



UTILIZING DIGITAL GAMES TO IMPROVE COGNITIVE, SOCIAL, AND LEARNING SKILLS IN CHILDREN

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Abstract

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Gadgets are part of children's life nowadays. With the advancement of technology, every activity is closely related to gadgets, whether for education, tasks or even entertainment. The increasing use of gadgets, especially digital games in toddlers and pre-school children, have shown the shift of learning through an interactive and a visual platform. This study described and analyzed how digital games can be a tool to improve cognitive, social and learning skills for children aged 4 to 7 years old residing in Jabodetabek. Through a descriptive qualitative method, this study interviewed 10 parents using open-ended questions to share and describe the experiences and growth observed in their children in regards to gadget use. Overall, the majority of informants showed agreement on how digital games have improved their children's way of thinking, learning and social skills, including problem solving and emotional intelligence. This study also found a new perspective on how a video platform like YouTube showed positive outcomes in their children's learning experience. Several recommendations on the use of gadgets were also shared in this study, such as time management, digital application choices and the importance of a parent-child interaction.

Keywords: Cognitive; Digital Games; Gadgets; Game-Based Learning; Social Learning

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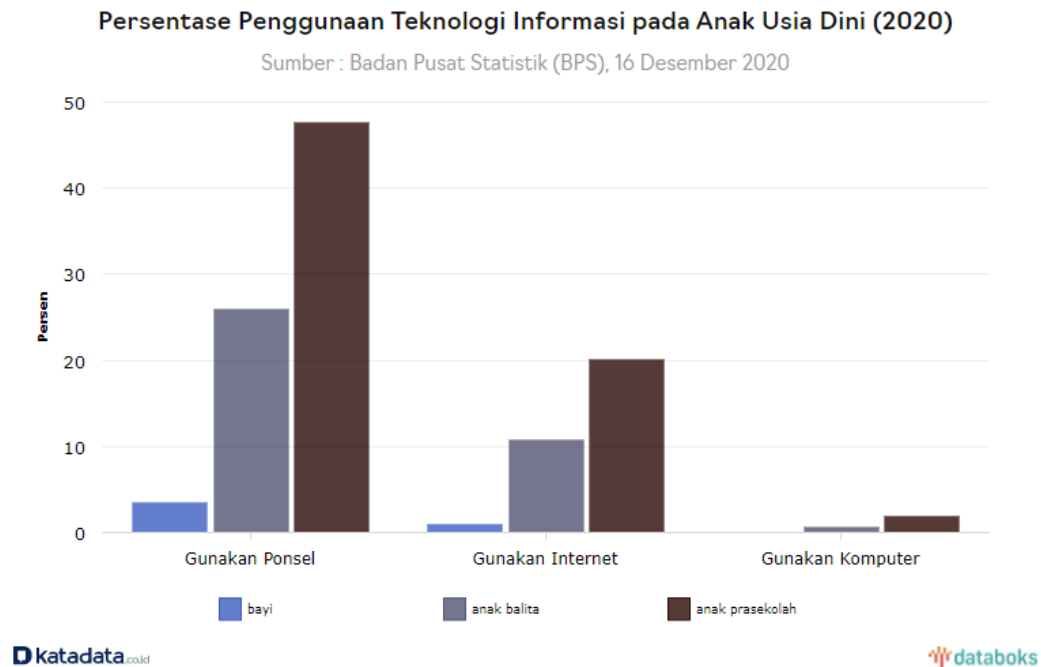
INTRODUCTION

Gadgets are part of children's life nowadays. With the advancement of technology, every activity is closely related to gadgets, whether for education, tasks or even entertainment. Specifically in the early childhood education, game-based learning has been incorporated in schools as part of digital literacy, defined by UNICEF as the ability to access, manage, understand, integrate, communicate, evaluate and create information safely and appropriately through digital technologies. The organization also promotes a holistic approach of digital literacy for children, empowering them not only technical skills, but also cognitive and social skills to be protected and productive in the digital age (UNICEF, 2019).

