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The Relationship between Gamification and Emotional Intelligence among Children with Autism Spectrum Disorder

Charles Arzone[a], Kannamah Mottan[b], Khatijah Md. Saad[c]

[ab]Universiti Pendidikan Sultan Idris, Tanjung Malim, Perak, Malaysia
[c]Politeknik Ibrahim Sultan, Pasir Gudang, Johor, Malaysia
E-mail: charlessch89@gmail.com

Abstract: In this article, we argue that to apply games as an intervention for emotional intelligence in learning environments, multiple perspectives have to be taken into account. At first, we will define gamification and emotional intelligence, and then discuss theoretical models that describe the relationship between gamification and emotional intelligence. We then review the design elements of games that improve children's emotional intelligence (self-awareness, self-control, motivation, empathy and social skills). Finally, we will discuss the basics of these design elements in emotional intelligence by reviewing key theories from education and psychology that are most pertinent to gamification and by describing empirical research on intervention with games that have been or should be conducted. We conclude that a combination of gamification and emotional intelligence is necessary for both game design and game research to fully capture what games have to offer for children's emotional development.

Keywords: Gamification, emotional intelligence, autism children, Goleman model, Malaysia

INTRODUCTION

Studies show that the current approach to school-based intervention is to use conventional tools and activities such as toys, puzzles and props to stimulate engagement and assist in the delivery of teaching content (Alarcon-Licona & Loke, 2017). In Malaysia, teaching and learning for students with special needs are being upgraded using Information and Communication Technology (ICT), particularly through the integration of education and entertainment (Mohd Yusof et al., 2015). The use of technology as an intervention tool is not a new thing for improving emotion recognition of children with autism spectrum disorder (ASD) (Lee et al., 2018). This is due to the support mechanisms offered by ICT that are particularly attractive and adapted to children with ASD. The latest finding about the use of ICT in the field of serious games and robotics applied to individuals with ASD indicates that the field of serious games has already produced fascinating and positive outcomes, although the clinical validations are not always complete (Grossard et al., 2018).

At present, technology is being extensively used among children with ASD in affluent countries, however there is a lack of studies exploring the use of technology for children with ASD in developing countries (Soysa & Al Mahmud, 2019). It has been shown by studies that use interventions-based computer, using gamification usually, skills numerous developments, allowing children with disabilities to learn that teachers (Kousar et al., 2019). A number of studies conducted over the years have shown that users with ASD are getting immense benefits by use of digital applications (Mezhoudi et al., 2019). For example, the computer software program FaceSayTM developed by Rice et al., 2015 improves the ability of children with ASD to recognize emotions and understand another's perspective and shows great promise in enhancing these skills in the more general school environment.

People in their daily life experience different kind of emotional states, some of which are negative and which can lead to decreased attention, productivity and ultimately, reduced quality of life (Taj-Eldin et al., 2018). The ability to feel, name and manage emotions is one of the most important skills that are necessary in dealing with different life situations and in social relations (Szewczyk-zakrzewska, 2019). For children, the ability to understand each other's emotional states is a significant factor for successful adaptation in society. Children who are able to recognize the emotions of others and react appropriately and empathetically are found to have better social skills and more positive social relationships. However, children with ASD often show impairments in emotion recognition and empathy, which have a negative influence on their social life (Alegne Sanz, 2017). Social-emotional impairments are considered core symptoms of ASD Boily et al., 2017 and affect their ability to recognizing others' emotions and mental states (Fridenson-Hayo et al., 2017).

Fostering emotional intelligence at a young age has proved to significantly improve individuals' communication skills, emotional management, handling of negative situations; hence, making them more empathetic and compassionate to others as well as having greater self-awareness (Shah & Jameel, 2019). To increase one's emotional intelligence, children with ASD should be trained on (i) how to deal with people in a way they would accept; (ii) how to understand his/her emotion and accept it; and (iii) how to express their emotions (Dykshoorn & Cormier, 2019).

