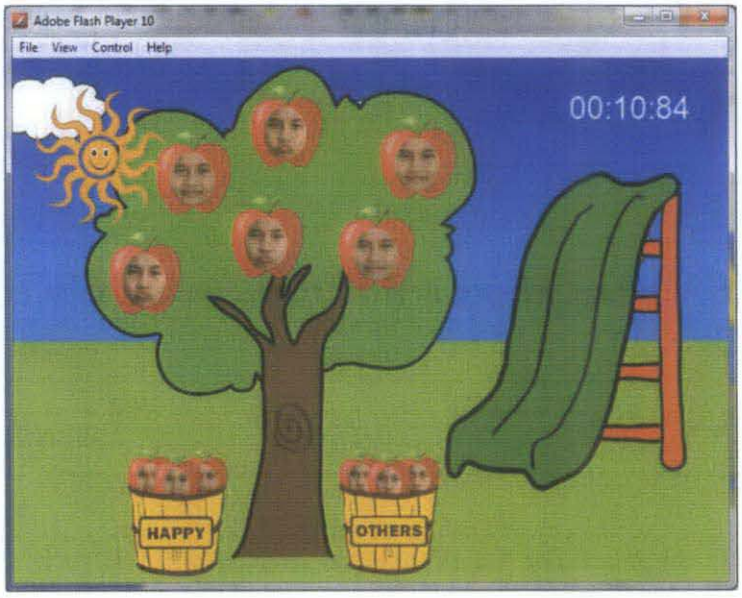

Figure 7: The 'Happy Slide' game

At respective location, a character who will be introduced as a friend in the start of the game will teach the child about the emotion and facial expression. Real pictures and videos are used so that the child can see the real expression. Only one child, a girl will be used as the real human beings throughout the game. This is so that the child can focus on the expression of this child. If many real people are being used, they might get confused as different people tend to express emotions differently. The lesson can be repeated many times and when the child is ready, he will be able to play the game. If not, he can still repeat the lesson until he gets it. Children with Asperger's Syndrome learn well repetitively. After the game has finished, they can enjoy snapping a picture of a character portraying the facial expression and finish their goal.

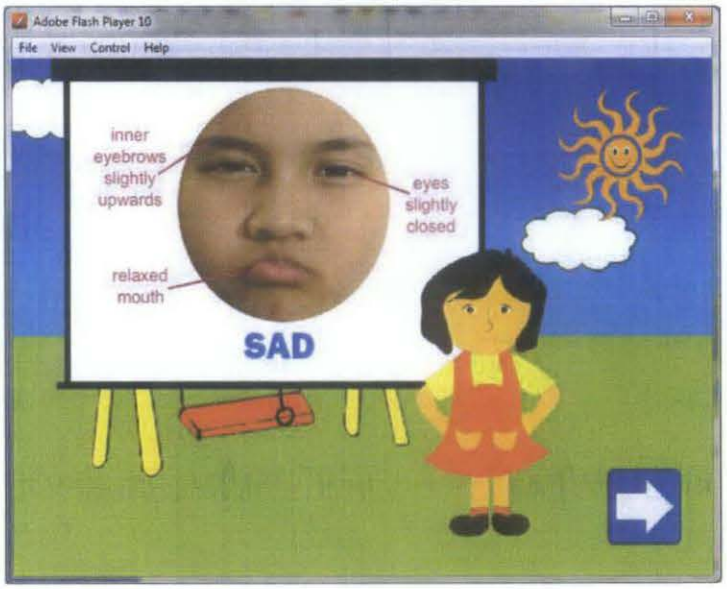

Figure 8: Teaching facial expressions through pictures

When enough pictures are taken, the child will meet the character that asked them to collect the pictures. The character will then sit down with the child and the friends he met during his journey in the playground. The character will then, read the story from the book she's writing. She will stop at certain situation and the child will put a picture of the facial expression that corresponds with the situation. Through this social story, the child will not only learn about appropriate social behaviour but can also put all his knowledge into use. They will be praised and rewarded each time they gave correct answer and will be corrected if they give wrong answer.

4.3 Game Testing Result

Four trial sessions have been done with the children. Each child showed different performance during the first trial. Child A did well where his result is just slightly lower than child D, E, F in the control group, while child B and C show a bit lower result compared to them. Figure 9 shows a graph of the result of each student in 'Happy Slide' game for all trials. Roughly, all children had a small decline in performance after the first trial. However, after the second trial onwards, there are improvements in every child's score. The time taken for them to finish the game has become shorter after each trial. It is clear from the graph that the Asperger's Syndrome group showed bigger improvement in their performance compared to the control group. The biggest improvement can be seen from child B where he took 100 seconds to finish the game in the first trial and improved to only 30 seconds in the fourth trial.