The data published by Hootsuite and We are Social showed how Indonesians are socially active, with 338.2 million smartphone users in January 2020. This is ironic as the total population marked that year was 272.1 million citizens, or equivalent to 124% of the total population, indicating people had more than 1 smartphones (Kemp, 2020).

During the COVID-19 breakout in 2020, toddlers and preschoolers in Indonesia used smartphones widely. This statement is supported by a 2020 data by Central Bureau of Statistics Indonesia (BPS), that showed a significant number of smartphone users on

children aged 0 to 6 years compared to internet and computer users that year, with a total of 29% of the population; babies under the age of one on 3.5%, toddler aged 1 to 4 years on 25.9%, and pre-school students aged 5 to 6 years on 47.7% (Lidwina, 2020).



Source: (Lidwina, 2020)

Figure 1.

Data of Smartphone Users aged 0 to 6 years in 2020, Central Bureau of Statistics Indonesia

A trend of learning and exploring using digital games are seen for years, including for toddlers and preschoolers. Defined, a digital game is a set of challenging experiences, scenarios, or decisions, structured by rules and goals, and mediated by a digital electronic device (Martinez-Garza, Clark, Killingsworth, & Adams, 2015). It is also a popular form of media, offering possibilities for learning through a computer, video game console, mobile device, or interactive television (Ilomäki & Kankaanranta, 2009).

Since Ataki, the first commercial video game launched in the late 1970s, followed by Nintendo in the early 1980s, the percentage of players have grown overtime, leading to advancement of hardware and software technologies which allows more intense and realistic gaming experiences (Green & Bavelier, 2006).

Digital games are becoming a driving medium of culture, with the growth of innovative content combined with education and values that could be perceived by the users (European Games Developer Federation, 2020). Specifically for children, several digital games designed with a rich, fun and interactive experience could potentially foster children's learning, cognitive development, skill building, social interactions, physical activity, and healthy behaviors (Lieberman, Fisk, & Biely, 2009). However, there should be synergy between the learning process and the user's interaction with the software, appropriate for the intended learning task (Bottino, Ferlino, Ott, & Tavella, 2007).

In a previous research, it was found that educational games such as animal and fruit learning applications can support the development of children in kindergarten, improving their soft skills such as nature awareness, self-confidence and their ability to follow rules. Teacher's role in explaining and guiding the children is important, while implementing

gadgets as an alternative learning medium in class (Silawati & Rachmania, 2017). Even for a difficult subject like mathematics, it was seen that children tend to get attracted to learn and play more using game-based applications due to the challenges and score competitions between friends. Some children even helped their friends in solving the math problem, encouraging them to learn and share more (Pritami & Muhimmah, 2018).

Additionally, game-based learning can be used for linguistic development, for example *Duolingo* application that can be used to improve the chosen language through repetitions, speaking and vocabulary practices, even when learning at home (Fadhli, Ulfa, Sukirman, & Susanto, 2019). A potential improvement on stimulating children's intelligence to take actions, be active and develop emotional quotient (EQ) was also found in the learning process (Rakimahwati & Ardi, 2019). This stands as a strong opportunity where learning does not always have to be in school, but also at home with the support of multimedia and game-based learning.

Digital games provide four levels of engagement for children's play; Receptive interactivity suggests the association with the child's cognitive development to process and encode the information from the game; Manipulative interactivity associates itself with the motoric skills, a physical and explicit behavioral engagement used in devices that primarily rely on touch to manipulate on-screen objects; Embodied interactivity which involves reciprocity between the user and system, an experience when a child exchange a meaningful dialogue with an intelligent agent or receiving feedback on the learning performance through scores; and contingent interactivity that consists of dialogues, exchanged messages, or feedbacks from previous actions or messages, whether by self-initiation or co-opted play with adults involved in guiding the direction of the play (Flynn, Richert, & Wartella, 2019).