Emotional intelligence has become an important research topic for the past few years. Being able to know how someone feel while doing something is powerful knowledge that was not available before in the Human-Computer Interaction research field (Garcia-Garcia et al., 2019). Emotion awareness, or the ability to identify and name one's own emotions, leads us to a better understanding of our own emotions, what eventually translates into the development of our emotional intelligence (Marshall, 2007). While being able to recognize one's own emotions seem like an inborn skill, it is an ability humans learn and develop throughout their lives. However, not every individual is equally prone to cultivate this skill. For instance, person with ASD find it hard to recognize emotions in others, as well as to understand and handle their own ones. In order to mitigate these problems, one option is to actively teach these emotional intelligence skills during childhood, and one effective tool to do so is gamification. Gamification is understood the application of game thinking and game design to non-game environment such as education. The main goal of gamification is to promote motivation an engagement, as well as promote an engaging experience in numerous contexts.

Gamification

Technologies such as gamification are the important and valuable part of ASD learning approaches (Kousar et al., 2019). At present, technology is being extensively used among children with ASD in affluent countries (Soysa & Al Mahmud, 2019). However, there is a lack of studies exploring the use of technology for children with ASD in developing countries especially in Malaysia. Gamification, in its nature, integrates not only games but also the whole psychological environment (Dymora & Niemiec, 2019). Proper develop and implement game-playing can encourage people to compete with others and achieve the set tasks and goals. Beside it stimulates them to continue their activity and self-improvement to be better and beat their records.

Kristianto, Dela and Santoso, (2018); Landers, (2014) defined gamification as the use of features commonly associated with video games in the context of non-game. Meanwhile, Woodcock and Johnson, (2017) defined gamification as a game application system includes competition, reward, measuring player/player behaviour into non-game domains such as work, productivity and vitality. In the contexts of education, gamification best known as a learning approach using elements of games or video games with the aim of motivating students in the learning process and maximizing feelings of fun and involvement in the learning process (Jusuf, 2016).

According to Pikos and Olejniczak, (2016); Weerasinghe et al., (2019) gamification has furthered the possibilities in raising engagement and motivation in educational applications with the use of game design elements and game principles in the teaching and learning environment. To teach EI skills for children with ASD, a more advanced approach than computer simulations is gamification. Gamification involves the child playing a computer game that engages them in a target behaviour, with the goal of subsequently imitating it in real life (Kang & Chang, 2020). Their previous study in gamified the task steps of taking a shower and hygiene training targeting an elementary school children with intellectual disabilities showed children were able to take the shower independently and the percentage of correct task steps increased (Kang & Chang, 2019b, 2019a).

Past study has found that gaming has a number of advantages compared with conventional teaching method. Specifically, this type of training can be directed toward the development of a particular skill by

organizing exercises that are (or that gradually become) more challenging; is often perceived as enjoyable and motivating, which increases long-term adherence; and can in many cases be performed at home or at a central location, which increases the frequency of training (Dickinson & Place, 2016). Research by Gay, Leijdekkers and Pooley, (2016) among youths and adolescents with autism found that gamification plays an essential role in promoting and stimulating acquisition and improvement of skills, especially social awareness. The findings of the study of Malinverni et al., (2017) also show the effectiveness of gamification in stimulating early social behaviour of children with autism. An important aspect that contributes to the success of gamification is the use of interesting elements and mechanics for children.

According to Hamari, Koivisto and Sarsa, (2014) gamification has a positive effect, but the effect depends on the context in which the gamification is performed as well as the users who use it. Appropriate gamification elements should be applied in solving problems as they can help pupils learn and turn the subject into something they want to know and enjoy (Mohamad, Salam & Bakar, 2017).

Therefore, it indicates that gamification method is statistically effective in improving children's knowledge, skills, and attitudes (Fadhli et al., 2020).