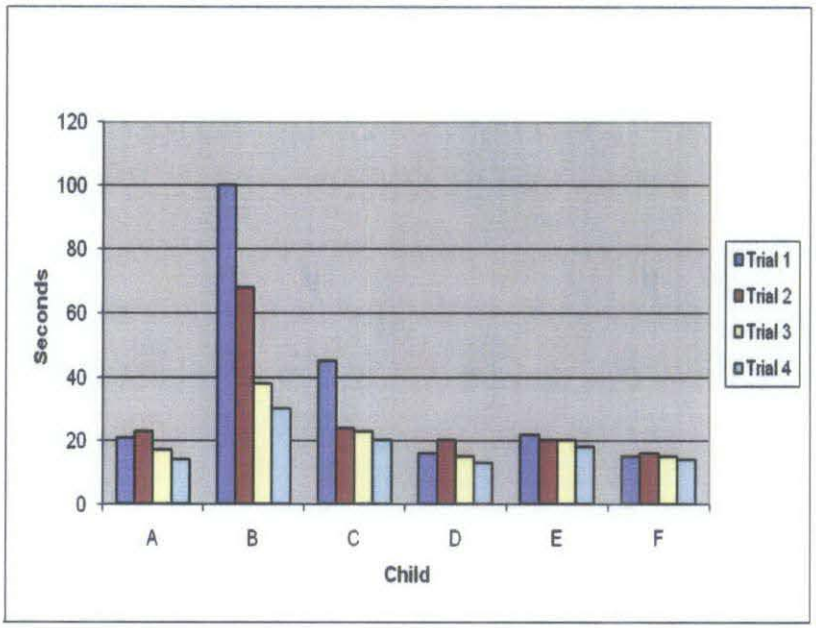

Figure 9: Results of each child from 'Happy Slide' game

As for the 'Sad Swing' game, the result is quite similar to the 'Happy Slide' game whereby child D has the highest score followed by child F. Child A came third while child B has the lowest points. However, in this game child A and B showed a decline in points in the second trial as seen in Figure 10 while all others have improved his score. From the graph, it can be seen that though being in the control group, child E does not do that well either. Nevertheless, his average score is still higher than child B of the Asperger's Syndrome group.

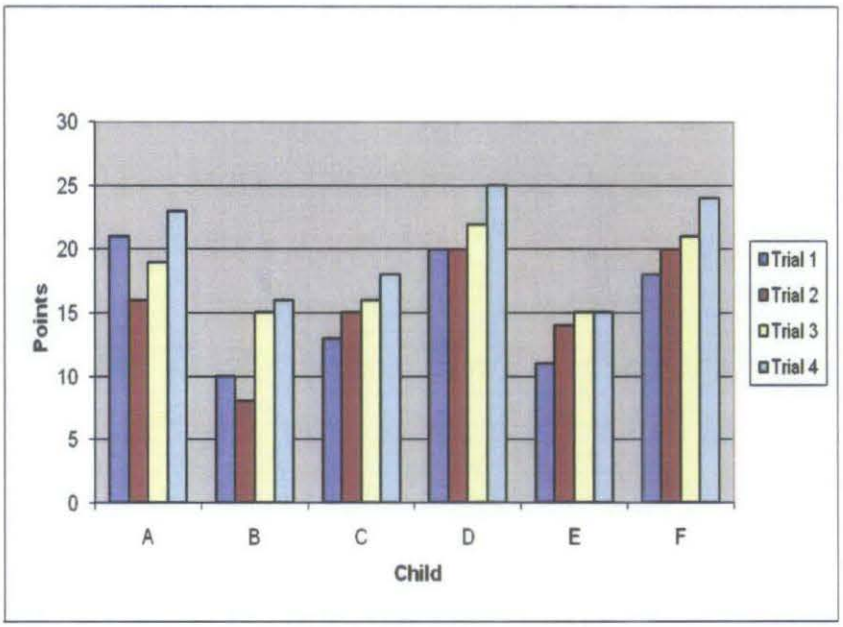

Figure 10: Results of each child from 'Sad Swing' game

In the third game, 'Angry Seesaw', the children are required to be fast in choosing the correct answer. The performance indicator in this game is the same as 'Sad Swing' where it counts the points each child manage to obtain while playing the game. However, in overall, the performance for this game is slightly lower than the 'Sad Swing' game. Still, all of the children showed improvements in their score after each trial. The Asperger's Syndrome group showed bigger improvements compared to children in the control group.