Additionally, Prensky (2002) stated five levels of learning on digital games: 'How' to do something that resembles the real life situations, such as nature's characters, motoric skills and self-defense; 'What' are the rules and limitations; 'Why' is the strategy being used to solve the problem; 'Where' does the context work and the cultural value it represents; and 'When or Whether' as the ultimate learning experience when children make decisions and understand the impact or message behind it.

The use of multimedia as a learning base can potentially improve the ability of children to absorb information through visuals, animations and simulations that creates real and abstract information, especially when incorporated with the 'learning by playing' concept (Yafie, et al., 2020). However, parent's guidance at home is necessary, especially for games that involve violence and other sensitive content (Prensky, 2002).

In spite of the negative perspective that some parents have on digital games, Prensky (2006) stated that games are not enemies; instead it could connect children and adults through co-plays and collaborations in the game. Additionally, it could foster a stronger parent-child relationship (Sheffield & Lin, 2013). The interactions done by parents such as physical and verbal stimulations, involvement, positive tones, active participation and interest could enrich the child's growth and development (Pempek & Lauricella, 2017). Co-play using digital games can also reduce the gap between grandparents and grandchildren by building a mutual value through communication, solidarity, and social connections between generations (Costa & Veloso, 2016).

Based on the background and literature stated, this research aims to discover if digital games could boost learning abilities in children aged 4 to 7 years, focusing on their cognitive, social and academic abilities as the main variables. This research is focused on the use of gadgets at home, understanding how playing digital games could impact on those variables mentioned, beyond the school learning environment.

METHODS

This study adopts qualitative descriptive research method, focusing on a natural setting, interpreting a phenomena and the meaning that the informants carry. It begins with assumptions and theoretical frameworks that highlights the research problem, addressing the meaning of the individuals based on a social problem, using an emerging enquiry approach (Creswell & Poth, 2018).

In spite of the epistemological credibility questionings in a qualitative study, descriptive method has been proven on its viability and acceptability in plenty of academic papers. It basically draws the research from naturalistic inquiry, with a goal to study a comprehensive summarization of specific events experienced by individuals, collecting data in a logical manner (Lambert & Lambert, 2012).

This study was done by an in-depth interview, to understand the point of view of the informants through the unfolding meaning of their experiences (Creswell & Poth, 2018:296). It was done one-on-one, using Zoom Video Conference as the medium due to the COVID-19 pandemic at the time of the study. Open-ended questions were asked to gain depth in the study.

10 informants were invited to be part of this research on April 2021, focusing on parents with children aged 4 to 7 years, or during the study was enrolled in a Montessori and Pre-school level. The research was limited to *Jabodetabek* (Jakarta-Bogor-Depok-Tangerang-Bekasi) region to gain more insights on a specific conglomerate area. However, this research does not represent the whole population, as it will serve as a unique experience shared by the informants. Pre-screening questions were sent to the parents to ensure that their children were exposed to digital games using gadgets at home, or even exposed to gadgets for other activities such as watching YouTube.

One parent from each family was invited, with a criteria of that spends most of their time with their child at home and is aware of the growth of their child through gadget use. Nine mothers and one father became part of this study; three informants having children aged 4 and 5 years (a total of six), and two informants having children aged 6 and 7 sequentially (a total of four).

RESULTS & DISCUSSION

To understand on how digital games could boost learning abilities in children aged 4 to 7 years, as shared by the informants based on their children's gadget exposure and activities at home, this study have divided the results into five sub-categories: 1) First gadget exposure, 2) The time spent on gadgets, 3) The activities done on gadgets, 4) The cognitive, social and academic abilities built through digital games, and 5) Concerns on gadgets development.

First Gadget Exposure

As published by American Academy of Pediatrics (AAP), toddlers under two years are suggested to avoid gadget exposure due to their immature symbolic, memory, and attentional skills that makes it difficult for them to transfer knowledge through the 3-dimensional experience. Parents who decided to expose their children to gadgets at the age of 18 to 24 months should note the use of high-media programming and avoid solo gadget use (Radesky & Christakis, 2016).