Emotional Intelligence (EI)

"Anyone can become angry-that is easy. But to be angry with the right person, to the right degree, at the right purpose, and in the right way-this is not easy" – Aristotle, The Nicomachean Ethics

Emotional intelligence (EI) has assumed great importance over the past two decades, in educational, psychological and social studies, as well as research. EI is a person's ability to understand one's own feelings and use them to make effective decisions in daily life (Goleman, 1996). While Bar-On, (2006) find that EI is a cross-section of emotional and social competencies, skills and facilitators that determines how well we are capable of understanding and expressing ourselves, understanding others and connecting with them and meeting daily demands. EI is also a form of social intelligence that involves the ability to monitor one's own and others' feelings and emotions to distinguish between them and to use this information to guide one's thoughts and actions (Salovey & Mayer, 1990).

According to Boyatzis (2019), EI can be defined as a constellation of components from within a person that enable self-awareness of and management of his/her emotions, and to be aware of and manage the emotions of others. EI also defined as the ability to identify, understand, and use emotions positively to manage anxiety, communicate well, empathize, overcome issues, solve problems, and manage conflicts (Papoutsi et al., 2018). EI is a construct that has been successfully applied to a range of skills that allow for the prediction of competent human social behaviour (Reynolds et al., 2018). EI found to be important characteristic of an individual's personality when it comes to regulate one's own emotions and managing the emotions of others (Shah et al., 2019).

EI seems to be a unique area of interest for this population, particularly for interventions that propose to capitalize upon potentially inherent strengths (Mccrimmon et al., 2015). Compared to their typically developing peers, children with ASD have deficiencies in EI skills and that leads to difficulties in understanding themselves and the people in their social environments in relation to emotions, feelings and thoughts (Papoutsi et al., 2018). Past research shows that aspects of both trait and ability EI were significantly weaker in people with ASD compared with typically developing people (Boily et al., 2017). Other studies also show that person with ASD reported lower levels of EI relative to their typically-developing peers, as expected given the social and emotional challenges faced by individuals with ASD (Brady et al., 2014).

Therefore, improvements in the dimensions of EI can help reduce the symptoms of ASD and make it as a predictor of their health levels (Kristensen et al., 2014).

Autism Spectrum Disorder (ASD)

Autism Spectrum Disorder (ASD) is a neurodevelopmental disorder characterized by a pattern of symptoms that include persistent deficits in social interaction, communication, rigidity of thought and imagination, repetitive behaviours, and in some cases, unusual responses to sensory stimuli (Alarcon-Licona et al., 2018; Alarcon-Licona & Loke, 2017; Leung et al., 2019). Impairment of social interaction and verbal and nonverbal communication such as facial expression, gestures, and eye contact, as well as socio-emotional reciprocity deficits present since the beginning of childhood (Lima et al., 2019).

Autism also defined as a development disorder that affects the social skills, nonverbal communication or what is know as body language (Ahmed & El-Seoud, 2019). They have trouble to understand what other

people think and feel. As a consequence, it makes them very hard to express themselves by any other means. People with ASD tends to have high IQ but very low EQ. Children with ASD display difficulties in understanding the feelings, motives, and body language of other people and in managing their social relationships (Syriopoulou-Delli & Gkiolnta, 2020). As ASD is characterized by a spectrum of symptoms and a wide range of intelligence, it is possible for children with ASD to be low functioning or high functioning. Both the verbal and non-verbal communication skills pf children with ASD are generally quite low, and some never develop completely functional speech corresponding to their chronological age.

Due to this deficits, children with an ASD face the daily challenges of social interactions (non-verbal communication) and these difficulties make adequate interpersonal interactions "in real time" a challenging obstacle to overcome in many cases and can lead to excessive demands, frustration and isolation (Schwarze et al., 2019). Currently, ASD children affect a significant number of people who have difficulties with communication and socialization, which results in complexities for their learning process (Valencia et al., 2019).

LITERATURE REVIEW

The major technological leaps that have taken place over the last years, one of which is the creation and increasing use of ICT, require a reconsideration of the capability of the computers to meet the expectations of modern education, especially in the field of special education (Alexopoulou et al., 2019). Researches confirm that new technologies offer freedom and greatest opportunities to person with disabilities, as these are not just limited to simple information management but can also operate supportively, improving the learning ability, the academic performance and functionality of the people that have special needs and those with special educational needs. As an assistive tool, games contribute positively to the betterman of education.

