



Doctoral Colloquium—Challenging Stereotypes Around Neurodiversity Through Co-Design in a 2D Videogame, The Things Left Behind

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Abstract. The Things Left Behind is an interactive, story-driven game that delves into the multifaceted experiences of neurodiverse individuals. Set within a cozy game aesthetic, the game offers players a unique opportunity to explore and understand the world through the lens of neurodiversity. The primary objective of The Things Left Behind is to foster understanding and empathy towards neurodiverse individuals. By immersing players in narratives that reflect the lived experiences of those with neurodivergent traits, the game seeks to challenge perceptions and broaden horizons. Each story vignette, co-designed with neurodiverse individuals, serves as a window into the challenges, joys, and unique perspectives that define neurodiversity. Furthermore, with the entire development team comprising neurodiverse individuals, the game promises an authenticity rarely seen in mainstream media. Through this interactive medium, we aim to not only entertain but also educate, promoting a more inclusive and understanding society.

Keywords: Educational Game Design, Co-Design, Neurodivergence, Game Design, Immersive Learning.

1 Introduction

In an era characterized by the pervasive influence of digital media, the nuanced and diverse experiences of neurodiverse individuals remain underrepresented [1]. This absence not only perpetuates stereotypes but also misses an opportunity to foster understanding and empathy and to celebrate and reaffirm the experiences of those who are neurodivergent [2]. Addressing this gap, the present research introduces The Things Left Behind, an interactive video game being developed through a design-based research approach [3]. The game serves as a collaborative platform that employs co-design methodologies, involving neurodiverse individuals not just as subjects but as co-creators. Each narrative vignette within the game is a window into the lived experiences of neurodiverse individuals, offering players an opportunity to engage with, understand, and reflect upon these unique perspectives. This paper elucidates the methodology and preliminary findings of the project, which is currently in the initial stages of analysis and design. The research includes empathy interviews and focus group discussions as part of its data collection methods. By leveraging the interactive capabilities of the video game medium, we aspire to not only entertain but also educate, thereby contributing to a more nuanced and inclusive understanding of neurodiversity in society.

2 Literature Review

2.1 Neurodiversity & Representation

The neurodiversity movement has emerged as a transformative force in redefining societal attitudes towards neurodevelopmental conditions such as autism, ADHD, and dyslexia [4]. This paradigm shift has been instrumental in challenging conventional narratives that often pathologize these conditions as deficits or disorders [5]. Instead, the neurodiversity framework advocates for a more nuanced understanding, recognizing these conditions as natural variations in human cognition and behavior. This perspective not only humanizes individuals with neurodevelopmental conditions but also celebrates the unique talents and challenges that come with neurodiversity [6].

This ideological shift has found its way into various forms of media, from news articles to films and documentaries [7, 8]. Media outlets have begun to adopt a more balanced approach, moving away from stigmatizing portrayals to narratives that are more empathetic and nuanced. However, this progress has been uneven. Autism, for instance, has received considerable media attention, often portrayed in a more humanizing light compared to past representations. This is a positive development but also highlights a significant imbalance in media representation. Other conditions like ADHD and dyslexia have not received the same level of nuanced attention. They are often sidelined or stereotypically portrayed, reinforcing existing stigmas and misconceptions [2]. This discrepancy in media representation raises questions about equity and inclusivity in the portrayal of neurodiverse individuals and underscores the need for a more comprehensive and equitable media landscape that goes beyond autism to include a broader range of neurodevelopmental conditions [9]. Such inclusivity is not just about fairness; it's also about accuracy. A more equitable representation would provide a fuller picture of the neurodiverse community, capturing the rich tapestry of experiences, challenges, and talents that these conditions bring. This, in turn, could foster greater public understanding and acceptance, contributing to a more inclusive society.