In this study, eight parents stated that they have exposed their children to gadgets since two, followed by one parent who exposed her child to gadgets since one, and another parent at four. Specifically to the parent that exposed her child to gadgets since

one, it began by her father who showed YouTube videos while she eating or drinking milk as a form of distraction. Other parents also agreed that they first exposed YouTube on the first gadget use, followed by digital games months after.

The Time Spent on Gadgets

World Health Organization (2019) suggested a balance of time spent on physical activities, gadgets and sleep for children below five years in a day. Specifically to gadgets and any other digital devices, WHO recommends a 'null' screen time for infants until one year, and a maximum of 60 minutes for toddlers aged 2 to 4 years. This continues with the recommendation from AAP (2016) for children aged five, with a maximum of 60 minutes of screen time per day.

For children above six years, American Academy of Child and Adolescent Psychiatry (AACAP) suggested a balance between screen time and physical movement, using it as per need and avoid while having meal and outings with family; also switching it off 30 to 60 minutes before going to bed (Screen Time and Children, 2020).

Ever since the pandemic last 2020, all 10 parents agreed that the screen time for their children have increased significantly. Parents allowed a maximum time of one hour per day for their children to play digital games on gadgets before the breakout, whereas since March 2020, it has increased to 4 until 5 hours a day, including their online school hours.

Specifically to digital games and leisure activities such as watching YouTube, three parents still maintained a time frame of 30 minutes to 1 hour per day, followed by four parents giving 1 till 2 hours per day, and two parents up to 3 hours per day. Both parents who allowed their children to use gadgets 3 hours per day admitted these two reasons: 1) The pandemic made them stuck at home and their children preferred spending time on gadgets, and 2) parents were busy with their work which left them with no choice but to give gadgets to their children for their pass time.

Overall, all 10 parents have imposed strict measures on the duration, by letting them play 15 to 20 minutes at one time, with adequate gaps before the next screen time on that day to avoid eye-strain. Several distractions were also done, with activities like drawing, painting, gardening, baking, playing a musical instrument or even playing offline games such as *Lego*, *Barbie dolls*, action figures, or *Monopoly Deals*, as one of the parents of a seven-year-old mentioned. Some parents even encouraged their children to read story books to keep them away from gadgets.

