



RESEARCH REPORT 4

cti

SPIRITUAL LOOP PROJECT

on machine intelligence
& pastoral care





The Story of an Inquiry

As our name indicates, the Center of Theological Inquiry (CTI) is dedicated to asking new questions of global concern and convening the best researchers to study them across disciplines. The Spiritual Loop Project is a magnificent example of this kind of inquiry by CTI.

The inquiry began with a question raised by our visionary funder, the Templeton World Charity Foundation (TWCF), as part of its Diverse Intelligences initiative: “Can machine intelligence enhance spirituality?” As we launched our project, we refined that question to ask, “Can machine learning enhance the spiritual lives of disabled persons?” And we focused on videogaming as a promising medium to engage persons with disability and fellow church members in a pilot study.

At that point, CTI was extraordinarily fortunate to appoint the ideal researcher to ask that question, the Rev. Dr. Erin Raffety, CTI’s Research Fellow in Machine Intelligence and Pastoral Care. As an anthropologist and ethnographer, Erin had studied the social dynamics of disability and family life, a research interest which she took further in a landmark study of the experience of shared joy in families with disabled members. As a theologian, Erin was also engaged in research on the understanding of disability in congregations, leading to her pioneering book, *From Inclusion to Justice: Disability, Ministry, and Congregational Leadership*.

To complete our research team for this cross-disciplinary project, I am indebted to Professor Gordon Morison, Head of the Department of Computing at Glasgow Caledonian University. In response to my quest to find a graduate student who could develop the video game and machine learning component in collaboration with Erin Raffety, Gordon generously introduced us to his outstanding doctoral student, Maria Insa-Iglesias. As CTI’s Technology Fellow, Maria drew on her computing expertise to develop the *Spiritual Loop Game* with Erin and the game players.

Together, Erin and Maria have written this fine report on their research findings from the fieldwork study. Our research team has been guided throughout its work by CTI’s advisory board for this project. In thanking Erin and Maria for their collaboration, our advisors for their guidance, and TWCF for its grant, I commend this CTI Research Report to the wider research community for further inquiry on the potential of machine intelligence for spiritual progress.

William Storrar, PhD
Director



The Research Team

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Erin Raffety and Maria Insa-Iglesias would like to thank the Templeton World Charity Foundation for their generous support of this research.

We would also like to thank the Director of the Center of Theological Inquiry, William Storrar, for conceiving and supervising this CTI Research Project, and Associate Director Joshua Mauldin and Assistant Director for Administration, Jade Talag, for their administrative support.

We thank Glasgow Caledonian University for their partnership in providing the computing expertise for this research, specifically Gordon Morison and Gianna Cassidy.

We thank Professor John Swinton for Erin Raffety’s appointment as a visiting fellow at Aberdeen University, and the review of her Spiritual Loop Project fieldwork proposal by the university’s ethics committee.

We are grateful for the input and guidance of CTI’s Spiritual Loop Project Advisory Board on this research, specifically Gianna Cassidy, Hanna Reichel, Kathryn E. Ringland, Susan Schneider, Eric Stoddart, and John Swinton.

Finally, we would like to thank all of the research participants and their Christian communities, without whom this project and research would not have been possible.

Project Overview

The Spiritual Loop Project endeavored to answer the question, “Can machine intelligence enhance the spiritual lives of disabled persons?” through ethnographic research, prototype development, and experimentation with machine technology. With generous funding from the Templeton World Charity Foundation Diverse Intelligences Initiative and two years of sustained research, prototype development, and analysis (Fall 2020–Summer 2022), the pilot project explored this question through the lens of online videogaming in Christian faith communities. The results of the pilot project include a custom Minecraft game developed with significant input from disabled users, rich data collected from gameplay sessions with users, as well as focus group feedback following gameplay research. The data suggest that despite the significant challenges of artificial intelligence (AI) (the theory and development of computer systems able to simulate human intelligence) when it comes to disabled communities, this pilot study confirmed that the videogame Minecraft is a promising platform for developing an accessible digital environment and integrating machine learning to promote social and spiritual connections through collaborative play.

This project is the first research to integrate the heretofore siloed literatures of *videogaming and disability* and *videogaming and spirituality*. In contemporary videogaming, *machine intelligence* provides increased capabilities, fabricating opponents and generating interaction with the lived

environment of the videogame for users. These games facilitate important social flexibility for disabled users in that they can traverse virtual spaces in new, creative, and meaningful ways (Rapp and Ginsburg 2013; Ringland 2019). However, accessibility is a pressing concern for people with disabilities playing videogames (Ellcessor 2016; Ringland 2017). Overall, disabled people have not been prioritized in markets for leisure; in fact, their social needs and desires have been downplayed in casting technology to be a mere vehicle for assistance rather than human connection or creativity (Alper 2016). Katta Spiel and Kathrin Gerling show that this is especially true when it comes to neurodivergent persons, who are frequently treated as objects of education or therapy in videogaming (2020).

The silo-ing of these literatures reflect false assumptions that this study, alongside important, yet novel scholarship, also wishes to contest: for instance, (1) that people with disabilities do not necessarily desire social connection (Jaswal and Akhtar 2019); (2) that they lack the cognitive or social capacity to engage in spiritual growth, fellowship, and discipleship (Swinton and Mowat 2006; Swinton 2016; Raffety, et al. 2019); or (3) that their efforts to forge connections online and through online gaming represent actions that are somehow deviant or run counterproductive to the social (Alper 2016). As many of the above scholars have shown, it is these assumptions on the part of non-disabled persons, clergy included, that often stymie communication and connection with people with disabilities in congregations, other congregants, and their religious leaders.

Owing to these concerns, our research design *centered disabled users*, particularly neurodivergent persons, as experts, relying on fieldwork with them and their communities to shape the development of a videogame prototype to test the insights for ma-

chine intelligence in enhancing spiritual lives. It was disabled persons’ input in the preliminary fieldwork stage of research that led us to focus on building in Minecraft due to its familiarity and appeal and to develop a village-based game due to the interests of our players in exploring spiritual and natural environments and experimenting with worship participation and leadership (see Table of Design Goals 2.1 in “Prototype”). Although we wish time would have allowed for more sophistication and breadth in overall game development and more initial feedback and revisions following the launch of the prototype in Summer 2021, participant observation conducted with players and communities in Fall–Winter 2021–2022 demonstrated that participants were highly satisfied with the gameplay experience and that the machine learning elements, particularly custom tasks, cooperative tasks with algorithms, and NPCs, did offer opportunities and tremendous potential for collective spiritual engagement.

Therefore, even though as a pilot the modest prototype supported only a small community of users (n=8), the findings from the research have implications across the fields of disability studies, practical theology, and human computing and information, and offer potential for directing further research at their intersections and to the benefits of a diverse subset of users and communities. This report describes the timeline of research and project development in the Spiritual Loop Project (SLP), the research methods, the videogame prototype that was developed, and the results of the fieldwork conducted during gameplay and feedback sessions over roughly two years (Fall 2020–Summer 2022). Given the small scale of the existing study, the report also offers reflections on future directions for prototype development and implications for further research and study.

Among the exciting findings in this preliminary study are (a) the untapped potential of cooperative play in videogames as a catalyst for neurodivergent leadership in spiritual communities; (b) the novel use of machine intelligence as a vehicle for accessibility among neurodivergent and neurotypical players; and (c) the potential development of neurodivergent moderation of such online communities as an opportunity for machine learning to continue to develop as an ethical tool for human connection and spirituality. These first two findings were surprises in fieldwork: although we somewhat laid the conditions for neurodivergent leadership to flourish, its impacts and benefits were far beyond the scope of our imagination. Furthermore, although our partnership with neurodivergent research subjects kept machine learning’s accessibility potential in view, it was relatively late into the project that we realized that we were using machine learning in this distinct, novel way. Finally, the hope that future research will continue to center neurodivergent insights and leadership by making their moderation a key feature of the ethical use of machine intelligence is a direct insight of the research itself and remains a critical goal to using machine intelligence for humane and spiritual ends. This research just scratches the surface of what is possible, but clearly demonstrates the tremendous potential for machine intelligence to enhance the spiritual lives of disabled persons, provided those disabled persons remain central and integral to the use and development of technology for themselves and their spiritual communities.

