

A REVIEW OF GAME-BASED LEARNING AS A TOOL TO STIMULATE LEARNING PROCESS FOR AUTISM SPECTRUM DISORDER (ASD) CHILDREN

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ABSTRACT

There is a strong emphasis on the use of technology in the delivery of the academic process. It is especially important for students who struggle with the daily learning process, such as children with Autism Spectrum Disorder (ASD). Game-based learning (GBL) is an effective tool for stimulating the learning process in children with ASD. With the increasing prevalence of ASD and the variety of challenges faced by students on the spectrum in traditional educational settings, there is a growing need for innovative approaches to improve their learning experiences. GBL, with its interactive and engaging elements, has the potential to cater to the unique learning styles and preferences of children with ASD. GBL's interactive and adaptive nature meets the cognitive needs of ASD children, resulting in a more inclusive and engaging learning environment. Examining existing studies and interventions that use GBL to stimulate the learning process for children with ASD, shedding light on the positive outcomes observed in terms of engagement, motivation, and skill acquisition. Using information from previous writings, it discovered improvements in communication skills and academic achievement among ASD children who used the GBL technique. Educators can better address the specific learning needs of ASD children by understanding the cognitive processes involved in GBL. This review has the potential to pave the way for future research and improvements in the use of GBL in ASD educational contexts. Finally, this review contributes to a better understanding of how GBL can be used as a valuable tool to stimulate learning in children with ASD. It aims to inform educators and practitioners about the potential benefits of implementing GBL for children with ASD by synthesizing existing knowledge and identifying areas for further research.

Keywords: Autism Spectrum Disorder, Education Game, Game Based Learning, Gamification

1. INTRODUCTION

As demonstrated by the last ten years, the education system as a whole is changing significantly in a world where technology is advancing at a rapid pace. The educational system began with traditional classroom instruction and evolved to include Open Distance Learning (ODL), Game-Based Learning (GBL), and other systems. GBL is the most recent system and is thought to push the educational system towards greater digital and creative learning. Game-based learning processes can be utilized as a means for students to communicate, provide feedback, and advance their social and mental development (Aayeshah, 2012).

In writing title Peranan Multimedia di dalam Pembelajaran Kanak-kanak (2007) notes that, in contrast to traditional methods like writing in a book, the use of game elements in the learning process can make students more observant and recognizable. This is based on cognitive theory. According to Hsin Yuan Juan & Soman (2013), learning systems with game components can give students a creative and adaptable environment, which makes it easier for them to absorb information. According to Rohaila Mohamed Rosly & Khalid, F. (2017), incorporating game-based learning into the classroom can enhance student engagement and elevate the country's educational system.

This article's goal is to review the method of using GBL as a learning tool to enhance learning for individuals with autism spectrum disorder (ASD). An interpretation that suggests this group, particularly children, finds it difficult to integrate into society or receive a quality education system differs from that of the general population when considering the viewpoint of individuals with disabilities, or more specifically those with autism syndrome.

Children with learning difficulties make up this group of children with special needs, according to Modul Pendidikan Khas Bermasalah Pembelajaran (2010). This module describes several categories for children with learning difficulties, one of which is autism spectrum disorder or ASD. Children with ASD should have equal access to a high-quality national education system in order to prevent them from quitting school. The nation's current special education system can assist children with ASD in learning in a way that is appropriate for them, to a certain extent. Technology is defined as equipment that uses electronics to enable users to store, connect, process, create, and deliver information in tandem with game-based learning techniques to students with ASD, according to Abd Rahim Abd Rashid (2005).

2. THEORETICAL BACKGROUND

In order to clearly see the connection between the concept of gamification through GBL and also ASD children, the theoretical background that reveals these two elements is searched and collected.

2.1 Gamification Concept

In general, Deterding et al. (2011) state that gamification can be defined as an approach or method that has gained popularity and emphasizes the mechanical and dynamic integration process through video games. Yet, cite the year 2008 as the introduction of this often-used term, "gamification." The game's dynamics refer to reward, status, achievement, self-expression, competition, and altruism, while the mechanics in this context are points, levels, challenges, virtual goods, leader boards, badges, and gifts (Hunicke, LeBlanc and Zubek, 2004).

