Integrating Psychological Principles and AI Technology into UX Design for Developing a Metaverse that Promotes Healthy Disconnection for Young Kids

Feng Liu
Mercer University, Atlanta, USA
LIU_F@mercer.edu

ABSTRACT

The overuse of technology and extended time in 3D virtual worlds by young children and teenagers have raised concerns among parents and teachers about potential negative impacts on their psychological well-being and real-world engagement. This paper reviews earlier studies from educational and psychological perspectives and proposes using psychological principles as a crucial guide for user experience (UX) design in 3D virtual worlds, or the future metaverse. The goal is to create opportunities for healthy disconnection and encourage children to return to real-life activities. The paper also explores leveraging psychological insights and artificial intelligence (AI) technology in designing metaverse experiences. Such an approach allows UX designers and developers of 3D virtual environments to create functionalities that support disconnecting from the virtual realm. This helps mitigate the potential hazards of excessive virtual involvement and encourages a balanced integration of digital and offline pursuits. Such a virtual social environment could be seen as a responsible metaverse.

CCS CONCEPTS

• **Social and professional topics** → User characteristics; Age; • **Human-centered computing** → Human computer interaction (HCI); HCI design and evaluation methods; Heuristic evaluations; • **Applied computing** → Law, social and behavioral sciences; Psychology.

KEYWORDS

3D virtual worlds, Metaverse UX, Technology addiction, 3D online game addiction, User Experience, UX, UX design for young children Metaverse, Metaverse, Responsible metaverse, Psychological concerns of metaverse

1 INTRODUCTION:

Over the past few decades, one of the main goals of the virtual environment, or metaverse design has been to engage users as much as possible, creating an immersive virtual environment that is comfortable compared to the real world. However, with the rise of technology usage, children are increasingly immersed in 3D virtual worlds, particularly online games, which offer captivating experiences and opportunities for exploration and socialization. Prolonged engagement in virtual environments may lead to challenges such as addiction, social isolation, and diminished real-world interactions.

Many studies have explored how virtual reality environments impact human behavior, both positively and negatively. For instance, "User Experience Evaluation in Shared Interactive Virtual Reality" [Guertin-Lahoud et al., 2023] reported a positive impact on the social dimension of the experience, revealing that shared VR elicits significantly more positive affect, whereas presence, immersion, flow, and state anxiety are unaffected by the co-presence of a real-world partner. "Towards the Development of Prosocial Behavior in Students through the Use of Video Games" [Luis et al., 2023] shows that online games can have positive effects on cognitive development, such as improving memory, problem-solving skills, and comprehension.

However, according to Gottschalk's "Impacts of Technology Use on Children: Exploring Literature on the Brain, Cognition and Well-being" in 2019 on the Organization for Economic Cooperation and Development (OECD) working paper [Gottschalk, 2019], online games and virtual platforms can negatively impact kids by causing addiction, leading to mental health issues like anxiety and depression, and disrupting sleep. They could also affect real-life social skills and academic performance due to less time spent on homework and face-to-face interactions.

The negative impact of online gaming on young children has been extensively documented in Psychology and Mental Health research areas. Harvard Health report highlights various physical and psychological issues linked to excessive gaming, such as gamer's thumb, vision problems, and obesity. Additionally, gaming disorder, characterized by withdrawal, tolerance, and negative impacts on relationships and daily functioning, poses a severe psychological threat [Grinspoon, 2020]. Another study in Child and Adolescent Psychiatry and Mental Health examines the correlation between video gaming addiction and cognitive deficits in children, including memory, attention, and learning skills. This research indicates that higher levels of gaming addiction are significantly related to poorer cognitive performance, suggesting long-term negative impacts on academic and cognitive development [Farchakh et al., 2020]. These

findings underscore the importance of monitoring and moderating online gaming activities among young children to mitigate these risks. Emphasizing balanced usage is crucial to prevent negative impacts on children's well-being and social development. Now, let's examine some facts regarding time management in virtual games among young kids.

According to the "Born connected: The rise of the AI generation" [Qustodio, 2024] the average time spent using Roblox in the United States in 2023 was 139 minutes per day. To mitigate the negative effects of online gaming, the OECD recommends setting screen time limits, encouraging physical activities, monitoring game content, and maintaining open communication about online experiences. Similarly, "Teens and Social Media Addiction" [Shepherd's Hill Academy, 2024] highlights that teenagers are spending excessive amounts of time on social media.

The article "Metaverse and Mental Health" [Sternlicht and Sternlich, 2022] emphasizes the potential of technology to create virtual environments that support the mental and physical growth of young children. In a similar vein, "Emergence of the Metaverse and Psychiatric Concerns in Children and Adolescents" [Kim and Kim, 2023] discusses the potential future concerns associated with the metaverse. The metaverse is a shared virtual environment that integrates aspects of social media with virtual reality (VR), augmented reality (AR), and online gaming. It is imperative to consider user experience (UX) design in the development of responsible metaverses for the younger generation.