2.2 Video Games as Media

Video games have undergone a remarkable transformation since their early days. In the beginning, the games industry was seen as a peripheral form of entertainment, often dismissed for its lack of complexity or cultural significance. However, over the years, video games have evolved into intricate, interactive experiences that not only entertain but also engage players in complex narratives and virtual worlds (e.g., *Baldur's Gate 3* has 17,000 possible endings). Videogames now rival the production quality of Hollywood blockbusters, featuring high-definition graphics, compelling storylines, and intricate gameplay mechanics [10]. This evolution has not occurred in isolation; it is part of a broader convergence of different media forms. Video games are now intertwined with other forms of media, including film, television, and even literature, influencing not just technological advancements but also social, cultural, and economic aspects of society [11]. Media theorist Henry Jenkins describes this phenomenon as "media convergence," a multifaceted process that manifests itself in various ways, including technological, economic, social, and cultural convergence [12].

In recent years, the games industry has started to take issues of diversity and inclusion more seriously [13, 14]. Initial efforts were primarily geared towards improving gender representation, perhaps in response to longstanding criticisms about the objectification of women in video games [15]. However, the industry has begun to broaden its focus to include other marginalized groups such as those who are Black, Indigenous, and other People of Color, LGBTQ+ communities, and people with disabilities. This is a significant shift, signaling a growing awareness of the need for more inclusive representation in video games. Despite these positive developments, there is still much work to be done. Emil Lundedal Hammar's research in 2015 pointed out that while there has been considerable focus on race, gender, and sexuality, other marginalized groups, particularly those with mental and bodily disabilities, remain underrepresented [16]. While some strides have been made in improving the representation of neurodiverse individuals in media and video games, much work remains. Autistic communities have been vocal about the need for more nuanced portrayals that move beyond harmful stereotypes and authentically reflect the complexity of their experiences [17]. The ethical imperative here is clear: media representations should aim to educate the public and challenge existing stereotypes, thereby fostering values of recognition and inclusion. Moreover, the issue of underrepresentation extends beyond the characters portrayed in video games to include the people who create them. The lack of diversity among game developers, writers, and designers [18] likely contributes to the limited perspectives represented in the games themselves [19]. Therefore, addressing diversity and inclusion in video games is not just about changing the characters on the screen; it's also about diversifying the teams that create these virtual worlds.

2.3 Educational Potential of Serious Games to Foster Neurodiverse Representation

Serious games are generally understood as video games developed with an educational aim rather than solely for entertainment [20]. These games often tackle serious subjects like war, climate change, and social issues, aligning with their educational objectives. Unlike commercial games, which may be adapted for educational use but were initially designed for entertainment, serious games are intentionally designed to serve educational or training purposes from their inception. They incorporate pedagogical elements to instruct or educate, thereby imparting specific knowledge or skills [21]. However, it's worth noting that education and entertainment are not mutually exclusive; serious games can be both instructive and engaging [22]

Serious games have found applications in various settings, including educational institutions, healthcare organizations, and businesses [23]. They have been used to teach a wide array of subjects, from science to social issues [24]. Most research on these games has been conducted in custom-designed game environments. For instance, Mission HydroSci is a 3D virtual learning environment where middle school students explore water resources through scientific argumentation [25]. Other examples include Darfur is Dying, which aims to raise awareness about the humanitarian crisis in Darfur, Sudan [26], Papers, Please which explores the ethics of immigration [27], That Dragon Cancer which approaches death and terminal illness [28], and the commercially available game Spiritfarer which deals with themes of loss and grief [29].

The application of serious games in the realm of neurodiversity is a burgeoning field that holds considerable promise. These games can serve as immersive platforms that allow players to step into the shoes of neurodiverse individuals, offering firsthand experiences of the unique challenges and abilities associated with conditions like autism, ADHD, and dyslexia. By doing so, serious games have the potential to challenge prevailing stereotypes and misconceptions, thereby fostering a more nuanced and empathetic understanding of neurodiversity. However, the development and implementation of serious games focused on neurodiversity also come with their own set of challenges. These include ensuring that the games are designed in consultation with subject matter experts in neurodiversity, as well as with neurodiverse individuals themselves, to ensure authenticity and effectiveness [30]. Additionally, rigorous scientific evaluation will be essential to assess the impact of these games on both neurodiverse and neurotypical individuals.