Overall Timeline

AUGUST 2020

- Completed literature review

SEPTEMBER 2020

- Obtained Ethics Board Approval for research with human subjects from University of Aberdeen
- Recruited research subjects
- Advisory Board Report 1 submitted
- Advisory Board meeting 1

OCTOBER 2020-JANUARY 2021

- Conducted preliminary fieldwork with research subjects to inform game development

FEBRUARY 2021

- TWCF Progress report submitted

MARCH 2021

- Hired Technology Fellow, Maria Insa-Iglesias, PhD student, Glasgow-Caledonian University (GCU); began partnership with GCU
- Advisory Board meeting 2

MARCH-JUNE 2021

- Game development in Minecraft

JUNE-JULY 2021

- Early feedback solicited from research subjects

SEPTEMBER-DECEMBER 2022

- Gameplay fieldwork conducted with research subjects

JANUARY-FEBRUARY 2022

- Focus groups conducted and game feedback collected from research subjects

MARCH-MAY 2022

- Data analysis conducted

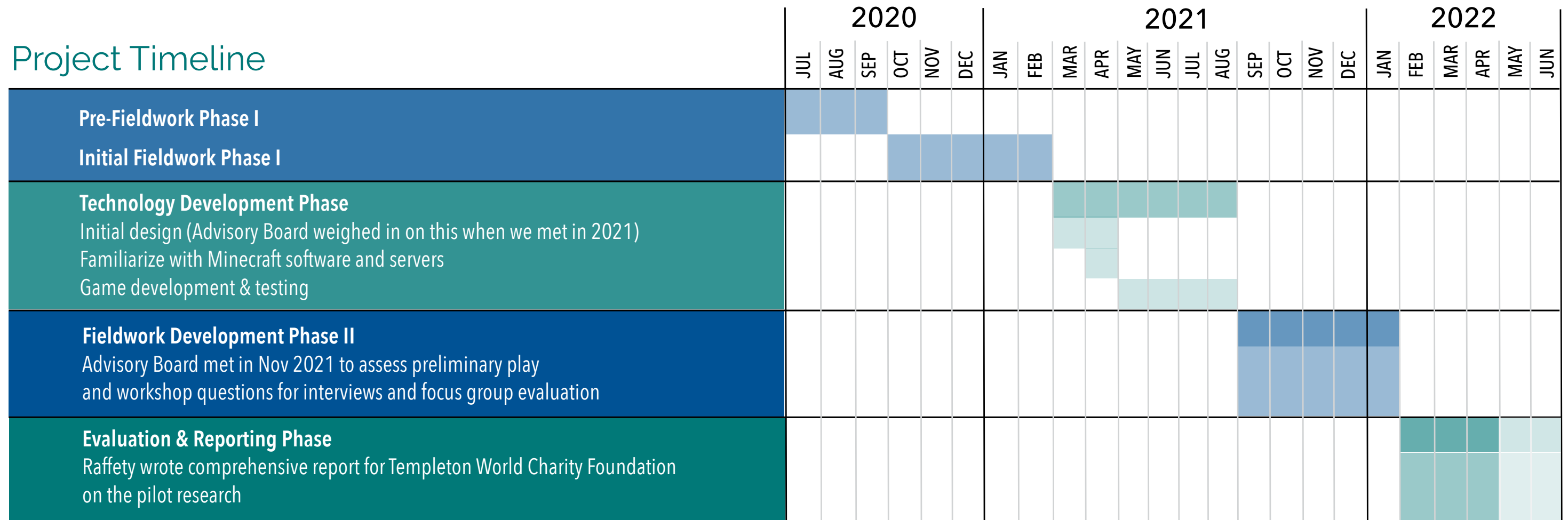
APRIL 2022

- Advisory Report 3 submitted
- Advisory Board meeting 3

JULY 2022

- Final report submitted

Project Timeline



Overview:

The research fellow recruited three research units (RU1, RU2, and RU3) to (1) offer insights into prototype development, particularly with respect to accessibility and spirituality game components; (2) observe and participate in gameplay sessions both prior to and after prototype development; and (3) finally, the research fellow conducted focus group feedback sessions at the conclusion of gameplay sessions. Qualitative data collected was coded and analyzed for focused and emergent themes, with particular attention to how the machine learning elements of the game impacted overall gameplay and evidence of spiritual communication and connection. The researcher used semi-structured interviewing, participant observation, and focus groups to gather data.

Recruitment:

Recruiting research subjects for the project was done through existing networks and social media. Given the small size of the project and the researcher's expertise with Reformed Christian theology, the decision was made to restrict the participants to Reformed Christian communities. Other criteria for participation in the project specified that communities must have disabled participants with prior experience in videogame play, as well as others in the community (disabled or non-disabled participants) who are willing to play with them. In other words, whereas disabled players were required to have prior knowledge of videogaming, non-disabled players were not.

The research only admitted subjects who were preexisting members of Christian faith communities.

These specifications were made in order to avoid recruiting and potentially harming disabled persons in requiring or training them to learn certain skills or adapt or adhere to Christian guidelines or principles. In other words, by ensuring that disabled persons already had expertise and interest in gaming, as well as affiliation with Christian faith communities, we attempted to ensure that they were not only willing, but knowledgeable and contributing participants to the project. The goal of the project was to center disabled persons' knowledge and affinity for videogaming as a key resource for Christian communities. Although disabled participants' knowledge of videogames and experience of disability varied considerably across the research units, each research unit was comprised of at least one disabled gamer and one non-disabled community participant.

Research Subjects:

The research fellow recruited a total of 8 research subjects who were grouped according to their preexisting community groups, in Research Units (RU). RU1 is formed by an adult (female, 60s) and a young adult with autism (male, 21); RU2 is formed by an adult (male, 50s), his daughter with mood disorder (11), a young adult (male, 20s), and a young adult (female, 20s); and RU3 is formed by an adult with fibromyalgia, PTSD, and anxiety (female, 40s), and her mother (female, 60s).

Research Subjects Table 1.1

RESEARCH UNIT	NUMBER OF MEMBERS	DEMOGRAPHICS	LOCATION	COMMUNITY TYPE
Unit 1 (RU1)	2	Adult female, white, 60s; Young adult male, white, 21, autism	New Jersey	Reformed Church
Unit 2 (RU2)	4	Adult male, 50s, Black and Latinx (father); Youth, female, 11, Black and Latinx, mood disorder (daughter); Young adult male, white, 20s; Young adult female, white, 20s	New Jersey	Lutheran Camp
Unit 3 (RU3)	2	Adult female, white, 40s, fibromyalgia, PTSD, anxiety (daughter); Female, white, 60s (mother)	California/ Wyoming	Presbyterian (PCUSA) Church

Incidentally, all disabled participants in the study were neurodivergent, although some had additional diagnoses. However, there was a wide variety across ages of participants and roles of those persons within worshiping communities: for instance, one neurodivergent participant was an 11 year-old girl (Unit 2) and another was the head pastor of a Presbyterian congregation (Unit 3). While Unit 1 was a traditional church community, Unit 2 was a group of camp counselors and a family who regularly attended a Christian camp. The pastor of Unit 3 left her call at a Presbyterian church in California during the course of the research, so we adapted to help her play the game with her mother, who is a member of another church community and was feeling socially isolated due to the COVID-19 pandemic.