Meanwhile, according to Shariful Hafizi, Kamarul Shukri, and Norzehan (2017), mechanics describes every element or rule in the game, particularly through data representation, algorithms, and programming procedures. Dynamics refers to a feature of a mechanism's real-time response that is solely determined by the input provided by students. Conversely, aesthetics is the emotional reaction that players or students have both inside and outside of the game when they engage with it. It can see in Fig. 1 below.

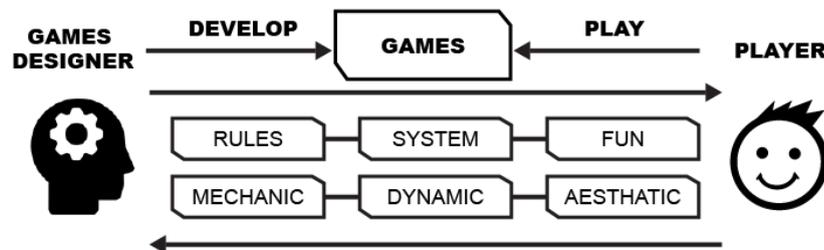


Fig 1. Processing and interactions between mechanic, dynamic and aesthetic framework components

Katherina Valencia et al (2019) in writing tittle The Impact of Technology on People with Autism Spectrum Disorder: A Systematic Literature Review state there are different implementation or types in gamification such as game-based learning, serious game and e-learning.

2.1.1 Game-Based Learning

Shaffer et al (2005) points out that game-based learning (GBL) places a strong emphasis on playing games with clear learning objectives. When mentioned about educational games, it must strike a balance between the need to thoroughly cover the material of subject or education model and the desire to put the fun of the game first (Plass, Perlin, & Nordlinger, 2010).

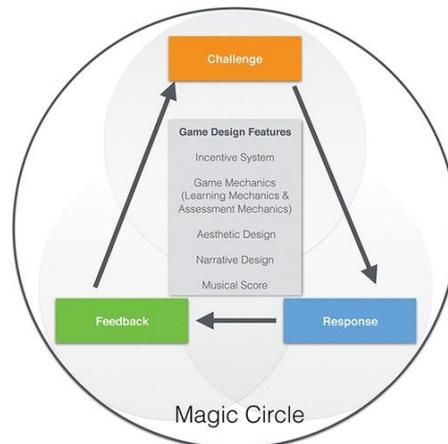


Fig 2. Model of game-based learning

In Fig. 2 consequently take a look at a straightforward model that explains the fundamental framework that almost all games in GBL seem to have. Three essential components make up this structure: a challenge, a response, and feedback. When the player is presented with a new challenge or is prompted to respond differently to the initial challenge, this creates a loop (Plass, Homer & Kinzer, 2015).

2.1.2 Serious Games

Serious games are ones whose primary goal is skill practice or learning rather than amusement or fun. Abt, C (1970) in his book called Serious Games defined this concept as:

“Games that have an explicit and carefully thought-out educational purpose and are not intended to be played primarily for amusement. This does not mean that serious games are not, or should not be, entertaining”

Pitarch (2018) mention the serious games are games that combine and integrate teaching and entertainment to teach or help students practice specific skills or content. Also, instructional game-based games will employ serious games (Fox, Pittaway & Uzuegbunam, 2018).

2.1.3 E-Learning

The acronym "Electronic Learning" is where the term "E- Learning" originates. E-Learning, as defined by Khan (1997) is a hypermedia instructional program that uses the attributes and resources of the Internet to create meaningful learning environments. In other words, e-Learning is online teaching and learning via the Internet and technology.

2.2 Autism Spectrum Disorder

Autism in the writing of Vidya Bhushan Gupta (2005) states that it is a term taken from the Greek language which means "living in self" which was found by the Swiss psychiatrist, Eugen Bleuler in 1911 where it can be expressed as someone who isolates himself as a result of poor social relatedness in schizophrenia. A child with autism spectrum disorder (ASD) typically exhibits symptoms during the first three years of life. It is a neurodevelopmental disorder marked by restricted and repetitive behavior, poor verbal and nonverbal communication, social interaction, and imagination (Christie, et al., 2009).