2.4 Aims of this Project and Study

Building on the promising intersection of serious games and neurodiversity, this paper aims to contribute to the growing body of work that seeks to foster understanding and empathy towards neurodiverse individuals. To operationalize this goal, we pose the following two research questions that will guide our study:

- (RQ1) What insights can be gleaned from neurodiverse individuals that would inform the development of a video game authentically representing their daily lives, challenges, and experiences? This includes aspects such as gameplay mechanics, narrative elements, character development, and interaction models.
- (RQ2) What design principles and strategies can be employed to create a video game that is inclusive, accommodating, and accessible to players from diverse neurodiverse backgrounds and sensitivities?

By addressing these research questions, we hope to offer actionable insights that can be used to develop video games that not only entertain but also educate and foster empathy. These games would aim to provide a more nuanced portrayal of neurodiversity, thereby contributing to broader societal understanding and inclusion.

3 Research Methods

This paper serves as an introductory report in a multi-stage Design-Based Research (DBR) project [31], situated within the Learner Experience Design framework [32]. Utilizing Allen's Successive Approximation Model version 2.0 (SAM2) as our guiding methodology [33], the study unfolds across three interlinked phases. Each phase is designed to contribute to the creation of highly relevant, usable, and effective learning environments, a methodology that has garnered significant support in existing literature [34–37]. The initial phase and focus of this study, employs a multi-pronged approach to inform the design of *The Things Left Behind*. In this phase we conducted empathy interviews to understand the emotional and cognitive needs of learners, perform a literature review to identify existing research gaps, and assess current market offerings through product and game reviews. Additionally, focus groups were conducted to gather a range of perspectives.

3.1 Materials: The Things Left Behind 2D Game

The Things Left Behind is a narrative-driven game aimed at fostering empathy and understanding for neurodiverse individuals while also celebrating and affirming neurodiverse experiences. Created by a majority neurodiverse development team, the game immerses players in stories that reflect the real-life experiences of neurodiverse people. Set in a "cozy game" aesthetic [38], it offers a relaxing and emotionally resonant environment where players navigate challenges and make choices that shape the story. The game's primary goal is to educate as well as entertain, challenging societal perceptions about neurodiversity. Gameplay involves exploration, puzzle-solving, and choice-based narratives, inspired by successful titles like Florence and Life Is Strange. Through this interactive experience, we aim to create a more inclusive society by offering players a genuine look into the world of neurodiversity.

3.2 Participants

To recruit participants, we utilized purposive sampling [39] and snowball sampling [40] methods. To begin, we leveraged existing networks and institutional resources to find individuals who would be eligible to participate in the study. Additionally, we expanded our reach by posting flyers and advertisements on various social media platforms. To be eligible to participate in the study participants needed to (1) speak English, (2) be 18 years or older, (3) consider themselves a gamer, and (4) identify as being neurodivergent. Participant details and demographics are provided in Table 1.

Table 1. Participant Details & Demographics.

Pseudonym	Gender	Race/Ethnicity	Age	Neurodiverse Conditions	Participated In?
George	Non-Binary	White	38	ADHD, Depression, Anxiety, PTSD, OCD	Empathy interview; Focus Group
Amy	Agender	White	26	Autism, Anxiety	Empathy interview
Frankie	Non-Binary	White	31	Autism, ADHD	Empathy Interview
Zelda	Female	White	40	ADHD	Empathy interview; Focus Group
Lisa	Female	White	24	Generalized Anxiety and Depression and probably ADHD	Empathy Interview
Haley	Female	White	33	ADHD Combined Time. Late life diagnosis.	Empathy interview; Focus Group
Nanette	Female	White	33	ADHD Combined Time & Generalized Anxiety Disorder	Empathy interview; Focus Group
Jessica	Female	White	51	ADHD, Major Depressive Disorder	Empathy Interview
Rosco	Male	White	36	Depression, Body Dysmorphic Disorder, Bipolar, Generalized Anxiety, Schizophrenia, ADHD	Empathy Interview

3.3 Data Sources

To comprehensively investigate the research questions, this study employed two qualitative research methods: Empathy Interviews and Focus Groups.

