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Mitigating Negative Effects of Digital Media on Children Through Innovative Toy Design

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Abstract: In today's world, with the rapid development of the information era, the contents on the Internet are daily renewal and children's access to which and use of mobile phones or computers has become the norm. However, the question of whether this is having a negative impact on children's development has been an issue of great concern. This paper reviews some of the characteristics of contemporary Internet information that are detrimental to children's intellectual development and cognitive formation, as well as the possible pitfalls in children's use of electronic devices and exposure to the Internet environment, and concludes that the content online shall do harm to children's intelligence development if they single-minded and overly rely on this, and excessive screen time may lead to behavioural problems and even physical and psychological issues. Therefore, it is suggested that children need to be exposed to digital media with the guidance and intentional protection of parents and educators during their growth, and should not use electronic devices for too long. Based on the findings of this study, the authors have designed a book toy that aims to provide a solution to help children better navigate their cognitive and intellectual development in a de-digitalised way in their growth.

Keywords: digital media, young children, toy design

1. Introduction

Digital media has taken an increasingly pervasive part of young children's life. With high-definition images, immersive sounds, and interactive features, digital media offers a rich and engaging experience that attracts children's attention and curiosity. However, the influence of digital media on their development remains controversial.

On one hand, proponents such as Kirschner and van Merriënboer argue that digital media can provide personalized and flexible learning experiences, enhance children's cognitive skills, and stimulate their interests and curiosity [1]. On the other hand, opponents' express concerns about the potential negative effects of excessive digital media use, for example addiction, social isolation, and impaired behaviour according to the study of Lillard and Peterson [2].

Recent research has shed new light on the effects of digital media on young children's cognitive and behavioural development. For example, Christofides and Muise conducted a review of literature and found that digital media may alter children's brain structure and function, as well as affect their learning, memory, and thinking abilities [3]. Nathanson et al. used experimental methods to investigate if pre-schoolers' executive functions have a relationship with television exposure and

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found that excessive television viewing could have consequences of children's inability to concentrate, memory impairment, and poor self-discipline [4]. Furthermore, the Common-Sense census worked by Rideout and Robb, which surveyed the media use of children aged 0-8 years old, revealed that more children are exposed to diverse forms of digital media, and spend increasing amounts of time with these media devices, which may have implications for their physical health and cognitive development [5].

Therefore, this paper aims to focus on comprehensive review of the negative influences of digital media has done on the cognitive and intelligence development of the young generation, and examine how digital media may shape children's thinking, learning, and social behaviours. Specifically, this paper will first provide the properties of digital media and discuss how they will limit the development of young children. Next, the paper will turn its attention to the consequences of children's unsupervised access to electronic devices. Finally, this paper will discuss the impacts, and offer a toy design project that is expected to be helpful to children.

It is therefore believed that this paper will be of interest to those concerned with the physical and mental well-being of children and will provide a valuable reference for creating a healthier and more balanced educational environment.

2. Literature Review

2.1. Children and Content of Digital Media

Before exploring the influence of digital media on children, it is wiser to know the characteristics of contemporary digital media, which include the speed, immediacy, volume and wide distribution of information.

Firstly, while concise and straightforward information can certainly increase the efficiency of users, Rosen et al.'s study found that high school students tend to think in fragmented and shallow ways when using social media rather than deeper understanding and reasoning, and even though it can be inferred that the conciseness of information can increase efficiency, in the same study, students were also noted to learn less effectively due to frequent task switching as a result of using digital media [6].

Secondly, the rapid dissemination of information can lead to the spread of misunderstandings and rumours, as people do not have enough time to think deeply and verify the veracity of information. In their article, Brossard, D., and Scheufele, D. A. explore how digital media can contribute to the spread of anti-science views and rumours and the impact on public scientific literacy, which can be detrimental to children's cognitive development if they are exposed to such information at an early age before their ability to distinguish between right and wrong is developed [7].

Finally, according to Jean M. Twenge, information overload in digital media can lead to distraction and reduced decision-making ability [8]. With too many sources of information, people often have difficulty choosing what is important and are easily distracted by unnecessary information.

Moreover, Chassiakos et al. have concluded in their studies respectively that digital media has a more significant impact on the cognitive, psychological and social abilities of younger children, the author is in favour of the need for parents and educators to take appropriate protective measures at this stage [9].

Although the above talks about the negative effects of digital media, it is also recognised that it has positive effects. Based on the above understanding of the content of digital media, the author concludes that children should enjoy the benefits of digital media under proper guidance and supervision and should be encouraged to learn about the world and develop their abilities in ways other than viewing information on their screen.

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2.2. Child Development and the Use of Electronic Entertainment Devices

Having a clear understanding of digital media itself, the author would like to explore how children's physical and mental growth is affected by digital media.