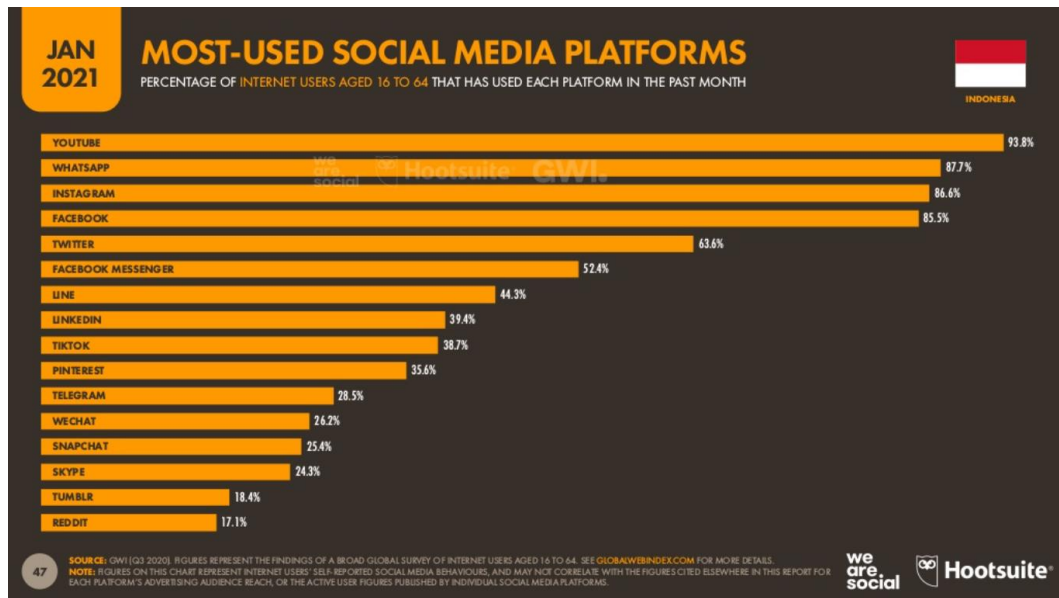
Activities Done on Gadgets

With the growth of digital games, children are provided with a variety of choices to play. Edutainment and simulation games are considered as the most developed (Wirawan, Agushinta R., Ibrahim, Muhammad, & Saifudin, 2013).

In this study, several edutainment game applications were mentioned by parents with children aged 4 to 6, such as *Talking Tom*, *Tom and Friends*, *Toddler Games*, *Numbots* and *Drawing for Kids*, followed by simulation games such as *Flight Pilot*, *Car Wash* and *Donut Shop*. One parent with a seven-year-old son mentioned that his son plays *Minecraft* and *Roblox*, together with his friends since the pandemic, as they felt connected through the social platform provided in the application. The same was also mentioned by another parent with a seven-year-old daughter who played *Roblox* for several months by the recommendation of her school mates. The majority of parents also mentioned other types of games that their children often play, such as puzzle, tracing games, coloring, memory, and matching games.

An interesting finding was received from the informants on how YouTube became a major part of their children's gadget activities. As published by Hootsuite and We are

Social, YouTube stands as the most-used social media platforms in December 2020, within the age group of 16 to 64 years in the country (Digital 2021: Indonesia, 2021).



Source: (Digital 2021: Indonesia, 2021)

Figure 2.

Most Used Social Media Platforms in Indonesia - January 2021

In this study, 9 out of 10 parents mentioned that their children access YouTube almost every day. Only one parent mentioned that her seven-year-old daughter prefers watching Netflix compared to YouTube, watching cartoons like *Spongebob Squarepants*, also teenage and comedy shows like *Project MC²*, *The Thundermans* and *The Big Show* within the platform.

For YouTube, educational channels such as *Cocomelon*, *Peppa Pig*, *Blippi* and *Ryan World* were mentioned, followed by one four-year-old child who prefers watching flight simulations and animal kingdom due to his fondness for those topics. Two parents mentioned how their children love watching comedy channels and digital games-related, such as tutorials on how to win in *Minecraft* and *Roblox*, or even following the characters of *Tom and Friends* and *Talking Tom*. One parent with a five-year-old son mentioned his fondness for international songs, following the lyrics and dances from Bruno Mars and BTS, influenced by the home environment itself.

Seen further, the majority of parents mentioned that their children prefer spending more time on YouTube compared to digital games on a daily basis. When confirmed on the use of YouTube Kids in specific, all nine parents stated that they prefer setting a regular YouTube for their children due to the availability of more content. The parents also added on the importance of frequent monitoring when the children access the platform, to ensure that they are watching appropriate contents as per their age group.

The Cognitive, Social and Academic Abilities Built through Digital Games

Cognitive function is a broad term that refers to a mental process involved in the acquisition of knowledge, information manipulation, and reasoning, including perception, memory, learning, attention, decision making, and language abilities (Kiely, 2014). Additionally, Bandura’s Social Cognitive Learning (SCL) was seen as part of this study, defined as a process where an individual learns from other members of the group by

observing and imitating their behavior (Subbotsky, 2012). It also focuses on how children and adults react cognitively based on their social experiences and environment, and how those experiences influence their behavior and development (Nabavi, 2012).

In this study, it was found that playing repeatedly has impacted positively on the cognitive growth of children, with 9 out of 10 parents sharing similar experiences. For instance, children who were exposed to educational games such as matching, mathematics, and art (drawing and coloring) on their gadgets had an improved concentration ability, and a better understanding of logic, color differences, also problem solving.