Empathy Interviews. To gain an in-depth understanding of individual experiences and emotional responses, we conducted empathy interviews [41] with nine participants. These interviews were open-ended, allowing participants to freely express their thoughts and feelings on the subject matter. Each interview lasted approximately 45 minutes and was audio-recorded for subsequent analysis. The interviews were conducted by trained researchers to ensure a comfortable and open environment for the participants. The empathy interview protocol was designed to explore the nuanced experiences of neurodiverse individuals, focusing on both positive and negative aspects. It covers a range of topics from personal emotions and relationships to societal attitudes, concluding with an open-ended question for additional insights on empathy and understanding.

Focus Groups. In addition to Empathy Interviews, we organized one focus group, consisting of four participants. These sessions were designed to capture a range of perspectives on the research topic. A trained moderator led the focus group, which lasted about 60 minutes. The discussions were also audio-recorded and later transcribed for analysis. The focus group protocol was designed to explore a comprehensive range of topics, from media representation and academic research gaps in neurodiversity to practical considerations in game design for neurodiverse characters and players. It aims to capture both personal experiences and broader perspectives on how neurodiversity can be authentically and inclusively represented in gaming.

3.4 Data Analysis

The analysis of the collected data employed an inductive coding approach, adhering to open coding procedures to allow for the emergence of themes and patterns without preconceived constraints [42]. Initially, three members of the research team independently familiarized themselves with the transcribed data from both the Empathy Interviews and Focus Groups. During this phase, three team members took notes to capture initial impressions and observations. After this individual review, the team convened to discuss their initial findings and to align their understanding of the data. Following the discussion, the team engaged in open coding, where they broadly highlighted passages that seemed significant, laying the groundwork for more focused coding and theme identification in subsequent stages of analysis.

4 Next Steps and Game Prototypes

As we advance in the development of "*The Things Left Behind*," our focus is now shifting towards refining the game's implementation and evaluation. The game is currently being developed in Unity 2022.3.9f1, and we have a working prototype that includes features such as NPC interactions, a preliminary script outline, movable characters, a quest system, and a save and load system. This prototype will serve as the basis for a series of user-centered evaluations and usability tests conducted in iterative cycles to ensure that the game meets and exceeds the expectations of its diverse audience.

To better understand the neurodiverse community we aim to represent, we are continuing to conduct focus groups and empathy interviews. These methods are helping us create empathy maps and personas [43] that will inform the game's design and narrative. We are also collaborating with an artist [44], who is a co-author on this paper, to ensure the game authentically represents the experiences of neurodiverse individuals. Our immediate next steps include finalizing the game's art direction, which will be guided by further focus groups (see Fig 1). This collaborative and iterative approach highlights our commitment to creating a game that is not only engaging but also truly representative, offering players a unique insight into the world of neurodiversity.