2 A CASE STUDY OF KIDS ON ROBLOX, A METAVERSE:

An interview study was conducted with five parents of six kids ranging from 2nd grade to 7th grade. Questions addressed the time spent on online games, whether the kids could control their gaming time and volunteer to stop, and whether playing games impacted their normal lives. The findings showed that none of the parents reported success in controlling their kids' overuse of virtual games. The average game-playing time among the studied kids was 2 hours, with Roblox and Minecraft being the most popular games. Four out of the five parents were unaware of how to set up screen time controls.

In addition to the interviews, an observation was conducted during a weekend playdate. The playdate started at 10 AM, and instead of playing real-life games, the kids immediately hooked on Roblox, Minecraft, and other virtual games. By 3 PM, five out of the six kids did not stop playing for 4.5 hours without parental interruption. The findings indicated a significant lack of features in the games encouraging breaks.

The participants were not told that they would be studied. They were interviewed afterward, and we recorded the time they played the number of games they played, and whether or not they were able to come back to the real world by themselves. By 3 PM they were not finishing the play on the game. Three results show that 5 out of the 6 kids did not stop playing for 4.5 hours without interruption from the parents. One of the kids switched from Roblox to Minecraft after 30 minutes and stayed on Minecraft the rest of the time. They explored 5 -7 different games. Five of them felt hungry and went to get some snacks without their eye leaving the screen. None

of them looked for lunch. When being asked if any of the games encourage them to have a break. The answer is "Of course No!"; When being asked why you like Roblox or Minecraft, the answer is the following

I think it is cool
I can create my land or my world and do stuff
I can talk with my friends
I just roaming around to see what is happening
Some of the games are educational, I can make a word game
Some of the games are out of date. I am bored with them, but I go there to check if there are any new ones.

3 METAVERSE UX DESIGN WITH PSYCHOLOGICAL CONCERNS IN MIND

Concerns about the impact of online gaming on young children persist in the education field. As a 3D virtual environment development community, it is essential for us to carefully consider how our user experience (UX) design can positively influence the next generation of the metaverse, particularly for young kids user group. Here are some detailed tips from a psychological perspective.

3.1 Incorporate Scheduled Break Reminders:

UX designers should integrate default scheduled break reminders into virtual environments. These features interrupt prolonged gameplay sessions and encourage users to engage in real-life activities. For example, at noon, a lunchtime reminder could pop up, synchronizing the virtual world with real-world time. Similarly, a bedtime reminder from parents could follow, with the computer screen dimming to mimic the experience of parents turning off lights in a child's room. These reminders help children maintain a healthy balance between virtual and offline activities. In Nielsen's "10 Usability Heuristics for User Interface Design" [Nielsen, 1994], the second principle is "Match Between the System and the Real World". Just as breaks are essential in real life, such as those provided in schools for children, we advocate incorporating similar breaks into the design of 3D virtual games and the 3D metaverse. These breaks should be integral considerations in UX design for a conscientious metaverse experience.

3.2 Offer Incentivized Breaks:

To encourage disconnection from the virtual world, consider offering rewards or bonuses for voluntarily taking breaks. For instance, a user could earn an additional 100 points for pausing the game for 10 minutes. This method not only incentivizes breaks but also reinforces the importance of balancing virtual play with other activities.

3.3 Design with Cognitive Load Theory:

Virtual world interfaces should be designed with cognitive load theory in mind. This approach facilitates easier navigation and reduces mental fatigue, making it simpler for children to disengage from virtual worlds when necessary. By optimizing the design, children can transition between virtual and real-world activities seamlessly.

3.4 Leverage Psychology Principles of Social Influence:

Integrate social norms and peer pressure principles into the virtual world design to promote polite behavior and teamwork among children. Content that encourages these values positively influences how children interact within the virtual world, fostering a supportive and respectful environment.

3.5 Goal Setting and Customization:

Allow users to customize their goals for tasks and the time spent on games, as well as the outcomes. This approach bridges metaverse behaviors with real-world actions, promoting balanced engagement and helping children develop time management skills.

3.6 Empower Parents with Tools:

Develop tools for managing a child's virtual world usage directly within the metaverse environment. These tools could include time limits and activity monitoring features. By empowering parents, the metaverse supports healthy disconnection habits, enforcing boundaries, and promoting a balance between digital and offline activities.

3.7 Raise Awareness of Negative Impacts:

Display alerts about the immediate benefits of disconnection, such as increased energy or improved mood, to reinforce the negative social impacts of game addiction. Highlighting these benefits can help children overcome the temptation to remain in virtual worlds for extended periods, reducing the perceived value of prolonged engagement.

4 ARTIFICIAL INTELLIGENCE IN FUTURE METAVERSE USER EXPERIENCE DESIGN

AI technology can play a crucial role in leveraging psychological principles to design user experiences (UX) in 3D virtual worlds that promote healthy disconnection for children.

