# KidCraft: Co-Designing within a Game Environment

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## Abstract
Co-design research with children is a field that continues to find new ground and expand as it explores new, and more effective ways to design. As children become more enveloped in a world of technology and video games, it follows to leverage these kinds of experiences for use in our design toolbox. In addition, continuing to explore how to include a larger global audience through distributed co-design can advance the design process. The study presented in this paper serves as a preliminary exploration of virtual sandbox game environments as a co-design tool. Utilizing a design inclusive research approach, we discuss what led us to explore this environment as a co-design tool, how it evolved over time, our success in using it to include those who could not attend in-person sessions, and our plans to expand on this research in the future.

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Design; Children; Participatory Design; Minecraft

## ACM Classification Keywords
D.2.2 [Design Tools and Techniques]: Evolutionary Prototyping

## Introduction
Co-design with children is an important topic within the SIGCHI community. Researchers [2, 5, 7] have established

**Figure 1:** Aerial view of Kidcraft community village.

various philosophies for designing with children in multiple ways. These philosophies are usually low-tech and enable children to express their ideas with tools that are accessible to them such as paper, crayons, and other art supplies. But what happens when children are bored with these techniques and want more? How can researchers leverage popular technology to include and engage children in the co-design process, especially those in an urban environment?

This paper reports on Kidcraft, a customized three dimensional (3D) game world that enables children and adults to co-design within an environment regardless of their location. In this paper, we describe previous work related to children and technology-based co-design, the motivations for the project, and the observed experiences and success of the environment.

## Background

For some time now, children have been included in various aspects of the technology design process. They have been users, testers, informants and design partners [2]. These roles enable children to participate at varying stages throughout the design process. At the same time, these roles enable design researchers to elicit feedback from children or work with them as full-partners in the cooperative design (co-design) of new technologies. In Druin's Cooperative Inquiry [2], children and adults work together to design new technologies for children as design partners.

This work was completed as part of an intergenerational design team called KidsteamUB which is located in the city of Baltimore and meets twice a week. The children who participate in KidsteamUB self-select themselves and participate for one school year. All of the children live within the geographical boundaries of the city of Baltimore, Maryland. A number of the boys in the group talked endlessly about the game Minecraft, a popular game in which players build virtual worlds using blocks.

As researchers, we know that we need to continuously re-evaluate our methods to include more people in the participatory design process. We explored how traditional co-design techniques could be adapted for geographically distributed, asynchronous use in previous work [9]. Because of our motivation to include more children in the design process and the intense interest in technology, specifically Minecraft, we felt that we could leverage the synchronous nature of multi-player games as well as their persistent worlds as a base for our design sessions.

## Process

In order to address this technology-focused group, we explored new technology-based tools to enable collaborative design. We evaluated online environments to use in KidsteamUB and chose an open source clone of Minecraft called Minetest. This project spanned several months culminating in a week-long, persistent design session occurring in the game world.

This project followed a Design Inclusive Research [3] approach in order to investigate using a game environment as a platform for intergenerational co-design. In this approach, prototypes become means of creating knowledge. In each design session, adult researchers worked with the child design partners to create new things. The adults were also tasked with taking notes and making observations about how the design process progressed through the use of prototypes. At least one researcher walked around and took pictures and videos of the different teams in the real and virtual world. At the

**Figure 2:** The town square was the central meeting place for the co-design team.

end of all sessions, the entire intergenerational design team would get together and debrief about the experiences of the day. The notes, photographs, and recordings were analyzed for content and used to construct the narrative of the development and evaluation of the prototypes.

## Kidcraft

For this research, we created a customized, multiplayer game world hosted on a private server using the open source Minecraft clone, Minetest. We called this world Kidcraft as a portmanteau of Kidsteam and Minecraft. Due to its similarity to the popular Minecraft game, all of our child design partners were at least somewhat familiar with the premise and functionality of this environment. We used Kidcraft in two in-person design sessions over two weeks.