The proportion of ASD patients in the population is rising. In special education schools, children with ASD who are part of the circle of students with learning difficulties are regarded as the highest class. According to the Malaysian Ministry of Education's 2022 Special Education Data, the number of Special Needs Students with learning problems climbed from 79,921 in 2021 to 88,118 in 2022 (<https://www.moe.gov.my/en/muat-turun/pendidikankhas/buku-data-pendidikan-khas/5570-buku-data-pendidikan-khas-tahun-2022/file>).

3. LEARNING PROCESS

Examining how much GBL can encourage students with ASD to follow the learning process can involve looking at some learning processes. Students will acquire cognitive skills as well as self-skills during the learning process.

3.1 Games Learning Process

Mostafa et. al (2017) explains that there is a need for changes in the use of technology in learning. It needs to be used as an application tool and a facilitation tool in the learning process, especially for ASD students who have problems in the context of social communication. Sutaji (2015) in his writing describe multimedia digital games are just one example of the diverse and varied approaches to teaching and learning that are based on technology. These games can stimulate multiple senses while also enhancing interactivity. Learning techniques based on technology such as game-based learning, can provide added value to ASD students, particularly in the subject in classroom, so that it is in line with the passage of time, the needs of ASD children, and also achieves ASD students' learning goals (Sharulnizam Ramli, Syed Abu Bakar & Sabzali Musa Khan, 2017).

This group requires special education to help them gain knowledge that is relevant to their needs, and they should be given special attention because they are concerned about not receiving the best education possible for their lives. Jeremy Sarachan (2012) state children with ASD struggle with their sensory systems, social behavior, flexibility, attention, and comprehension of the viewpoints of those around them need the GBL technique to stimulate the education process. ASD children are a group that has difficulties in communicating and getting along, there

needs to be a suitable learning process. Children with ASD often face communication problems, emotional and social disorders.

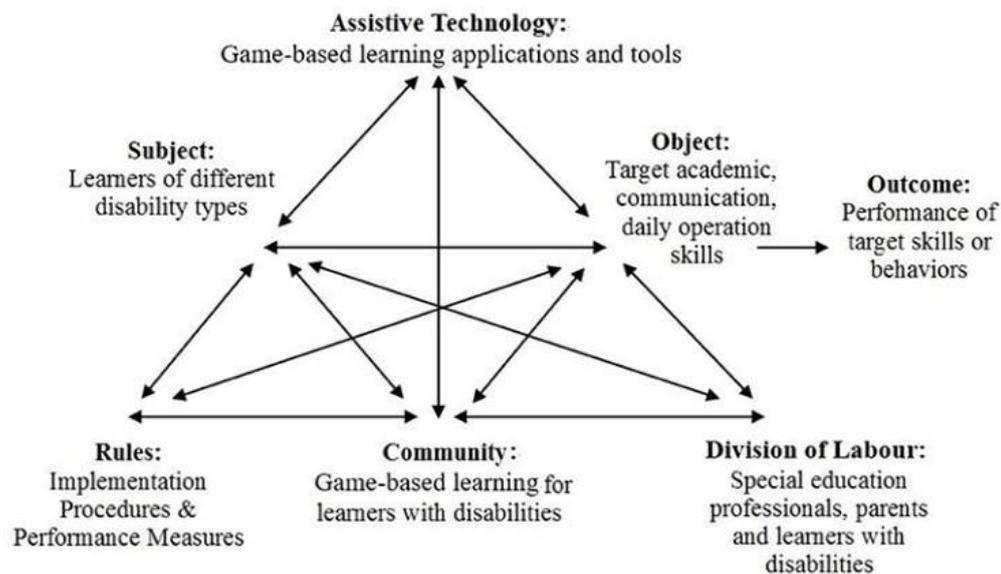


Fig 3. Activity theory to analyze game-based learning for learners with disabilities.

Whyte, Smyth, and Scherff (2015) discovered that when using GBL instead of traditional learning methods, students with ASD are more likely to succeed and are more motivated to learn academic material. Tiili A. et al, (2022) show the framework covered both the learning outcomes and the adaptations made to game-based learning tools and applications, as illustrated in **Fig. 3**. These days, it's evident that games are used more for education and learning than for amusement. They're also seen to be more focused on interactive, captivating elements and serving as resources for children with ASD (Muneeb Imtiaz Ahmad et.al, 2011).