In addition to this reformulation of RU3, a mother-son pair dropped out of participation in RU1 in Spring 2021, because the mother

claimed the son was not showing as much interest in videogaming as he returned to many of his pre-pandemic activities. The preliminary fieldwork phase also included pre-interviews and conversations with a number of pastors, rabbis, videogame enthusiasts, and disabled gamers who did not meet the criteria for selection and therefore did not become part of the larger study.

Fieldwork:

In Fall 2020, the research fellow completed initial interviews with interested parties, which were coded and analyzed for focused and open themes, and ultimately recruited three research units, existing Reformed Christian communities made up of 2-4 individuals, for the pilot study.

In Winter 2020-2021, the research fellow hosted focus groups to gather insight on what types of accessibility needs, gaming interests, and spiritual interests should be integrated

into game prototype; all focus groups were transcribed, coded, and analyzed. In addition to these group sessions, the research fellow also observed the majority of the disabled gamers on Zoom playing their favorite games. This helped the researcher experience the features disabled gamers particularly enjoyed so that she could work to incorporate them into the future prototype. This also allowed the researcher to begin to develop a method for conducting participant observation with gamers and their communities online, something that is not unprecedented, but needed a bit of adaptation given some disabled gamers' accessibility needs and the challenge of group, online play.

Although the researcher tested other gaming platforms such as Discord, due to widespread familiarity with Zoom and research participants' preference for visual and audio communication during play, the research fellow and the technology fellow developed a method for online gameplay that involved simultaneous Zooming for communication and data collection during play. The research fellow and the technology fellow tested this approach in Summer 2021 orientation sessions, during which participants were instructed over Zoom how to download the current version of Minecraft, log onto the server, and periodically share their screen to demonstrate challenges or observe other players' play. These orientation sessions also allowed research participants to give some initial feedback on some of the gaming elements, as the technology fellow was still working to complete the prototype through August 2021.

From September 2021 to January 2022, the research fellow facilitated the scheduling of Zoom gameplay sessions for each research unit. It should be noted that research units played exclusively with the research fellow and the other members of their unit so that the researcher could observe how the game impacted spiritual play, conversations, and relationships among persons who already had prior relationships. Again the goal was to foster enhanced spiritual connection versus initiate spiritual connection.

Overview of Gameplay and Feedback Data Collection:

The research fellow conducted a total of 5 play sessions with Research Unit 1, 4 play sessions with Research Unit 2, and 7 play sessions with Research Unit 3, each session totaling 1-1.5 hours of play, for a total of 30.5 hours, and occurring between September 2021 and February 2022. Each play session was recorded using Zoom and participants used screen sharing to provide sporadic video footage of various gameplay elements. After each session, audio transcripts were downloaded, edited, coded, and analyzed for open and fixed concepts and themes. The server console also reported data on advancements made in game sessions and interaction with NPCs that was utilized in data analysis. Finally, each research unit participated in a focus group exit interview that solicited feedback on emergent themes of interest following their last play session in January and February 2022. These interview responses were also coded and

Table of Play Sessions Conducted 1.2

RESEARCH UNIT	SESSION NUMBER	DATE	DURATION	PARTICIPANTS	NOTES
RU1	1	11/16/21	1.5 hrs	All	
RU1	2	11/29/21	1.5 hrs	All	
RU1	3	1/28/22	1.5 hrs	2/3	
RU1	4	2/1/22	1 hr	All	
RU1	5	2/22/22	1.5 hrs	All	Feedback/Beat game
RU2	1	10/1/21	1.5 hrs	All	
RU2	2	10/22/21	1.5 hrs	4/5	
RU2	3	11/19/21	1.5 hrs	All	Beat game
RU2	4	1/27/22	1.5 hrs	All	Feedback
RU3	1	9/23/21	1.5 hrs	All + tech fellow	
RU3	2	10/1/21	1.5 hrs	1/2	
RU3	3	10/20/21	1.5 hrs	1/2	
RU3	4	11/4/21	1.5 hrs	All	
RU3	5	11/23/21	1.5 hrs	All	
RU3	6	12/1/21	1.5 hrs	All	Beat game
RU3	7	1/18/22	1.5 hrs	All	Feedback

analyzed.

Fieldwork Limitations:

Because the research fellow both participated in and observed all gameplay sessions, gameplay cannot be studied independently from the guidance she provided throughout the sessions except through raw data collected regarding advancements made in the game, game progress, and interaction with non-player characters. Although the majority of sessions were attended by all members of the research unit, there were some sessions that lacked all attendees' participation. Although criteria for research participation necessitated that disabled players have prior experience and interest in videogaming, non-disabled players possessed a wide variety of prior experience and interest that significantly impacted

gameplay.

Given the number of players and variety of experiences, play sessions were quite difficult to schedule, and lack of technology access inhibited several play sessions. This is important to keep in view because owing to the digital divide (see Coleman 2015), and the restriction of internet access along existing minority lines, disabled persons regularly lack access and autonomy over technology use. For instance, one player could not play on his Chromebook and CTI provided a PC for him to play on. Additionally, the software did not allow players to play on phones or tablets, which would have increased accessibility.

Design Goals & Choice of Minecraft:

Focus groups from Winter 2020-2021, which were coded and analyzed for focused and open themes, identified the design goals below as priorities in game construction. The design goals are grouped with respect to the following fields: gaming (G), AI (A) and spirituality (S):

Table of Design Goals 2.1

GOAL TYPE	DESCRIPTION
G1	Strike a balance between something that has both skill-based and story-based elements.
G2	Allow for openness, exploration (many users seemed to enjoy this), and spontaneity in the game.
G3	Mix fantasy, reality and opportunities to allow users to take on multiple roles/perspectives.
A1	Increase access for participants and their communities.
A2	Increase social and spiritual opportunities. This use of AI somewhat dovetails with increased access, but if the game is able to learn people’s dominant modes of communication and interest, the game can serve as a prompter for social and spiritual connection.
S1	Make some of the abstract facets of faith concrete for users.
S2	Allow for actual play with religion, including authority.
S3	Create meaningful social interaction with others in the game.
S4	Confront social biases around disability and allow users to experience freedom, as well as connection.

Due to this guidance, the technology fellow chose to build the game within Minecraft, given widespread familiarity with the game among participants, malleability of the game, prior work in the game to support neurodivergent players (Hughes-Roberts 2020), and the potential for using non-player characters (NPCs) in the game to support collaborative play.

In addition to design goals provided through fieldwork, the Advisory Board also provided theological counsel and insight, particularly in the early stages of game development. For instance, the Advisory Board was instrumental in suggesting an incentivizing versus punitive reaction to nonproductive actions (“sin”) in the game.

Videogame Framework:

The technology fellow developed the Minecraft server by modifying Minecraft’s base software due to the Minecraft End User License Agreement (EULA). The license allows developers who purchase the Minecraft game to modify the game by adding modifications, tools, and plugins. The server was developed using CraftBukkit 1.16.5, a Minecraft server software modification.

We ran the server on Apex, a Minecraft server hosting service, and the research and technology fellows managed and maintained the server and player access to the game. The server was set up with features and rules, inspired by the Autcraft community (Ringland, et al. 2017), to create a fun, safe environment for neurodivergent players and their communities. These rules are safety measures that included: turning off violent monsters; giving each player the ability to keep their items safe in a chest tagged with their username; and monitoring and logging activity by administrators. The server was set up with custom properties and the most relevant are: players need to be on the whitelist to join the server; the default mode is adventure; the difficulty level is easy; there are no monsters or enemies; players can fly; and the nether world is disabled. However, what makes it unique is that the novel plugin is made using Bukkit API in combination with existing plugins, such as Crazy Advancements API, Lockette, WorldBorder, WorldEdit, and WorldGuard.