The cognitive formation and intellectual development of children and adolescents is a complex and long-term process that includes multiple aspects such as perception, memory, thinking and language. This process is often influenced by environmental, genetic, educational and other factors.

In recent days, an increasingly emphasis has been put on the impact of digital technologies on adolescents' cognitive formation and intellectual development. A study conducted by the American Academy of Pediatrics on children aged 8-11 showed children who use electronic devices for more than two hours a day scored lower on maths and language tests and were more likely to have behavioural problems [10]. The report notes that early childhood and adolescence are periods of rapid brain development for children, which is when they are most vulnerable to digital media. Excessive digital media use can have a negative impact on children's cognitive, emotional and social behaviour, and parents and educators are advised to limit children's digital media use, especially during school and sleep time.

Similarly, a study led by the Royal College of Paediatrics (RCPCH) states that overdose of screen time may lead to sleep problems, affecting the quality and length of children's sleep, and that the use of electronic devices may have a harmful consequence on children's memory, language and executive skills [11]. Overuse of these devices may also lead to behavioural problems, including poor concentration, poor independence and deterioration of social skills.

Furthermore, in the article of Tandoc et al., it mentions social media use had a positive correlation with jealousy, anxiety and depression in college students, showing that growing up with exposure to massive social media has negative effects on mental health for minors with immature mental development [12].

3. Discussion

It is important that children are properly and effectively guided through the stages of cognitive formation and intellectual development. Based on Piaget's Stages of Cognitive Development and Howard Gardner's Theory of Multiple Intelligences and the author's own observations and reflections, a series of recommendations are given below. According to this set of recommendations.

As the information conveyed by digital media is conclusive and untouchable, children should be encouraged to explore and try new things on their own, with a positive effect on promoting their cognitive and emotional development.

Children arrive at the age of 11 at the formal arithmetic thinking stage, when their abstract logic and reasoning skills begin to grow, and it is recommended that children develop critical thinking and analytical skills at this time, as this can help them to better evaluate information and make informed decisions.

Based on this research, the author has developed a children's toy, the Little Adventurer's Book. Figure 1 showed the sketch work of this idea.

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Figure 1: Initial design of the product.

The author observed during the inspiration discovery phase that children would touch, pick or cut plants, either consciously or unconsciously, possibly out of curiosity, a desire to explore or interest in the environment, among other reasons. With this as the driving force, the author has designed a toy plant illustrated book, which has two parts, an illustrated collection book and a tool kit, this can be observed in Figure 2, which showed the prototype of this design.

Figure 2: Prototype overview.

The illustrated book (see Figure 3a) has a specimen page between each two pages. On the left side of which knowledge and reference to the target plant is given, while the right side is left to the children

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to encourage them to write down what they have seen and felt.

The kit (see Figure 3b), attached to the book by Velcro and a knot, is a roll of artificial leather with different kinds of tools fixed inside for the children to use when making specimens of plants and observing and studying them.

(a) (b)

Figure 3: Prototype detail. (a) Content page; (b) Tool kit.

In the author's plan, when the children will use the toy book correctly according to the instructions with the different versions of this toy issued in different climatic zones:

In this process of exploring nature outside the home, the children will develop their bodily kinesthetics intelligence and natural intelligence; they will develop the courage to step outside their comfort zone; they gain deeper and more concrete knowledge through hands-on learning than they would get by looking it up directly on the internet; and, more importantly, the ability and habit of learning through this way. And after the young users have completed the exploration activities, as they write down the stories of what has happened and what they have learned, the children shall learn to record events and express emotions, their linguistic intelligence and intrapersonal intelligence develops.

The toy book is driven by children's curiosity and is complemented by the form of collection to reinforce their desire to complete the exploration tasks given in the book, enabling better cognitive formation and intellectual development in the process, in addition to strengthening family or peer relationships if they are not doing it alone. What's more, after the child has completed the collection, or after it is no longer in use, the toy book can be preserved as a witness to childhood and can be used for nostalgia by children as they grow older, which is the human dimension of this toy. Figure 4 illustrated the full concept of this toy design.

