Utilizing a User-Centered Design Process to Create Learning Modules in Minecraft for Middle School Aged Students

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Digital literacy and computational skills have become essential for people to succeed in their professional life. Our team designed learning modules in Minecraft to introduce students to computational thinking in an informal and engaging way. We decided to work with Minecraft because many students are already familiar with the game and because the technical characteristics allow us to customize learning experiences to better serve our purpose. In order to build content that was useful and accessible, we followed a user-centered design process, putting students at the center of every design effort. Over the course of two workshops we collected observations with 14 students to identify pain points in a Minecraft world intended to teach the game's basic mechanics. The two workshops were administered where we explicitly asked students to be a part of our design team. During the first workshop, students were asked to work through a tutorial module designed to teach Minecraft game mechanics. We wanted students to tell us what changes should be made to make the tutorial more fun and easier for new players. For the second workshop, students worked through a Redstone theme park with eight 'rides' designed to introduce them to circuits. Students were asked to be game testers and to document what issues they had, where the issues occurred, and what could be done to improve the game. At the end of both workshops, a reflective session was conducted with the students about their experiences. Observations included documenting technical problems such as students not being able to place blocks and usability problems when they did not know how to complete an activity. The workshop also included a Jeopardy game that we created to conduct a posttest of students' knowledge of the game after completing the Minecraft tutorial. We were able to identify areas where a lack of clarity and the presentation of information in the activity lead to a majority of students incorrectly answering questions and where students may have struggled due to lack of experience with the game. Lastly, we conducted a heuristic evaluation that helped us improve the instructional language to provide more context to the activities and iterated on our designs that hindered the student's ability to understand and complete the activities. We present on our findings and methods for conducting collaborative design sessions with children within Minecraft to create and improve upon learning modules for computational thinking exercises.