Storyline Description:

The game’s storyline starts in a small village (see Fig. 1) consisting of a main square, with a fountain, several villager houses, and a small church with a bell tower. Players can use this space but they cannot alter existing buildings (i.e., players cannot place or destroy structures in these spaces except in the dedicated areas with yellow outlines). It is up to players’ guile, creativity, and determination to build the village they want. The game’s purpose is to cooperate with players to complete a set of tasks (individual and cooperative), called “advancements” in Minecraft on each level, and make it to the last level to “win the game” (see Fig. 2 (B) for level 0 advancements and (C) for level 1 advancements). The advancements are designed to encourage interaction and cooperation and correspond to Christian biblical themes and principles. When players complete all the advancements, they are invited to participate in the great feast, a banquet that simulates the Last Supper. Upon completion of this final level, they advance to creative mode, where they are given access to all resources and can explore beyond the pre-existing village, simulating heavenly freedom. ▶



Figure 1: This figure shows a bird's eye view of the Spiritual Loop Project Minecraft server. The first environment where participants start playing is the village, which includes the fountain square, plots (yellow house plot and mural plot), and the church. This server is inhabited by Non-Player Characters who guide players, promote social interaction, and collaborative play to win the game.



Figure 2: This figure shows some scenes from the Minecraft server. Players start the game next to the fountain square (A), where they find a book with instructions about how to play, suggested by the chat. Players need to complete a set of individual and collaborative tasks (called “advancements” in Minecraft) that are listed in the book or can be visualized on the advancement tab: level 0 (B) and level 1 (C). The NPC, AI witness, guides players through the game and provides hints when interacting with it, for example, on the mural plot (D) or at the Community House (E).

Unique Features:

The *individualized tasks* are custom advancements where each player is required to interact with elements of the game or perform tasks that benefit the community. For example, the task “find your chest” requires players to find a chest labeled with their name; the task “build your house” requires players to place a minimum number of blocks into the configuration of a house on their plot of land to welcome others and interact with them; the task “speak to your neighbors” requires socializing and interacting with others in the game through utilizing the chat feature. Other individualized tasks include “discover the mural,” “call to worship,” “visit the church,” and “light the church.”

The *cooperative tasks* are customized advancements where cooperative play is required to benefit the community. For example, the task “share to care” requires sharing resources with others; the task “collaborate to discover the mural” requires cooperating to break blocks to discover the village mural. Players are not able to advance through the game if they do not discover the meaningful cooperation necessary to complete the tasks (see the hint provided by NPC in Fig. 2 (D) and (E)). Other cooperative tasks include “share time together,” “worship together,” and “the great feast.”

Although a few of the advancements can be individually completed (i.e. “find your chest,” “build your house,” etc.), most advancements require collaborative action to be completed (i.e. “talk with other players,” “share resources,” “share time,” “worship together,” etc.). Therefore, the game is designed to encourage multiplayer interaction and cooperation.

AI Components:

Non-Player Characters (NPC) and Decision Trees. Non-player characters (NPCs) operate through AI algorithms and provide realistic interaction with human players in the game. As an existing feature of Minecraft, NPCs like farmers and villagers offer players a more realistic environment, enhancing the feeling of immersion and the players’ enjoyment.

Our custom Minecraft environment responds in one way or another depending on the actions that the players carry out, for instance conducting a cooperative task, individual task or interacting with other players. In other words, the idea is that each player explores the environment at their own pace, without a defined order, but all with the same goals of collaborating and interacting. The NPCs,

villagers and witness, have an important element in the game environment as they vary how each player explores the environment.

Our custom Minecraft game integrated NPCs like priests, pastors, farmers, and villagers into the existing environment. Villagers are designed with decision trees so that they provide a different message each time a player communicates with them. In this way, communication with NPCs is an important aspect in our videogame if players want to obtain all the hints to complete the game. However, our videogame has implemented NPC’s communication in a simpler way in this prototype. Each NPC has a list of messages to communicate to the players and each provides each message randomly, a simpler implementation based on decision-trees where there is just a single decision to make. These players did not allow for much interaction.

However, we also used white witness characters designed with decision trees who appear strategically in the game when players were taking nonproductive actions to provide hints, biblical/spiritual advice, or assistance regarding how to process through the advancements. The implementation of the witnesses has been done following the diagrams in the Figures 3 and 4, a simple implementation based on decision trees where the NPC decides based on a set of conditions. For instance, when a player is looking for

a plot to build a house and decides to build on sandy ground, a non-solid foundation (as attested to in scripture), an AI witness character appears and provides a hint. Because the game is designed with the idea that creations need to be built on a solid foundation, if a player continues to build on non-solid ground, the AI witness will appear with a message “right click.” If the player clicks on it, the NPC provides the hint, “Hey, your house foundation will not last here... be like a wise person who builds their house upon the rock.”

Another example of the integration of AI NPCs into the game as helpers is when a player needs to break blocks to discover the mural. If the player decides to break too many blocks without engaging in cooperative play, an AI witness appears. When the player clicks on it, it responds, “Call your neighbor to help you break the pink blocks!” (Fig. 2 (D)). Hence, the game encourages players’ freedom of exploration and creativity while providing them spiritual mentorship through NPCs as they progress through the various advancements and levels.

Cooperative Task Algorithms. The tasks are designed with an algorithm that hinders advancing the videogame levels for those players who try to advance merely individually.

For instance, when a player is looking for a plot to build a house and decides to build on sandy ground, a non-solid foundation, an AI witness appears and warns the player, and any block placed on sand will disappear.

Another example of the obstacles to hinder players from advancing the videogame levels without collaboration is when the player decides to break too many blocks to discover the mural without engaging in cooperative play. If the player keeps breaking blocks after the AI witness appears and warns the player about the need to collaborate, this player will be prevented from breaking more blocks (see Figure 3 algorithm “ $Tbb = Tbb + 1$ ” that checks the number of blocks broken in the mural by each player).

The last obstacle that hinders players from completing the whole videogame is when the player completes all advancements by themselves. The player will not be able to complete the whole videogame until everyone has completed all the advancements. It is at that stage, when a new space appears, called “Community House,” and all players will be able to complete the last two advancements and win the game together. Figure 3 shows the algorithm that checks if (A) “discover the mural” and (B) “collaborate to discover the mural” are completed. Afterwards, algorithm (C) (see in detail in Figure 4 (C)) checks if three or more players have completed Level 0 advancements and, afterwards, Level 1 advancements. If all players have completed Level 0 and 1 advancement, the Community House will load.