First, AI algorithms can analyze user behavior within virtual worlds to identify patterns of engagement and disengagement. By deep learning how children interact with the virtual environment, such as how long they continue on the game and what triggers he or she to disconnect from the virtual world, designers can tailor UX elements to encourage healthy disconnection, such as prompting breaks during periods of prolonged engagement. Second, AI-powered systems can also help personalize the virtual experience based on individual preferences, tendencies, and psychological profiles. By considering factors such as attention span, motivation, and emotional state, AI can adapt UX design elements to facilitate disconnection strategies that resonate with each child's unique needs. AI model potentially can predict when users are at risk of becoming overly immersed in the virtual world and intervene proactively to promote healthy disconnection. For example, AI algorithms can analyze real-time data on user engagement and predict optimal times for breaks based on factors such as fatigue levels and attentional resources.

AI-driven recommendation mechanisms can provide real-time guidance and support to children as they navigate the virtual environment. By offering personalized suggestions for taking breaks, engaging in offline activities, or managing screen time, AI can empower children to make informed decisions about their digital habits. For example, the environment can provide AI-powered avatars, or a virtual assistant, as an assistant avatar to help or arrange an avatar to help control the time spent on the game each time. or solving conflict issues between two virtual friends, mocking a teacher or a life coach in real life. Virtual assistants can remind children to take breaks, provide information about healthy digital habits, and offer suggestions for offline activities, enhancing the overall UX while promoting disconnection.

Last, AI-enhanced parental control tools can help parents manage their child's virtual world usage and promote healthy disconnection habits. AI algorithms can analyze usage patterns, set limits on screen time, and send alerts to parents when intervention may be necessary, fostering collaboration between AI technology and parental guidance.

By integrating AI technology into the design process for 3D virtual worlds, designers can create experiences that align with psychological principles and promote healthy disconnection for children. AI-driven solutions offer opportunities for personalization, proactive intervention, and adaptive feedback, ultimately empowering children to develop balanced digital habits and maintain a healthy relationship with technology.

5 CONCLUSION AND FUTURE WORK

By incorporating psychological principles and AI technology into UX design for 3D virtual worlds, designers can create experiences that promote healthy disconnection and facilitate children's engagement with the real world. Leveraging insights from psychology, UX designers can mitigate the potential negative impacts of excessive virtual world engagement.

In future research, expanding the participant pool and developing prototypes for 3D virtual environments featuring break notifications will be key. Collaborating with a team specializing in 3D virtual environment and metaverse design and development, efforts will focus on integrating AI-driven tools to encourage healthy disconnection, thus advancing responsible metaverse practices. This work aims to further integrate psychological insights into UX design, fostering balanced engagement with digital technology among children in virtual worlds.

REFERENCES

Shady Guertin-Lahoud, Constantinos K. Coursaris, Sylvain Sénécal, and Pierre-Majorique Léger. 2023. User Experience Evaluation in *Shared Interactive Virtual Reality*, vol. 26, no. 4, p. https://doi.org/10.1089/cyber.2022.026, 14 April 2023.

Benjamin M. Luis, Angel Mamani-Nina, and Ebelyn M. Mamani-Sucasaca. 2023. Towards the Development of Prosocial Behavior in Students through the Use of Video Games, *World Journal on Educational Technology*, vol. 15 (1), no. Jan., pp. 10 – 27.

Francesca Gottschalk. 2019. Impacts of technology use on children: Exploring literature on the brain, cognition and well-being, *OECD Education Working Paper* No. 195.

Peter Grinspoon. 2020. The Health Effects of Too Much Gaming, *Harvard Health Publishing*. [Online]. Available: https://www.health.harvard.edu/blog/the-health-effects-of-too-much-gaming-2020122221645. [Accessed 19 July 2024].

Youssef Farchakh, Chadia Haddad, Hala Sacre, Sahar Obeid, Pascale Salameh, and Souheil Hallit. 2020. Video Gaming Addiction and Its Association with Memory, Attention, and Learning Skills in Lebanese Children. [Online]. Available: https://capmh.biomedcentral.com/articles/10.1186/s13034-020-00353-3. [Accessed 19 July 2024].

Qustodio. 2024. Born connected: The rise of the AI generation. [Online]. Available: https://static.qustodio.com/public-site/uploads/2024/01/19122535/ADR_2023-24_EN.pdf. [Accessed 19 July 2024].

Shepherd's Hill Academy. 2024. Teens and Social Media Addiction [Online]. Available: https://www.shepherdshillacademy.org/common-teen-issues/teens-social-media-addiction/. [Accessed 30 May 2024]

Lin Sternlicht and Aaron Sternlich. 2022. The Metaverse and Mental Health. [Online]. Available: https://www.familyaddictionspecialist.com/blog/a-new-age-of-digital-addiction-what-the-metaverse-means-for-mental-health-and-digital-addiction. [Accessed 19 July 2024].

Soyeon Kim and Eunjoo Kim, 2023. Emergence of the Metaverse and Psychiatric Concerns in Children and Adolescents, *Journal of Korean Academy of Child and Adolescent Psychiatry*, vol. 34, no. 4, pp. 215-221.

Jakob Nielsen, 1994. "10 Usability Heuristics for User Interface Design.," Nielsen Norman Group. [Online]. Available: https://www.nngroup.com/articles/ten-usability-heuristics/. [Accessed 30 May 2024].