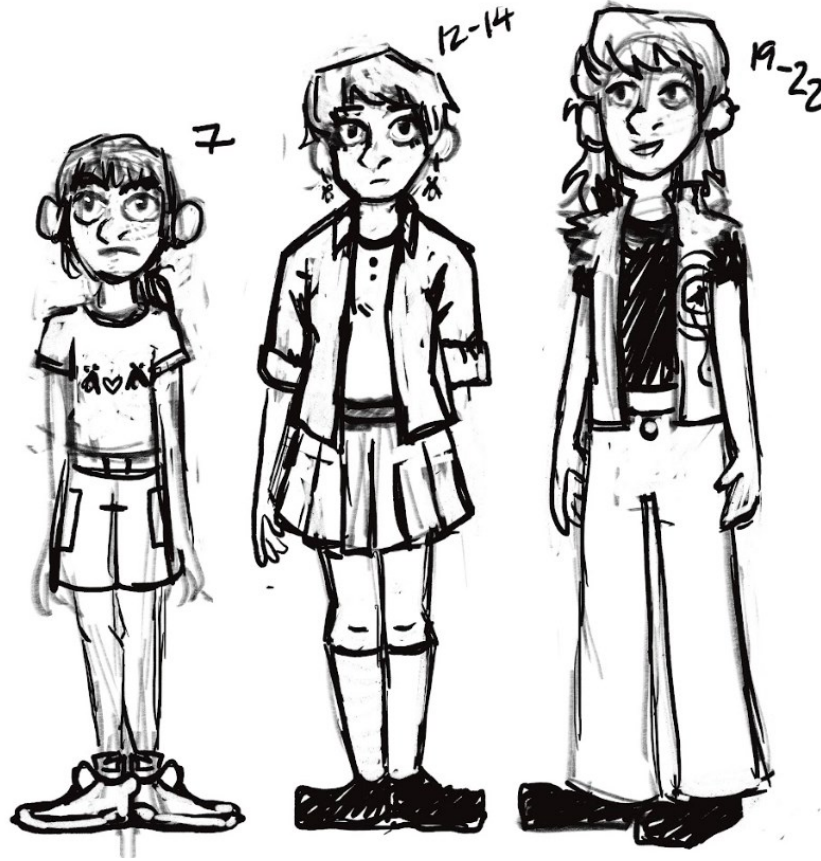


Fig. 1. Concept Art by Devon Whalen / artschoolcopout of the Main Playable Character.

5 Discussion & Conclusion

The discussion surrounding the representation of neurodiverse characters in media, particularly in video games, is long overdue. Historically, such characters have been either marginalized or depicted through harmful stereotypes. Our project, *The Things Left Behind*, aims to disrupt this status quo by not only featuring neurodiverse characters but also making them the focal point of the narrative.

What distinguishes our game is its unwavering commitment to authenticity. This is achieved through a co-design process [45] that actively involves neurodiverse individuals at every stage of development. The result is a nuanced portrayal that avoids clichés and genuinely resonates with the lived experiences of neurodiverse individuals. The game's "cozy" aesthetic further complements this by providing an inviting and comforting environment for players to engage with these narratives. The principle of co-design is not merely a trendy term in our development lexicon; it's a foundational commitment. Our neurodiverse team members are not just consultants but active participants in the game's development, from conceptualization to iterative testing. This ensures that the game isn't just about neurodiverse individuals but is also created by them, adding a layer of authenticity that is often missing in mainstream representations.

As for the current status of the project, we've made significant strides. Our team has conducted multiple empathy interviews and focus groups, which have been invaluable in shaping the game's direction. We've also initiated prototype development and are exploring various game engines to bring our vision to life. However, it's crucial to note that we are in the early stages and are actively seeking funding to maintain our momentum. Looking ahead, our immediate focus is on refining the game based on the feedback from our iterative testing sessions. We will continue to employ our co-design approach, ensuring that each game element is meticulously crafted to resonate with the neurodiverse community. Securing funding remains a critical next step, as it will enable us to accelerate the development process, expand our team, and ultimately, ensure accurate representation.