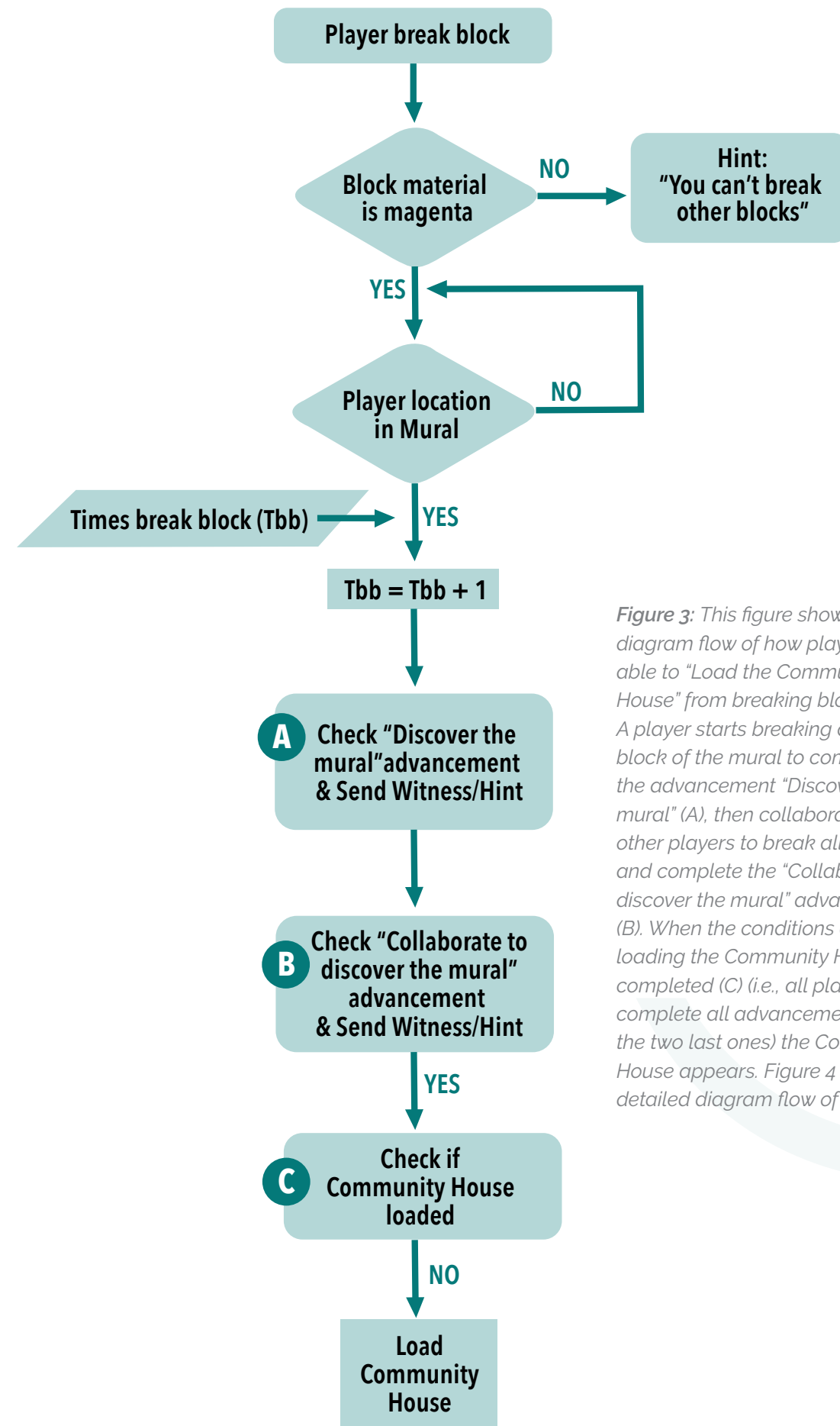


Figure 3: This figure shows the diagram flow of how players are able to “Load the Community House” from breaking blocks. A player starts breaking a pink block of the mural to complete the advancement “Discover the mural” (A), then collaborates with other players to break all blocks and complete the “Collaborate to discover the mural” advancement (B). When the conditions of loading the Community House are completed (C) (i.e., all players must complete all advancement, except the two last ones) the Community House appears. Figure 4 provides a detailed diagram flow of A, B and C.

Figure 4: This figure shows a detailed diagram flow from the instance a player breaks a block till the Community House is loaded.

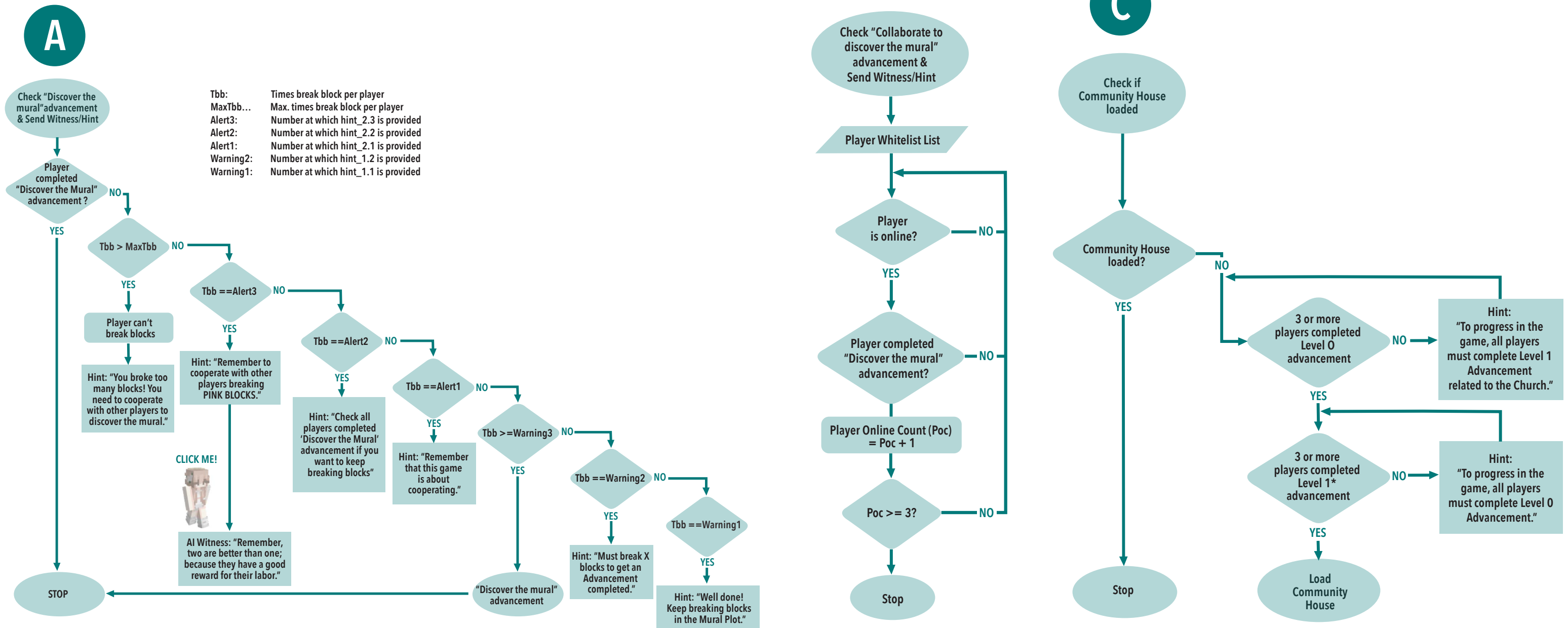


Diagram A) checks if players have completed the "Discover the mural" advancement counting the times a pink block is broken and sending hints while progressing correctly. If a player breaks more blocks than permitted, the NPC, witness, appears and clicking on it, the witness provides a hint encouraging to play cooperatively.

Diagram B) check if players have completed the "Collaborate to discover the mural" advancement counting that at least 3 players have completed the "Discover the mural" advancement and all pink blocks are broken.

Diagram C) checks if the Community House is loaded; if not, text hints are sent through the chat to provide them instructions on how to progress.

Gameplay Fieldwork Results

Our study demonstrated the critical role of cooperative play in fostering connection and leadership among neurodivergent people and their faith communities and potential for NPCs to be used to foster accessibility and cooperative play among neurodivergent people and their faith communities. The results section first reports these results specific to key AI elements in the game such as custom advancements, collaborative play, NPCs, and mentorship. Next, results are assessed along the lines of spirituality, highlighting three key findings in the project: (1) play as a key spiritual practice; (2) play with religious authority; and (3) neurodivergent leadership.

AI Elements:

Advancements. It took research units an average of 4-5 sessions of play to complete all the advancements in the game. Some players reported not understanding when or how they had made advancements due to lack of familiarity with Minecraft, whereas others noted that the charms that sounded and visual messages displayed really helped them understand when they had completed an advancement. Although the research fellow did not tell players what to do or how to do it, she did

provide encouragement toward actions that would facilitate progress through the game advancements. This encouragement, as well as repeated reminders regarding basic play in Minecraft, were noted as important support for participants. Players reported and displayed a high degree of satisfaction at winning the game, and all players reported really enjoying and appreciating the final game action being eating a feast together, because of its Christian biblical import. However, most players reported also being slightly dissatisfied at finishing the game, because they wanted it to continue indefinitely so that they could continue to explore, work together to complete advancements, and create. In general, the advancements provided a good amount of structure and meaning to the game, as players enjoyed puzzling through the various tasks together.