There has been profound research done in developing interactive video games, applications, tools to enhance the social and emotional cognitive abilities of individuals with disabilites such as Alzheimer's disease, Down Syndrome and others (Dawe, 2006). Study has been done on the effectiveness of introducing early intervention programs focusing on the understanding and assessment of emotional skills of person with Down Syndrome with the help of assistive technology (Jameel, 2017).

Person with ASD tend to enjoy themselves and be engaged when interacting with computers, as theses interactions occur in a safe and trustworthy environment (Valencia et al., 2019). Instead of medication, therapies and interventions are more likely to be seen as helpful for ASD children. Interventions for ASD children are varied, ranged from physical to occupational therapy. The use of games can also be one of the intervention tools as well as an educational tool for children with ASD (Suryawardhani & Amalia, 2018). Incorporating gamification elements into special needs children environments can motivate pupils and support pupil achievement (Dela Cruz & Palaoag, 2019).

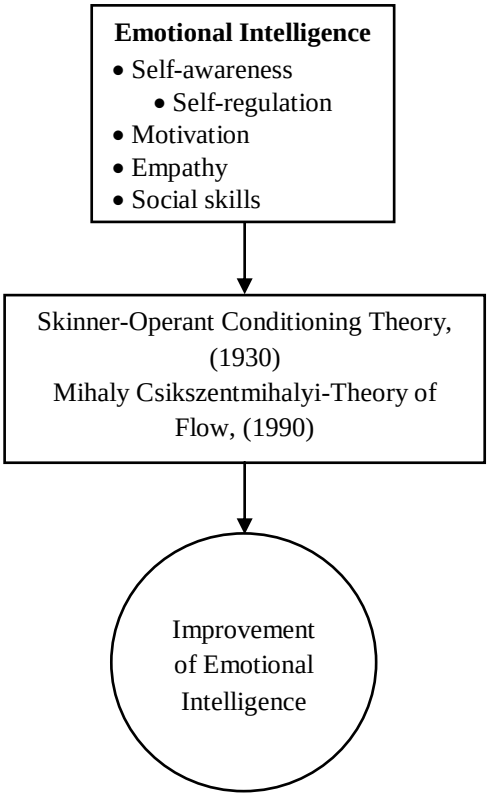
In ASD intervention, gamication provide the key guidelines for creating better learning outcomes for the child in a social skill that will improve his or her daily life (Sung et al., 2015). Gamification can be considered a feasible intervention within the treatment of children with ASD. The use of components that are very useful for children with ASD, such as simple and explicit rules with a focus on important abilities in ASD like communication skills and sense of perception (Ern, 2014). Therefore, improvement in EI and its dimensions can decrease ASD symptoms and signs in individuals with ASDs (Ghasempour et al., 2015).

A few studies showed very positive and promising results. This emphasizes the strong need for further investigation of effectiveness within these methods.

Conceptual Framework

According to Goleman, (1998) there's is five main dimension of emotional intelligence (figure 1). The conceptual framework was build based on research objective like what have been mentioned earlier. In this conceptual framework, the researcher wants to know about the relationship between gamification and emotional intelligence of children with autism spectrum disorder where the researcher emphasizes the five main elements according to Goleman's EI model. Gamification as an intervention tool will be used and the games elements is applied based on Skinner-Operant Conditioning Theory, (1930) and Mihaly Csikszentmihalyi-Theory of Flow, (1990). At the end of the day, intervention given will be analyzed on the emotional intelligence of children with ASD.