The first session gave our child design partners the chance to explore and familiarize themselves with Kidcraft through a simple design task. Design partners were split into three pairs and coupled with an adult design partner. For this session, our groups were given the design challenge to re-create the lab that we meet in during our KidsteamUB sessions. Adult design partners expressed their ideas as well as performed troubleshooting when child design partners got stuck or needed help to figure out controls.

Before the second session, the adult team members further customized the Kidcraft world to include more functionality. A flat, generic ground was created for the world in order to not have it look like a typical Minecraft world. This also enabled a blank canvas for our partners to build upon. With the new improvements, the design team was given the task of creating a virtual town or community in the new virtual space (See Figure 1). This session gave us the opportunity to have each of our child partners to work at separate computers and interact in the game instead of sharing. At the session start, we discussed what makes up a community or town and discussion was used as a starting point for the design of our virtual community.

At the end of this session, we felt that the game environment supported co-design in a co-located manner. In order to evaluate its effectiveness with a larger audience, we needed to have our design team use it outside of the lab.

To see how it performed as a geographically distributed design tool, we canceled our in-person design sessions and made the environment available on a private online server. Two members of the research team developed a Town Square among the buildings (See Figure 2). Participants needed to connect to the Kidcraft server with the client software. Throughout the week, five of the eight children and three of the five adults logged on to Kidcraft server.

Although the world was persistent and supported asynchronicity, we scheduled two synchronous design sessions within Kidcraft during the same meeting times as regular Kidsteam. The design goal of the sessions, as well as the week in general, was to design a library that would be useful to new members of Kidsteam. Because we were not sure if the design team would actually collaborate or just build their own versions, we designated one area to be the design space and outlined it in bright colors. A kiosk was also built in the game that listed the design challenge.

Three child designers and two adult designers attended the first synchronous session. The synchronous session ran similarly to a traditional, face-to-face design session. We held a brief meeting in the town square to discuss the

**Figure 3:** Interior and exterior views of the library created during Phase 3 design sessions.

design challenge. By developing a town square among the buildings that the children designed in the earlier session, we attempted to link the previous town-design sessions with this one and establish that Kidcraft is persistent and created for designing.

After the meeting, the design team "flew" to the designated area to begin designing and building the library (See Figure 3). In order to leave messages to other designers, team members made signs and placed them throughout the design. This also helped the researchers to understand why some design decisions were made as well as identify what some items built by the child design partners were meant to represent.

The design sessions became more and more asynchronous as the week went on. This was difficult because some team members did not attend the synchronous meetings at all. We learned after the session that some design partners wished not to participate in the design challenge and preferred to use the design environment as more of a personal sandbox. We also learned that some of the team members had technical difficulty in running the client software. Another issue that appeared was the inadvertent destruction of the world by design partners. One of our design team members had not attended the sessions where we first used Kidcraft and was unaware of the controls and the different elements available to him.

## Findings

In using the game environment, four important themes came to light: possession, collaboration, availability, and communication.

Possession was extremely important to the child designers. One thing that KidsteamUB strives to emphasize is that the designs created by the group are part of a bigger whole and that the individual ideas become part of the group's idea. During the use of Kidcraft, we found that the children were very keen on claiming ownership of buildings they created within Kidcraft even though the environment enabled the group to work together. Children described different elements of their designs as "my": my house, my fountain, my sign. However, most of these references were in describing the standalone things they built as individuals. Not until the accidental destruction of buildings did the possession really manifest itself. Usually friendly child participants became angry at the loss of their designs.

Collaboration became an important theme in the week-long design session. During the synchronous design session, the chat logs revealed a greater sense of collaboration than in the previous co-located session. During the library activity, Isaac asked the group "what about we label the books into sections" in order to be collaborative in his design idea. Besides building in Kidcraft, the child design partners helped each other with technical questions about the environment such as how to move around or choose different tools. Not only did the group work on a library for new Kidsteam members, but, they broke off and worked on smaller projects. One child, Geoff, suggested "Let's build a sign that says Kidsteam" to which another member agreed to build one with him.