References

1. Lewin, N., Akhtar, N.: Neurodiversity and deficit perspectives in The Washington Post's coverage of autism. *Disabil. Soc.* 36, 812–833 (2021).
2. Eastwood, S., Evans, B., Gaigg, S., Harbord, J., Milton, D.: Autism through cinema: co-creation and the unmaking of knowledge. *Int. J. Qual. Stud. Educ.* 1–18 (2022).
3. Barab, S., Squire, K.: Design-based research: Putting a stake in the ground. *J. Learn. Sci.* 13, 1–14 (2004).
4. Botha, M., Gillespie-Lynch, K.: Come as you are: Examining autistic identity development and the neurodiversity movement through an intersectional lens. *Hum. Dev.* 66, 93–112 (2022).
5. Chapman, R., Carel, H.: Neurodiversity, epistemic injustice, and the good human life. *J. Soc. Philos.* (2022).
6. Rosqvist, H.B., Chown, N., Stenning, A.: *Neurodiversity studies: A new critical paradigm*. Routledge (2020).
7. Olson, C.J.: Destigmatizing mental illness and neurodiversity in entertainment media. *Norm. Ment. Illn. Neurodiversity Entertain. Media Quieting Madness*. 207 (2021).
8. Kapp, S.K.: *Autistic community and the neurodiversity movement: Stories from the frontline*. Springer Nature (2020).
9. Gillespie-Lynch, K., Dwyer, P., Constantino, C., Kapp, S.K., Hotez, E., Riccio, A., DeNigris, D., Kofner, B., Endlich, E.: Can we broaden the neurodiversity movement without weakening it? Participatory approaches as a framework for cross-disability alliance building. In: *Disability alliances and allies*. pp. 189–223. Emerald Publishing Limited (2020).
10. Picard, M., Fandango, G.: Video games and their relationship with other media. *Video Game Explos. Hist. Pong Playstn. Beyond*. 293–300 (2008).
11. Mollet, T.: Looking through the upside down: Hyper-postmodernism and trans-mediality in the Duffer Brothers' *Stranger Things*. *J. Pop. Telev.* 7, 57–77 (2019).
12. Jenkins, H.: Convergence? I diverge. *Technol. Rev.* 104, 93–93 (2001).
13. Chatzakou, D., Kourtellis, N., Blackburn, J., De Cristofaro, E., Stringhini, G., Vakali, A.: *Measuring# GamerGate: A tale of hate, sexism, and bullying*. Presented at the Proceedings of the 26th international conference on world wide web companion (2017).
14. Inside The Culture Of Sexism At Riot Games, <https://kotaku.com/inside-the-culture-of-sexism-at-riot-games-1828165483>
15. Ray, S.G.: *Gender inclusive game design: Expanding the market (Advances in Computer Graphics and Game Development Series)*. Charles River Media, Inc. (2003).
16. Lundedal Hammar, E.: *Producing & Playing Hegemonic Pasts: Historical Digital Games as Memory-Making Media*. (2020).
17. Dall'Asta, M.: European Neurodivergent Detectives and the Politics of Autism Representation. *Ciné. Cie Film Media Stud. J.* 21, 145–174 (2021).
18. Kafai, Y.B., Burke, Q., Steinkuehler, C.: *Connected Gaming: What Making Video Games Can Teach Us about Learning and Literacy*. The MIT Press, London ; Cambridge, MA (2016).
19. Neely, E.L.: No player is ideal: why video game designers cannot ethically ignore players' real-world identities. *ACM SIGCAS Comput. Soc.* 47, 98–111 (2017).
20. Michael, D.R., Chen, S.L.: *Serious games: Games that educate, train, and inform*. Muska & Lipman/Premier-Trade (2005)
21. Zyda, M.: From visual simulation to virtual reality to games. *Computer.* 38, 25–32 (2005). <https://doi.org/10.1109/MC.2005.297>
22. Abt, C.C.: *Serious games*. University press of America (1987).
23. Schrier, K.: *Learning, education and games. Volume one: Curricular and design considerations*. Carnegie Mellon University (2014).
24. Zhonggen, Y.: A Meta-Analysis of Use of Serious Games in Education over a Decade. *Int. J. Comput. Games Technol.* 2019, e4797032 (2019). <https://doi.org/10.1155/2019/4797032>
25. Laffey, J.M., Sadler, T.D., Goggins, S.P., Griffin, J., Babiuch, R.N.: Mission HydroSci: Distance learning through game-based 3D virtual learning environments. In: *Virtual Reality in education: Breakthroughs in research and practice*. pp. 623–643. IGI Global (2019).
26. Shen, C., Wang, H., Ritterfeld, U.: Serious games and seriously fun games: Can they be one and the same? In: *Serious Games*. pp. 70–84. Routledge (2009).
27. Formosa, P., Ryan, M., Staines, D.: Papers, Please and the systemic approach to engaging ethical expertise in videogames. *Ethics Inf. Technol.* 18, 211–225 (2016).
28. Schott, G.R.: *That Dragon, Cancer: Contemplating life and death in a medium that has frequently trivialized both*. Presented at the Digital Games Research Association Conference (DiGRA) (2017).
29. Shifflett, J., Glaser, N., Jensen, L., Riedy, T., Griffin, J., Center, M.: Doctoral Colloquium—Confronting Death: Lived Experiences from Players of the Serious Game *Spiritfarer*. In: *2022 8th International Conference of the Immersive Learning Research Network (iLRN)*. pp. 1–3 (2022).
30. Lu, J., Schmidt, M.: Exploring the Needs and Preferences of Autistic Users in Extended Reality: A Participatory and Human-Centered Approach. In: Bourguet, M.-L., Krüger, J.M., Pedrosa, D., Dengel, A., Peña-Rios, A., and Richter, J. (eds.) *Immersive Learning Research Network*. pp. 138–149. Springer Nature Switzerland, Cham (2024).
31. Reeves, T., McKenney, S.: Design-based research. In: *The Sage encyclopedia of educational technology*. pp. 189–191. SAGE Publications Inc. (2015).