Two parents underlined on how their children were able to understand the parts of cars and airplanes through the digital games they played frequently. Instead, one of the children was able to share with his friends about airplanes using the right term confidently, in spite of still studying in a preschool level.

However, one parent with a four-year-old daughter shared the difficulties of her in holding a pencil, as she was accustomed to use her finger while drawing or coloring on her touch-screen tab. She also preferred to draw or color on screen as it was faster and convenient.

Yet, another parent a son of the same age said that using a stylus pen did not disrupt his offline learning experience, as the model is similar to a regular pencil. It was added that with the balance of offline and online games, it has built an equal interest in him to play both games and instead, gave him the experience of physical touch as he held the same device (such as pencil) and games (such as puzzles) without much difficulty. This indicate the importance of having a balance between digital and offline games that could stimulate better cognitive and motoric skills in children.

Nine parents added on the importance of visual learning experience, with YouTube as the medium. Only one parent felt that traditional learning gave a better outcome. Through the channels mentioned previously, children showed better language understanding, also improved manners and empathy towards a certain situation. For instance, a parent with a five-year-old son shared on how he was able to understand and empathize when his mother was busy doing household chores, offering help to do small tasks such as sweeping, taking plates from the dining table or even reminding his parents to switch off the lights and fans when not used. A parent of a four-year-old also shared how her son was able to solve his own problems, like opening a tight jar or doing his own homework. However, this situation depends on the mood of the child at that moment, and persuasion needs to be done by the parents.

In regards to language, nine parents agreed on how their children improved their English and Bahasa Indonesia vocabulary from the channels they watched. One of the four-year-old parents was astonished to see her daughter saying words like "*Fantastic*", "*Fabulous*", "*Amazing*", including giving compliments like, "*Mama, you did something well. Well done, Mama!*" when she saw her mother doing something that made her happy, in spite of still being in Montessori.

In addition, the majority of the parents saw an improvement of storytelling skills in their children, as they are able to share their feelings and point of view better than their classmates. This statement was shared based on their personal observation together with the teachers. However, three parents with a four-year-old child shared several negative impacts that occurred from watching YouTube or even Cable TV, including cartoons and superhero series. The parents shared on how their children began to use words such as "*anjing*" or "*dog*" in the wrong manner, becoming more violent and aggressive by hitting their parents after watching superhero series, showing more tantrums when asked to study or do other tasks while watching, also planning pranks to their parents such as tripping them with their legs or intimidate them verbally after watching cartoons like *Tom*

& *Jerry and Spongebob Squarepants*. However, the damage were minimized through the guidance and explanation given by the parents while they watch those programs, narrating on the reasons why those acts are not acceptable and the impact if the child still continues doing so.

The same suggestion was also given by other parents on the importance of accompanying and guiding their children while playing digital games. The concern was more on the advertisements and game suggestions shared within the application that may endanger, or were considered inappropriate for their age.

In terms of social abilities, 7 out of 10 parents felt that the combination of digital games and YouTube have improved the confidence in their children, especially on their ability to solve math problems, understanding how to trace alphabets and numbers better than their classmates, and most importantly, the ability to share stories and emotions confidently. Additionally, these children were seen more helpful and skillful in the process, on how they were able to guide their friends in the class tasks before the pandemic, and are able to cope up quickly with the technology during the online class transitions today.

One of the four-year-old parents shared on how her son was able to distinguish between the types of emotions, such as anger, sadness, disgust and more based on the lessons he learned from YouTube. This also include the observation of his environment, including the reactions of his parents when playing digital games together.

Three children in this study were still considered shy and introverted, yet it was not directly related to the use of gadgets. It was acknowledged by the parents that it came from the environment they were raised at.

Concerns on Gadget Development

A previous research highlighted the growth of gadgets and how parents need to cope up with technology to guide their children. Parents are known as the primary educators for children, and are in charge of cultivating skills and values, which majority are also coming from gadgets today (Sihura, 2018).