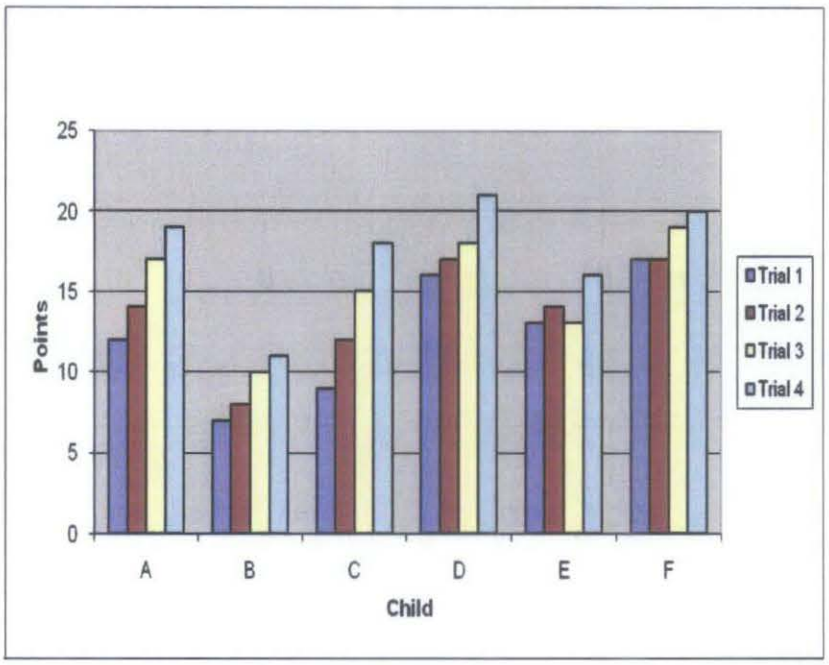

Figure 11: Results of each child from 'Angry Seesaw' game

The difference of results from the three games could be caused by the nature of the games itself. The 'Happy Slide' game consists of apples which are located at the exact same place on the tree each time the game is played. The children might have already remembered each location of the apples thus, making their time faster each trial. The 'Sad Swing' game on the other hand requires the children to focus as the raindrops will give random expressions. If they are not focused, they might get confused on which is the sad expression. Thus, this might have caused the decline in their scores. As for the 'Angry Seesaw', the game is much harder where the children do not just need to be focused while playing the game but must also be fast in deciding which the correct expression is.

4.4 Discussion

From all the testing that has been done, there are a few observations that can be discussed. Firstly, it can be seen that different children with Asperger's Syndrome have different set of capabilities. Some can already read at the age of 7 to 11 years old while some could not. Some have good motor skills and can control the mouse well while some could not. From here, it can be seen that it is important that the game to be flexible so that it can provide narration or voice-over for the children who could not read. However, the game should also be able to turn off the narration if the children who can read requested too. It is also seen that for children with less motor skills, it is better for the game to be played on a touch-screen computer. This is because it will make it easier for them to control the cursor and play the game.

Different types of games in FaceSnap have also shown different result. Games that is more predictable gives better result as the children remembers the facial expression as well as the location of the facial expressions. However, games that require them to focus in order to get better score are actually much better though it sometimes gives lower scores. This is because, children would not just remember the location but can actually understand and remember the expression until they can detect it in whatever situations. From the testing, feedbacks are shown to be positive as the children showed great interest in playing the games. None need to be force to play the game and many wanted to play the game all over again after they finished. The children are also asked to mimic the expressions they learned once they finished the game. Child B who was always happy found it hard to mimic the sad expression. However, with the real image of a child showing sad expression, he somehow managed to do it.

CHAPTER 5

CONCLUSION AND RECOMMENDATION

5.0 CONCLUSION AND RECOMMENDATION

5.1 Conclusion

Social impairment is quite a common problem especially among children with Autism Spectrum Disorder (ASD). However, they should not be left behind because they have their own abilities and have average to above-average intellectual ability. Through games, they can learn to overcome their social impairment and blend in with their peers. They can learn how to express emotions through facial expressions and learn appropriate social behaviour. Focusing on children with Asperger's Syndrome, this project finds the best game based methods for them and actually developing the game using Adobe Flash. After the game was developed, it was tested with six children, three of them with Asperger's Syndrome and the other three normal. Results indicate that all of them showed improvements in their performance. It can be conclude that FaceSnap is effective in teaching children with social impairment about facial expressions and social behaviour.