32. Gray, C.M.: Paradigms of knowledge production in human-computer interaction: Towards a framing for learner experience (LX) design. M Schmidt AA Tawfik Jahnke Earnshaw2020 Learn. User Exp. Res. Introd. Field Learn. Des. Technol. EdTech Books Httpsedtechbooks Orgux. (2020)
33. Allen, M.W., Sites, R.: Leaving ADDIE for SAM: An Agile Model for Developing the Best Learning Experiences. American Society for Training and Development (2012)
34. Schmidt, M., Glaser, N., Riedy, T., Rietta, C., Huszti, H., Wagner, J., Smith, G., Gutierrez-Colina, A.M., Wetter, S.E., Guilfoyle, S.M., Patel, A., Modi, A.C.: Learning Experience Design of an mHealth Intervention for Parents of Children with Epilepsy. *Int. J. Med. Inf.* 104671 (2022). <https://doi.org/10.1016/j.ijmedinf.2021.104671>
35. Glaser, N.J., Schmidt, M., Wade, S.L., Smith, A., Turnier, L., Modi, A.C.: The formative design of Epilepsy Journey: A web-based executive functioning intervention for adolescents with epilepsy. *J. Form. Des. Learn.* (2017). <https://doi.org/10.1007/s41686-017-0011-3>
36. Schmidt, M., Beck, D., Glaser, N., Schmidt, C.: A prototype immersive, multi-user 3D virtual learning environment for individuals with autism to learn social and life skills: a virtuoso DBR update. Presented at the Immersive Learning Research Network: Third International Conference, iLRN 2017, Coimbra, Portugal, June 26–29, 2017. *Proceedings 3* (2017).
37. Glaser, N.: Formative Design and Development of a Three-Dimensional Collaborative Virtual Learning Environment Through Learning Experience Design Methods. *J. Form. Des. Learn.* 14
38. Waszkiewicz, A., Bakun, M.: Towards the aesthetics of cozy video games. *J. Gaming Virtual Worlds.* 12, 225–240 (2020)
39. Kelley, K., Clark, B., Brown, V., Sitzia, J.: Good practice in the conduct and reporting of survey research. *Int. J. Qual. Health Care.* 15, 261–266 (2003).
40. Naderifar, M., Goli, H., Ghaljaie, F.: Snowball sampling: A purposeful method of sampling in qualitative research. *Strides Dev. Med. Educ.* 14, (2017).
41. Köppen, E., Meinel, C.: Empathy via design thinking: creation of sense and knowledge. In: *Design thinking research: Building innovators.* pp. 15–28. Springer (2014).
42. Creswell, J.W., Poth, C.N.: *Qualitative inquiry and research design: Choosing among five approaches.* Sage publications (2016).
43. Siricharoen, W.V.: Using empathy mapping in design thinking process for personas discovering. Presented at the Context-Aware Systems and Applications, and Nature of Computation and Communication: 9th EAI International Conference, ICCASA 2020, and 6th EAI International Conference, ICTCC 2020, Thai Nguyen, Vietnam, November 26–27, 2020, *Proceedings 9* (2021).
44. animation, <https://www.artschoolcopout.com/work/animation>
45. Newbutt, N., Glaser, N., Francois, M.S., Schmidt, M., Cobb, S.: How are autistic people involved in the design of extended reality technologies? A systematic literature review. *J. Autism Dev. Disord.* (2023). <https://doi.org/10.1007/s10803-023-06130-3>