Collaborative Play. All players noted that they loved the collaborative aspect of the game: they noted that this was enhanced by playing together on Zoom and being able to talk and help one another as they played.

"I think it was our interaction in general because when one of us encountered something, regardless of our locations, the collaboration more was us talking it out, identifying the problem and then us all going, okay, I'll go and get this.

I'll get this. We'll all meet up over here. Um, not necessarily collaboration, um, virtual only. So it was kind of like with the, with the dialogue portion of it added."

(RU2 January 27, 2022)

Collaborative Play

Potential of NPCs for Accessibility

Many players named cooperative tasks built into the advancements, including discovering the mural, worshiping in the church, sharing resources, and eating together, as highlights of the game experience from both a social and spiritual perspective. Many players expressed a desire to collaborate on individual advancements, such as "build your house," which is not supported by the existing game. However, players also engaged in collaborative and connective tasks outside of the advancement structure. For instance one player spontaneously asked, "Dad, will you dance with me?" (non-advancement related). Players also engaged in collaborative tasks like constructing a chapel, rescuing one another from water and caves, and exploring surrounding villages, that exceeded

"Uh, the witnesses are the only ones that I really think impacted the gameplay because they were the ones offering little clues to things. Um, the other ones, um, if you play in regular Minecraft, oftentimes you click and ... there's a specific type of conversation you can have.

And I found the other ones to be just a little, they felt flat to me, it felt like they could have been used to do a little bit more within the ... Yep. Other than just bumping into them and them saying, how are you liking the game ... "

(RU3 January 18, 2022)

the advancement structure of the game. There were also numerous instances in two research units of players engaging in spontaneous worship, singing or prayer with one another in the midst of the game, related but also unrelated to the actual play of the game.

NPCs. Players were asked explicitly about their interaction with NPCs in the game, which were designed to discourage destructive actions and encourage collaborative play. The results of these conversations were mixed, with some players reporting that they were not quite sure how to interact with these NPCs and therefore did not find them particularly helpful. ▶

Other players noted specific instances when NPCs helped them avoid destructive or non-productive actions in the game, such as the witness character that directed them to build their house plot on solid ground or witness characters that provided hints in the church or encouraged cooperation in revealing the mural. The server data reported the same mixed evidence that the NPCs sometimes guided players toward collaborative play and sometimes did not. One possible reason for these mixed results is that the witness players were not familiar characters within the existing Minecraft game and the invitation to “right click” on them for clues may have confused players, as right click usually affords different actions in typical Minecraft gaming. Finally, some players reported frustration that they could not interact more with NPCs.

Mentorship. Many players reported that the research fellow’s facilitation of the play sessions, as well as reminders of how to play were essential features of accessibility for the players. Scheduling play sessions with multiple group members was incredibly challenging, so having a mentor was necessary for this purpose alone to bring the group together online for the sessions. Mentorship was not originally conceived as a feature of accessibility in the game, but even getting players set up to play proved a challenge because players did not all have equal access to technology and some

players needed a lot of guidance to get on the server and get playing. As such, the research fellow provided a range of formal and informal support to research units, including but not limited to supplying one player with a computer, hosting many sessions with the technology fellow to teach players how to download the game, access the server, and play it, and even offering players emotional and pastoral support.

Spirituality:

Play as a Spiritual Practice. Players reported a high level of satisfaction with the game, especially regarding the Christian spiritual elements integrated into the game environment, the way the game relied on and achieved collaborative play through cooperative tasks, and the general experience of being able to talk as they played together and experience the virtual environment as an opportunity to de-stress, connect with one another in a novel way, and explore this novel spiritual environment together.

One disabled pastor commented that the game provided a safe and peaceful retreat from the stresses of the pastorate, where keeping her hands busy and withdrawing from job-related stress offered her significant relief.

The research fellow facilitated check ins and prayers with this research unit for whom players were experiencing challenging and traumatic experiences of illness and life transitions. The depth of these spiritual connections testifies to the critical, yet under-valued role play offers in spiritual communities. ▶

Play as a Spiritual Practice

“For me, quite honestly ... the ability to Zoom and talk about some of the real stuff that was going on in my life. While I was playing something that was allowing me to kind of numb some of the, the real serious effects that I was facing.

There was a lot of depression and a lot of anxiety that I've experienced over the last few months. And Minecraft gave me something to do with my hands and visually that didn't involve me having to necessarily look someone in the eye and give a real detailed explanation, but also with the Zoom then I was able to talk about, but this is what's going on and this is how I'm feeling about it.

And so it was almost therapeutic in a way.”

(RU3 January 18, 2022)

Play as a Spiritual Practice

Player A: He went out the back door!

Player B: I went out the back door to the church. Friends to Friends has a back door, we have plenty of backdoors. We have a back door that's by the office.

Player A: Friends to Friends has many doors actually.

(RU1 February 22, 2022)

Another research unit flowed in and out of conversation about their particular worshipping community and play within the game, blending the two quite seamlessly.

Taken together, these findings point to the importance of play as a spiritual practice, because it allows neurodivergent players to manage stress, engage socially in a low stakes environment, experience spirituality, and even play with religious authority.

Play with Religious Authority. We know that in online settings, religious authority tends to be more flexible, as communities renegotiate religious hierarchies in digital space, and this was certainly the case in our game. Neurotypical adult council members and pastors struggled to play the game and had to rely on younger players or neurodivergent players for guidance and insight. This created opportunities in which they were literally being led through the game by the neurodivergent players. We cannot conclude that the blossoming leadership in neurodivergent players' lives is directly tied to the game, but we can offer this game as one instrument in dismantling power hierarchies in faith communities that often stymie conversation, faith development, and leadership.

Play with Religious Authority

One player, a neurodivergent pastor, described this shift in her own ministry in the following way:

"For my own thinking on disability in ministry ... I think it really set an example. The covert ableism that we see a lot of times where we're assuming if somebody 'abled' can't do it, then somebody disabled probably can't and yet that's not actually always the case and often isn't the case ... that was probably one of the most theologically important experiences of the game.

It made me reassess some of the things I was actually doing in my own congregation and led to some changes in a couple things that maybe bothered a few of my congregants because they mentioned them to me afterwards, but they were the right things to do.

So I invited two new members to light candles on the second Sunday, and one woman, she's had brain cancer.

I knew there was a possibility of not doing it 'properly' quote unquote. And, um, I was right. She went to the first two candles. She started doing the reading and about halfway through she forgot what she was doing and proceeded to light all of the rest of the candles, including the Christ candle, and all the members of the church were like, Oh no!

And yet, if you were watching what she was doing, as you were listening to the reading she was doing, it was remarkably appropriate. And somebody asked me about it later. And I was like, if you could have felt the Spirit of God moving up there while that was happening, you would have known she was supposed to light all of those candles.

We've become captive to the ritual but we forget that the ritual is there for us.

And is it possible that someone who doesn't understand it in the same way, might actually have a deeper insight into what's actually going on here?"

(RU3 January 18, 2022)

Here the pastor reflects on how the playfulness of the game space caused her to reflect on religious authority and ritual in new ways, prompting her to reform some of her practices of ritual in ministry.

Neurodivergent Leadership

"What stood out to me was ... the realization that actually in trying to make this more accessible to the abled members of the community, we made it more accessible to the disabled members of the community who knew how to use it and teach others to do it."