5.2 Recommendation

In the future, a lot of improvements can be done to make FaceSnap much better. Firstly, it can be programmed so that it can best perform in both normal computers and touch screen computers. This is so that children who lack motor skills can also enjoy the game. There are more than three human emotions. Thus, the game can be upgraded so that it can add more emotions like surprise, fear and disgust. More social stories can also be included after a few mini games. For example, after each three games, the children can read a social story. To make the game more interesting, it could be designed as a 3D game compared to normal 2D game. It can also be programmed so that the children can personalize the game according to their preference. For example, they can enter their name when they start the game and the characters can communicate to them using their name which will make them feel more connected to the game.

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APPENDICES

APPENDIX 1: MY NAME IS KHAN MOVIE POSTER

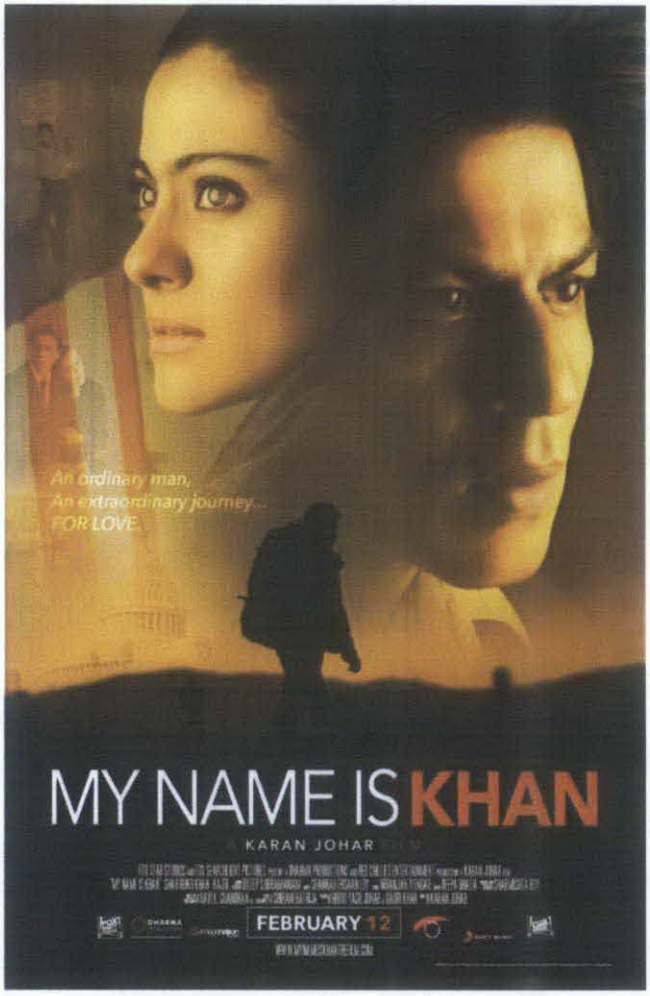

Figure 12: My Name Is Khan movie poster

APPENDIX 2: PROJECT GANTT CHART / MILESTONE

No.	Activities	2010					2011			
		8	9	10	11	12	1	2	3	4
1	Selection of project topic									
2	Preliminary research									
3	Identify scope									
4	Submission of Preliminary Report	•								
5	Requirements gathering									
6	Research work									
7	Submission of Progress Report		•							
8	Research work continues									
9	Initial game design									
10	Submission of Interim Report			•						
11	Game design continues									
12	Game development									
13	Submission of Progress Report							•		
14	Testing									
15	Submission of Progress Report								•	
16	Bug fixing and final testing									
17	Poster Exhibition								•	
18	Submission of dissertation									•

• Milestone Process

Figure 13: Project Gantt Chart / Milestone

APPENDIX 3: VISIT TO NATIONAL AUSTISM SOCIETY OF MALAYSIA (NASOM)

Figure 14: Mrs. Gengespari and I in front of NASOM Penang

Figure 15: One of the children in NASOM

APPENDIX 4: GAME TESTING IN NATIONAL AUSTISM SOCIETY OF MALAYSIA (NASOM)

Figure 16: The children in NASOM playing FaceSnap