All 10 parents were aware of the growth of gadgets, whether in school or social environment, that may impact on their children's learning experience. Three parents showed high concerns on the use of gadgets, with the main reason of addiction. One of them also said how gadgets have caused her son to have squinting eyes at the age of 2, due to the high exposure of YouTube accessed through a mobile phone since the early months of development. This made her limit the gadget use to weekends for leisure, and use only for school purposes during the weekdays.

On the other hand, seven parents accepted the development of gadgets, especially digital games and YouTube as a promising way of learning. They believed that with the controlled use of gadgets, together with a proper monitoring and guidance given by parents, it could bring better growth in their children, especially looking at how it has impacted them positively today.

Discipline and time management also need to be imposed, yet children should not be strictly banned from technology as how the parents believed it. Instead, it will make them more curious as the see their own family and friends playing, and may lead to an aggressive behavior when they get the chance to do so, with more risks if it occurs outside home or school environment. Majority agreed on the need of playing in moderation. Two parents believed that the trust and chance given to their children will make them more independent and confident when given responsibilities. Allowing children to choose their games and shows based on their likings were recommended, yet parents still need to monitor and ensure that it is still suitable for their age group.

Sitting and interacting with children while using gadgets can also improve trust and parent-child relationship, as stated previously. Additionally, it was also proven that it has improved family bonding, more than just parents and children when played together in an extended family setting.

Overall Results and Summary

From the discussions, it can be seen on how gadgets have become an important medium for children, with the exposure since the age of two, or as mentioned by the majority of parents in this study. The COVID-19 pandemic forced parents to let their children interact with gadgets for longer hours, two to three times more than the time set before the breakout. The interactions mainly include online school classes and additional leisure time to play digital games and watch YouTube videos to fill their pass time. Yet, parents have set strict measures of 15 to 20 minutes screen time per use, and then distract them with some off screen activities such as drawing, painting, gardening, baking, reading, also playing board games and musical instruments to avoid eye-strain.

This study found that most children loved edutainment and simulation games, with some mentioned were *Talking Tom, Toddler Games, Numbots, Flight Pilot*, and more. Interactive social games like *Minecraft* and *Roblox* became some of the choices for the seven year olds, as the application allows them to interact with their friends while playing. YouTube also became a major part of the children's gadget activities. Instead, most children preferred watching YouTube more than playing games in a day.

In terms of cognitive, academic and social skills, it was found that children who repeatedly played educational games had an improved concentration and logical ability, including problem solving skills. Some children also showed better storytelling skills and confidence in expressing their ideas and emotions, both at home and school. Visual learning experiences from YouTube videos became a strong supportive element in this study, especially for language and manners development. They also became more emphatic towards certain situations, such as helping their parents at home and friends at the online school settings.

In addition to the study, parental guidance was suggested during the children's exposure towards gadgets. More than just to avoid negative impacts, it was believed to create a stronger bond between parents and children, through collaborative learning and discussions. Additionally, the importance of balancing traditional and digital games also became an important point, especially for the motoric ability of the children, such as holding a pencil to draw or understanding shapes and sizes.

CONCLUSION

Understanding how gadgets are evolving rapidly in this era, especially game-based learning used beyond the school environment, it is crucial to accept and adjust with the growth for better learning experience, especially for parents as the primary educators for children. Specifically to digital games and video-based platforms like YouTube, it was seen that cognitive, social and academic growth can be achieved if the applications or channels exposed are appropriate to the age group. Educational and simulation games had shown a lot of positive impact in this study, with an addition of the right YouTube channels that shared good influences to the improvement of language, manners and behavior. The involvement of parents in the children's gadget activities can also improve bonding, while guiding the children to learn from the games played or videos watched. Moderate use of gadgets should also be maintained, minimizing the chances of addiction, adverse health concerns, while improving balance of activities for children. Further

research is suggested to focus more on the school environment, to see the educators' point of view to expand the findings qualitatively.

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