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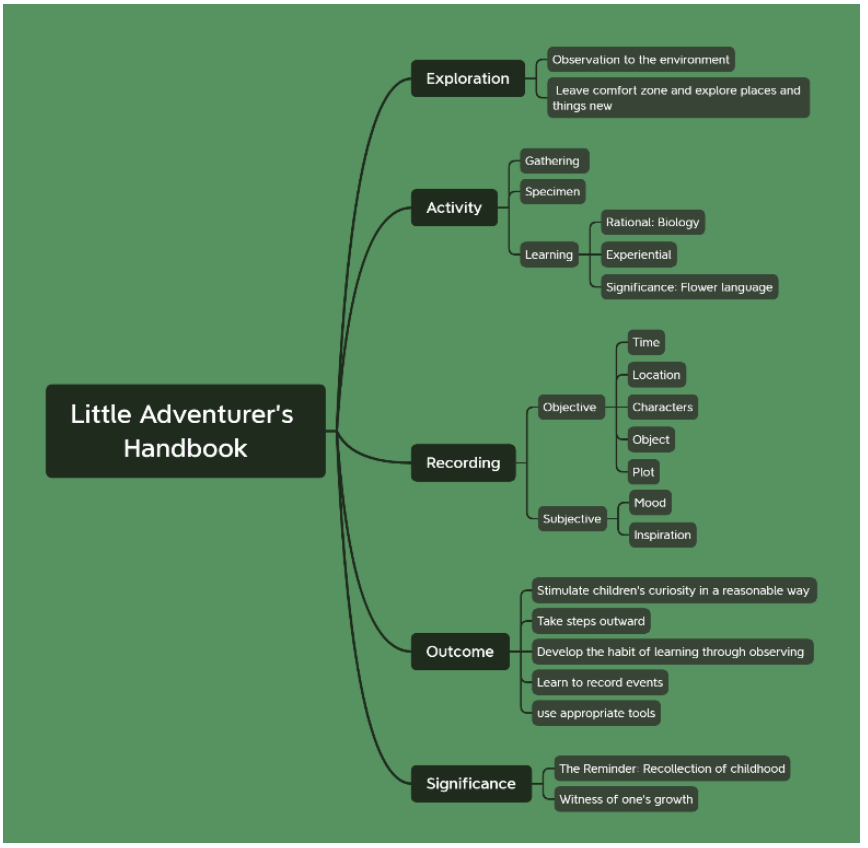

Figure 4: Mind map of the product concept.

There is still room for optimisation, for example by mixing in false information and leaving blank spaces in the information given to practice the little user's ability to discern and actively consult the information.

4. Conclusion

In an era of rapid information technology development, where people are exposed to more information at the same age than ever before, this trend cannot be reversed and the ecology of digital media is difficult to change, so it is an obligation and a responsibility to care for and protect children from the harmful effects of information online and digital media. It is important to emphasis on that although this article have focused on the negative aspects of digital media, the author do not deny that there are also positive aspects. However, the use of online information is a choice that should not be limited to. This work sincerely hope that children will grow up in a healthy environment and that the products designed will help to develop their intelligence and build up their cognitive skills.

References

[1] *Kirschner, P. A., & van Merriënboer, J. J. (2013). Do learners really know best? Urban legends in education. Educational Psychologist, 48, 169–183.*

[2] *Lillard, A. S., & Peterson, J.. (2011). The immediate impact of different types of television on young children's executive function. Pediatrics, 128(4), 644.*

[3] *Bochicchio, V., Valerio, P., Dell'Orco, S., Maldonato, N. M., & Scandurra, C. (2020). A Review on the Effects of Digital Play on Children's Cognitive and Socio-Emotional Development. A Review on the Effects of Digital Play on Children's Cognitive and Socio-Emotional Development.*

[4] *Nathanson, A. I., F Aladé, Sharp, M. L., Rasmussen, E. E., & Christy, K.. (2014). The relation between television exposure and executive function among preschoolers. Developmental psychology(50-5).*

DOI: 10.54254/2753-7048/16/20231151

[5] *Rideout, V. (2017). The common sense census: Media use by kids age zero to eight. San Francisco: Common Sense Media.*
[6] *Rosen, L. D., Carrier, L. M., & Cheever, N. A. (2013). Facebook and texting made me do it: Media-induced task-switching while studying. Computers in Human Behavior, 29(3), 948-958.*
[7] *Brossard, D., & Scheufele, D. A. (2013). Science, new media, and the public. Science, 339(6115), 40-41.*
[8] *Twenge, J. M. (2019). Have smartphones destroyed a generation? The Atlantic.*
[9] *Reid Chassiakos Y, Radesky J, Christakis D, et al. AAP council on communications and media. Children and adolescents and digital media. Pediatrics. 2016; 138(5):e20162593.*
[10] *Chassiakos, Yolanda, Linda, Reid, Mendelson, & Robert, et al. (2016). Media and young minds. Pediatrics: Official Publication of the American Academy of Pediatrics, 138(5), art. no. e20162591-art. no. e20162591.*
[11] *Royal College of Paediatrics and Child Health. (2019). The health impact of screen time: a guide for clinicians and parents. London, UK: RCPCH.*
[12] *Tandoc, E. C., Ferrucci, P., & Duffy, M . (2015). Facebook use, envy, and depression among college students: is facebooking depressing? Computers in Human Behavior, 43(feb.), 139-146.*