3.2 Cognitive Learning Process

Deubel (2006) asserts by promoting long-term memory, GBL has the ability to grab students' interest, inspire learning, and offer lasting education and real-world learning experiences. It also highlights the role that digital game-based learning plays in enhancing vocabulary and quickening cognitive processes. Computer-based instruction is one of GBL elements. GBL needs computer-based instruction to give a detail about what should ASD children do while playing an education game. When this happens, ASD children can have cognitive process while get some information to their mind and same time can stimulate the learning process. V. N. Yadav (2018) in the writing ASD: Challenges and Management state the computer-based instruction involves the use of computer technology or computerized programs like digital games and mobile games for teaching learning topic such as language skills, vocabulary, social skills, social understanding and social problem solving. Fig. 4 can be seen the integrated of a framework design that displays the engagement between GBL and cognitive that has been proposed by Plass et. al (2014).

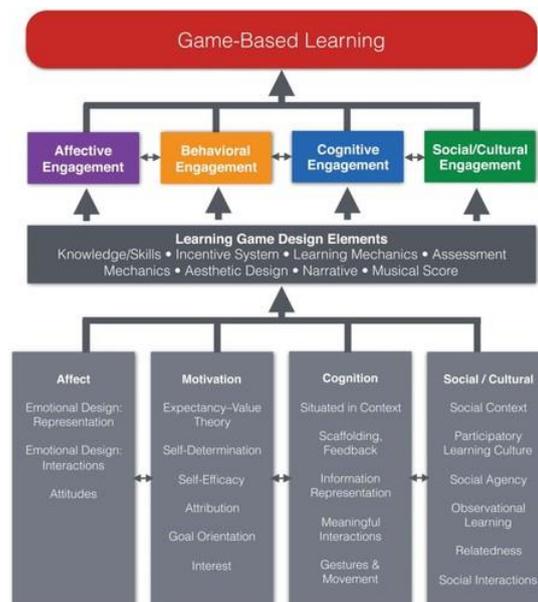


Fig 4. Integrated design framework for game-based learning and cognitive engagement

Because of this ASD children relies heavily on visual, concrete, and hand on therapies, visual is very important in the learning process for ASD children. According to Quadri & Oluwasegun's (2014) article, visual like therapy for ASD children because it's a highly effective and adaptable intervention for individuals with conditions like ASD. In addition to having an effect on academic development, it can give ASD children the calm they require during the learning process when use GBL because the game itself have a lot of visual. In order to monitor students' use of nonverbal communication processes, emotional expressivity, social connectivity, intellectual acuity, and content mastery, teachers can incorporate visual elements into their lessons, such as GBL (Amanda Newman-Godfrey & Lauren Stichter, 2017).

ASD children need to go through different ways in the learning process. In the writing A Framework for Developing Culture-Based Multi-Modal Mind Games: Improving Social Interaction Skills of Autistic Children (2014) describes how children with ASD struggle with communication, body posture, facial expressions, and eye-to-eye social interaction. According to Aksoy (2005), students' capacity for creative and cognitive skill thought can be simultaneously developed and enhanced when technology is used as a tool in the teaching and learning process. Meanwhile, Guilford in Carabine (2013) writing claimed that the creative process in GBL involved in learning can raise students' thinking flexibility, particularly in those with ASD. It can encourage more original and imaginative thought.

4. FUTURE STUDY

Future studies in applications utilizing the GBL with children who have autism spectrum disorders have a lot of potential. In the future study, it can concentrate more on identifying the critical elements that are most likely to result in favorable outcomes using GBL for various subgroups and also disparities in the cognitive and communicative patterns. Furthermore, the process of developing a GBL application can be studied in the future. Studies on game design that incorporate GBL for children with ASD are currently extremely rare. Thus, it would be wonderful to find out if such a study is conducted in the future. A more methodical approach to conceptualizing and designing games can be achieved by approaching game design elements as tactics to accomplish this engagement, grounded in well-established cognitive, affective, motivational, and sociocultural foundations in the future study as described in this article.

5. CONCLUSION

The use of Game Based Learning through this gamification technique is able to help teachers and students in following the learning process more easily, efficiently and creatively. Besides, in the learning process, what is more important is how students are able to understand everything presented by the teachers. By the implement of game-based learning in education process for ASD children, it can describe the fact that digital games are able to engage learners on an affective, behavioral, cognitive, and sociocultural level.

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