(RU3 January 18, 2022)

Neurodivergent leadership. Above all, the research fellow observed that in each research unit, neurodivergent players offered a key leadership role in play sessions. In research unit 1, the neurodivergent player intuitively flew through advancements and offered spontaneous worship that punctuated play sessions. During the course of the research, the pastor in research unit 1 actually left worship leadership to her neurodivergent congregant while she was on vacation! Although this instance cannot be attributed to gameplay, it speaks to the budding leadership among neurodivergent persons in both game and church settings. In research unit 2, an 11 year-old girl emerged as the ring leader, teaching adults how to play and orchestrating advancement and non-advancement oriented collaborative play. In research unit 3, a neurodivergent pastor implemented regular gameplay as a coping mechanism for stresses in the pastorate and provided sophisticated theological insights on her gameplay experience.

Notably, in each research unit, neurodivergent players took clear leadership roles in teaching others how to play, organizing others in the collaborative tasks integral to game play, providing spiritual insights, and providing feedback on the strengths and weaknesses of the game. These leadership experiences were paralleled by increasing leadership development in neurodivergent players' Christian communities. For instance, over the course of the study, the pastor in RU3 left her congregation and took a new call and this experience was mediated through the game that she said provided her an opportunity to destress, keep her hands busy, and feel safe. The neurodivergent member of his congregation in RU2 took over worship leadership for the pastor when she was out of town following Christmas 2021-2022. This was a new experience for him and while it wasn't something directly attributed to the game, the pastor noted that it has been something that's happened alongside leadership in other community settings.

Discussion

These instances and quoted feedback indicate that gameplay did foster spiritual connection and pastoral care among players, which was the overall goal of the prototype. However, more research is needed to sharpen the relationship between these effects and the roles of advancements, collaborative play, NPCs, and mentorship in this outcome.

AI + Mentorship. Although the connections regarding the relationship between NPCs and collaborative play in the study need further development, the role of mentorship in relationship to NPCs that emerged during fieldwork also offers an interesting avenue for development and study. Indeed, disability communities have long been suspicious about the intervention of AI and approaches to neurodivergent persons have been particularly limited within videogaming to educational or therapeutic interventions. This study suggests that combining NPCs with mentorship creates a supportive environment in which technology generates and relies on human interpretation. From the outset, the study was designed with neurodivergent players and their specific Christian communities in mind. Although indefinite continuation of the study with research fellow moderation would be untenable, the supportive relationship between NPCs and mentorship, as well as the emergent role of neurodivergent players as leaders suggests that neurodivergent players themselves may be able to provide suitable mentorship for such communities in

the future. This has the advantage of expanding neurodivergent players' role in both gaming and spiritual communities and offering them further opportunities to interact with and interpret NPCs.

NPCs for Accessibility. Furthermore, the role of NPCs and mentorship should be studied not just for their relationship to collaboration but to accessibility. To explain, the indication from all players that more guidance and support in gameplay would be helpful was surprising, especially given some of the neurodivergent players' high level of expertise with Minecraft. However, this suggests that in an interdisciplinary environment such as the one created, all players can benefit from more instruction, guidance, and support. NPCs should be investigated as a multi-faceted element of accessibility support given player interaction. The goal would be to vary interaction with NPCs based on different levels of need and desire for connection. Again, the critical role of mentorship could and should be further studied and explored as these NPCs become more sophisticated.

Summary of Overall Findings

The following provides a synopsis of the findings with respect to artificial intelligence, disability/ accessibility and spirituality/pastoral care from the Spiritual Loop Study. Results are elaborated upon in the pages that follow and some future directions for research are provided.

Artificial Intelligence

- 1) Study demonstrates the critical role of cooperative play in fostering connection and leadership among neurodivergent people and their faith communities.
- 2) Study demonstrates the potential for NPCs to be used to foster accessibility and cooperative play among neurodivergent people and their faith communities.

Disability/Accessibility

- 1) Study demonstrates the importance of centering disabled perspectives in research, especially research that involves artificial intelligence in videogaming.
- 2) Study broadens the concept of accessibility beyond physical accommodations toward social supports that increase accessibility not just for neurodivergent players but for communities of play.
- 3) Study demonstrates the importance of human facilitators in collaboration with artificial intelligence to allow for maximal access.

Spirituality and Pastoral Care

- 1) Study demonstrates the critical value of online gaming to disrupt traditional hierarchies within religious communities and empower and experiment with spiritual leadership of disabled members.
- 2) Study demonstrates insightful value of play within Christian worshipping communities that is underutilized as a vehicle for connection and care.
- 3) Study demonstrates the importance of online gaming spaces to provide respite for neurodivergent people.
- 4) Study demonstrates the importance of reflecting on existing value systems/theology within games in order to make religious gaming most efficacious.

Recommendations for Future Study & Development

This pilot study offers several directions for future study and prototype development.

- 1) *Expand Disabled Mentorship.* Centering disabled perspectives and voices in this project demonstrated the value of neurodivergent leadership in spiritual gaming communities. Therefore, as the discussion indicates, as the AI gaming elements are refined and expanded upon the lines below, the role of mentorship in the project needs to center disabled perspectives and leadership. We imagine that the future for this project is a community mentored by neurodivergent church leaders themselves: this is the real advent in accessibility.
- 2) *Isolate AI Gaming Elements to Measure Impact.* With regards to future study, it may be prudent to isolate the cooperative tasks, NPCs, and mentorship aspects to understand their varied impacts on collaborative gameplay. For instance, rerunning the pilot study with new research units without mentorship could help specify the extent to which mentorship is a necessary feature for accessibility within such communities. However, given existing research with Autcraft and the evident variety of experiences of disabilities among neurodivergent people, maintaining mentorship and gathering further data regarding cooperative tasks and NPCs would help to specify the role that such gaming elements play in enhancing not just connection but accessibility for neurodivergent and neurotypical playing communities. In order to further the study in the relationship between NPCs, cooperative tasks, and collaborative play, NPCs and cooperative tasks should be reworked for integration and sophistication into the Minecraft framework.
- 3) *Integrate SLP Advancements into Minecraft Game.* With regards to the prototype development, ideally Spiritual Loop Game advancements should be integrated into existing Minecraft advancements in order to clarify their relationship to the overall game. This would create a scenario in which experienced players do not become frustrated or merely engage in parallel play (choosing to complete traditional Minecraft or SLP advancements), but appreciate the challenge of the game as integral and relevant to existing Minecraft tasks. This would also involve increasing the sophistication of the game so that existing Minecraft elements do not have to be deactivated, which was another source of confusion and frustration for experienced players.

This would also integrate the spiritual components further into the existing ideology and even theology of the Minecraft world. This is something Kate Ott (2019) and others (Campbell, Grieve, and Steffen 2014; Coleman 2015) have detailed at length, but it is perhaps all the more important in a spiritual game setting, in which players actively suspend some aspects of reality to further the goals of Christian community. ▶

We learned this because our gameplayers experienced and expressed some spiritual tension amidst the values and the limits of technology. For instance, players grasped and embraced the collaborative aspects of the built game, but when some individual tasks (“build your house”) weren’t possible to collaborate on, players experienced limitations of Christian community that were tied to the structural confines of the game. Players also felt the tension of completing parallel spiritual advancements within a Minecraft game that has its existing set of advancements. As one player commented,

Integrative Spirituality

“[We’re] building an experience for, for spirituality and collaboration, and the first thing it tells you is how to make swords. You’re defending your crops and it’s like, no in our game, we would, what is it? We would mold our swords into plowshares. And we would give the crops away ... We could bend it to our narrative.”

(RU1 February 22, 2022)

This came as a watershed moment in that for us to do our due diligence in the construction of this game, we cannot just make theologically relevant play (as we did with slowing actions due to destructive or rewarding cooperative actions), but we need to study Minecraft in depth to understand its theology so we can collaborate with or confront it with eyes wide open.

- 4) **Further Expand Points of Accessibility through AI.** All players mentioned a desire for more instruction, feedback, and cooperative tasks in the game.