Another important theme was availability. In-person KidsteamUB takes place two days a week for 90 minutes but Kidcraft enabled the team members to participate whenever they were able to. Although we organized a synchronous design session with the tool, the team members came and went at different times over the week. The earliest logon by one of the children was just after 7:30AM and the latest was just before 7:45PM with most

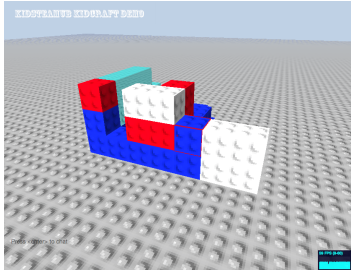

**Figure 4:** Prototype Web-based building tool.

sessions starting after school. That means that the children were accessing Kidcraft within a window of 6 hours a day for 5 days.

This improved availability had three important consequences. First, the design team could take more time to develop their ideas and build the in-game prototypes necessary to convey their designs. This was most noticeable when the children would go back to the previous projects and continue to work on their in-world house. *The second consequence was that team members who had not been able to attend Kidsteam sessions in-person were now able to do so in the virtual environment*. In particular, one team member's mother had an unexpected change of work schedule and he was unable to attend KidsteamUB sessions. We invited him to the Kidcraft world and he was able to participate in our synchronous sessions and contribute to designs. The third consequence was that more availability of the tool led to more accidental destruction.

The final theme that emerged from our observations with using a game environment as a participatory design environment was communication. In face-to-face KidsteamUB, design sessions are purposely set up to slowly focus the topic of conversations from unstructured discussions to design-based discussions. In the game world, the designers communicated differently than in face-to-face sessions utilizing the text-chat for on- and off-topic discussions. As mentioned, the game environment enabled members of KidsteamUB to attend sessions when they were not able to attend them as face-to-face meetings. Using Kidcraft, the team was able to meet and complete synchronous design projects as well as have the environment open for asynchronous development to accommodate different schedules of team members. More importantly, this flexibility extends to enable co-design for intergenerational design teams in different time zones. A multi-user game environment that supports building can be extended to enable opportunities for bringing participatory design to geographically distributed intergenerational groups.

One element that needs to be highlighted is the constant request of game features in the Kidcraft world. The best way to address this in future work is to design an environment that is different enough from an existing game to not unintentionally prompt expected behaviors through similarities in game experience. After the research, we developed a Web-based prototype environment that mimics building blocks in order to achieve this as well as limit technical difficulties because it runs in a Web browser without plug-ins. (See Figure 4).

## Limitations

Our goal in this research was to investigate if children could use a three-dimensional game environment to participate in co-design sessions in order to include more voices in the design process. There are a few limitations to this preliminary research. First, this study took place on three different occasions: two individual structured design sessions and then a one-week period of unlimited, unstructured designing. Second, the children that were part of our team had been design partners for less than six months. A longer study with more team members to evaluate this kind of co-design is needed to make generalizable claims. Another limitation of this research is that the tool we based the Kidcraft world upon utilizes a client-server model meaning that users at home required specialized software in order to participate. The software is only available as an executable for Linux and Windows-based operating systems. Mac OS users are

unable to utilize the environment without compiling it themselves or using specialized software which are both beyond the expectations of new users. This type of tool needs to run in a browser without additional software in order to be most effective in including more users in the design process.

## Conclusion & Future Work

In this paper, we have outlined preliminary work in using a game environment as a tool to support distributed intergenerational co-design. The environment successfully supported several weeks of design sessions with children and extended the design sessions from synchronous meeting times to open, asynchronous activities. We found that the flexibility and accessibility from home enabled children who could not attend in-person sessions to continue to participate with the group. Future work on this topic will include the continued development of a Web-based tool that does not rely on specialized client software. Additionally, the tool will need to borrow the affordances of a building game without setting the expectation of game-features that may be detrimental to design activities.

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