Figure 1. Conceptual framework



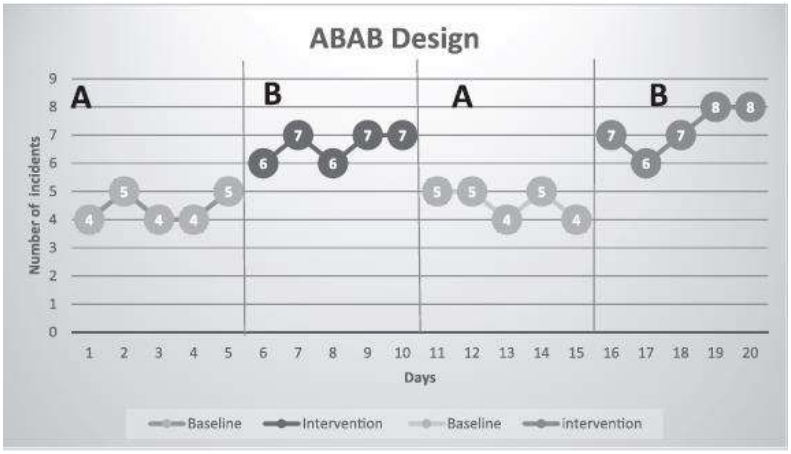
METHOD

Research design

The study design used quantitative methods with single-subject research design based on A-B-A-B Reversal Design: Giving and Taking Away and the final product used for the participants. According to Mitchell et al., (2014), reversal design is also known as the ABA design and ABA reversal design involving researchers evaluate the behavior of (A), further treatment and evaluation of behavior (B), and remove the treatment and re-evaluate the behavior (A).

Reversal or withdrawal designs Hitchcock, Nastasi and Summerville, (2010) involve the systematic introduction and removal of the independent variable across the baseline and the intervention conditions (A-B; A-B-A; A-B-A-B; B-A-B). In withdrawal designs, the independent variable is only introduced to influence a target behaviour during the intervention phases, and this independent variable is not present during the baseline phases of the experiment (Hammond & Gast, 2010) (see Figure 2).

Figure 2. A-B-A-B design



Sample and Data Collection

This study uses purposive sampling design because the researcher has identified the specific school and the study sample is selected based on several criteria. Fifteen pupils with ASD were directly involved in this study. Pupils who are eligible to participate in this study are based on several criteria set by the researcher.

For the purpose of this study, the use of gamification as an intervention tool is the independent variable. Meanwhile, the change in emotional intelligence is a dependent variable. Data collection will be carried out for five sessions per week during the same period over the fourteen weeks of the study. Changes in the EI of ASD pupils were observed for thirty minutes per session. During the observation, trained observers recorded the frequency and incidence of pupils' emotional display in the classroom and computer lab. The ten-second intervals system was used to monitor pupils EI responses. Then, every 30 minutes of the observation session was divided into 10 intervals leading to 120 intervals. EI will be assessed and recorded beginning every 10 seconds using a coordinated observation form. The five elements of EI will be observed accordingly. Goleman, (1998) there's is five main dimension of emotional intelligence which are:

Table 1. Emotional intelligence

Five main dimension of emotional intelligence	
(a) Self-awareness	Self-awareness relates to the ability of monitoring and understanding personal moods, emotions and drives and their potential impact on others.
(b) Self-regulation	Self-regulation is the ability to control one's troublesome urges and to think before acting.
(c) Motivation	Motivation goes beyond extrinsic reward seeking and deals with the joy and satisfaction in something.
(d) Empathy	Empathy is the ability to understand and share others' feelings and showing concern in this regard.
(e) Social Skills	Social skills are about building and managing relationships and the ability to find common ground.

Data Analysis

The results of the study were analyzed using visual analysis rather than statistical inference analysis. The data obtained were analyzed based on two types of patterns indicating that the intervention provided led to changes in the level of emotional intelligence of ASD pupils. According to Privitera (2014), there are two patterns of change in the data that need to be observed, namely change in level and change in trend.

CONCLUSSION

As a conclusion, it is acknowledged that technology can play a beneficial role in encouraging and stimulating the acquisition and improvement of skills, but at this stage cannot be relied on as a sole source of treatment. Due to the Covid-19 outbreak, researcher was unable to continue the data collection process and report the findings. However, the results of the full study will be presented and reported after data collection has been made.

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