Therefore, the existing prototype should provide more in-game instruction to describe the advancements in order to offer players clarity and connection. This can be done through the aforementioned directions 2 and 3, garnering and integrating disabled feedback regarding existing AI components (cooperative tasks and NPCs), as well as integrating SLP advancements and spiritual components into the existing Minecraft game.

However, there may be untapped opportunities for AI to increase accessibility given the insights of players:

AI for Accessibility

Player A: For me, there wasn't enough direction. I didn't really know like what I was doing and ... when it ended, I was surprised because I felt like I didn't really know what I had done. Like, I couldn't remember a few tasks, but there were other things that just happened. Or I was told to press this button and a little banner popped up and then we at the end, uh, had made it, um, as like an inexperienced player like that, I was missing some of that.

Player B: [There was] too little direction [in the game]. There should've been a little more like push for them. Some things like for the, um, what was it? The, the, the dinner thing. It should have been more straightforward on where like we had to be at what time.

(RU2 January 27, 2022)

As aforementioned, the results regarding NPCs with respect to accessibility and cooperative play were mixed and inconclusive. However, we believe that the very approach to using aspects of machine intelligence, including advancements, NPCs, and cooperative tasks to increase accessibility in the videogames, is a contribution to future studies and knowledge-making. Whereas much literature and research participants often thought of accessibility in rather rigid, physical terms (screen readers or augmented buttons, for instance), this study used machine learning as a tool for accessibility that could help players navigate through the game and foster social collaboration and spiritual connection. Although this is somewhat substantiated by other studies from a social vantage point (Bondi, Xu, Navas-Acosta, and Killian 2021; Ringland, et al. 2016), no other videogame to our knowledge has used machine intelligence as a tool for increasing access to spiritual connection and this is worthy of further attention and research. Providing a cooperative gameboard is one way in which this element could be highlighted and create a feedback loop for players in the game. Individual advancements should be expanded to allow for more cooperative work, which is rewarded in gameplay. This would also involve substantially expanding the machine learning aspects of the game, as most cooperative tasks run on algorithmic-based plug-ins and a cooperative game board would also involve plug-ins.

- 5) **Refine Sophistication of NPCs.** Finally, NPCs should be reworked to be further integrated into the existing Minecraft environment, appear more realistic, and allow for more sophisticated interaction with players. Again, this will involve substantially expanding the machine learning aspects of the game, as the current NPCs do not allow for dialogue or interaction.

As a pilot study, the Spiritual Loop Project provides compelling data that when disabled users' insights are centered, machine learning can be a viable tool for enhancing disabled persons' access to spiritual connection and community. *This is the first future direction for research, conducting more disabled-led studies of how machine learning can increase access to all aspects of spiritual and social life.* Indeed, the SLP shows that accessibility is often construed far too narrowly in terms of physical access. Although physical accessibility continues to be important in videogaming, we suggest that embracing machine learning as a viable tool for accessibility reflects philosophies such as multimodal learning and universal design that show great promise for disabled and non-disabled communities alike, but have yet to be integrated into machine learning and videogaming. With the help of disabled users and researchers, future studies can make sure that machine learning is used in ethical, meaningful ways to expand rather than constrict access in videogaming.

Given the impact of the SLP on both disabled and non-disabled congregants, we suggest *a second promising direction for future research is studying videogaming as an avenue for invigorating spiritual life through play for all community members.* In our study, videogaming subverted existing religious hierarchies by giving young, disabled gamers access to playing with different aspects of religious life and different roles in religious community. There

are important directions of study here for revisiting how religious communities conduct religious education, thinking about how play can be integrated further into worship life, and thinking about how religious hierarchies may be subtly constructed along able-bodied lines. Further study is needed to assess how videogaming challenges those hierarchies and whether videogaming can have an impact on those hierarchies in the long term.

A final direction for further research might consider the relationship between videogames and disabled leadership formation in order that religious communities can learn from how it is that videogames dismantle some of the barriers to access that still exist for disabled persons pursuing leadership in religious communities. A sustained study of why it is disabled people gravitate toward videogaming, what it offers them, and how it offers opportunities for leadership formation would continue to dismantle stigmas around videogaming and disability, as well as broaden knowledge around what these communities offer. Although studies of disabled children and videogaming abound, few studies take disabled adults' interest in videogaming seriously, and this attention is needed if subsequent studies are to understand videogames as more than just games in social and spiritual worlds.

As of July 20, we have submitted an application to broaden our game prototype to interreligious play and foster spiritual disabled online communities for neurodivergent youth through National Science Foundation BAA Convergence Accelerator grant. Our article, "Re-imagining Christian Education through Neurodivergent Fellowship, Play, and Leadership in Online Videogaming" has been accepted for publication in a special issue of *Gamenviroments* on "Teaching with Games: Educational Gaming in Religion, Philosophy, and Ethics" in 2023. We hope to continue to solicit further funding for this research and continue publishing the results in relevant journals. [!\[\]\(d66ff64371a51729ac8c1cdaa685ba6f_img.jpg\)](#)

Academic Papers & Presentations

The following listing provides citations for academic publications, presentations, and works in progress related to findings from the Spiritual Loop Project:

CONFERENCES & PRESENTATIONS:

- March 2022. Invited lecture to "Living with Robots" course. Exeter University, Department of Theology.
- Insa-Iglesias, Maria and Erin Raffety. 2022. "Dismantling Ableism and Ageism in Spiritual Care and Connection with Machine Intelligence in Minecraft." In 2022 "Dreaming Disability Justice in HCI" Workshop of the 2022 Conference on Human Factors in Computing Systems (CHI), ACM. ----- Conference Presentation. 2021. "Spiritual Loop Project" Diverse Intelligences Summit.

ACADEMIC PAPERS:

- Insa-Iglesias, Maria, Katta Spiel, Erin Raffety, and Gordon Morison. Under Review. "How Cooperative Tasks Supported by NPC Players Can Enhance Collaboration and Accessibility for Neurodivergent People." *CHI Conference Proceedings & ACM Digital Library*. April 2023.
- Raffety, Erin. Accepted & in progress. Guest Editor and Contributor. Special Issue for the *Journal of Disability & Religion* on "Neurodiversity and Theological Education." Fall 2023.
- Raffety, Erin and Maria Insa-Iglesias. Article accepted & in progress. "Re-imagining Christian Education through Neurodivergent Fellowship, Play, and Leadership in Online Videogaming." Special Issue, *Gamevironments* 2023.

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Press & Popular Publications

The following links provide press and popular publications about the Spiritual Loop Project offered over the course of its duration:

- Center of Theological Inquiry, video interview about the Spiritual Loop Project (July 2020): <https://vimeo.com/435177271>
- Center of Theological Inquiry initial interview with Research Fellow, Erin Raffety (Fall 2020): <https://www.ctinquiry.org/blog/2021/4/14/75v9p0b4jp301njbpw70p9lbq47b7w-7mrx>
- Center of Theological Inquiry blog, "Theology in the Age of AI: Machine Intelligence & Pastoral Care" (Summer 2021): <https://www.ctinquiry.org/blog/spiritualloopproject-wjmzk>
- GCU Glasgow Caledonian University, "GCU PhD Student Helps Develop Videogame to Engage Young Disabled People with Religious Communities" (Aug 27, 2021): <https://www.gcu.ac.uk/currentstudents/news/studentnewsspiritualloop>
- The National Scot, "GCU and Princeton Team up in Minecraft Bid to Aid Religion of Young People" (Aug 29, 2021): <https://www.thenational.scot/news/19544765.gcu-princeton-team-minecraft-bid-aid-religion-young-people>
- Spiritual Loop Project Game Demo (September 20, 2021): <https://www.youtube.com/watch?v=Lz5qm3uxy2Q>
- The War Cry, "Virtually Groundbreaking" (Jan 8, 2022): https://issuu.com/salvationarmyuk/docs/wc_08_january_2021_web/6?fr=sZTkxYjQ1NTA0OTU



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