

What-if Hypothetical Implementations in Minecraft (WHIMC)

Purpose

The goal of WHIMC is to develop computer simulations that engage, excite, and generate interest in science. WHIMC leverages *Minecraft* as a learning environment for learners to interactively explore the scientific consequences of alternative versions of Earth via “what if?” questions, such as “What if the earth had no moon?” or “What if the earth were twice its current size?”

Learners using our mods are invited to make observations and propose scientific explanations for what they see as different. Given ongoing discoveries of potentially habitable worlds throughout the Galaxy, such questions have high relevance to public discourse around space exploration, conditions necessary for life, and the long-term future of the human race. Studies in our project are occurring across three informal learning settings: museum exhibits, after school programs, and summer camps. Our research is driven by the following research questions:

1. What technology-based triggers of interest have the strongest influence on interest?
2. Which contextual factors are most important for supporting long-term interest development?
3. And, what kinds of technology-based triggers are most effective for learners from audiences who are underrepresented in STEM?

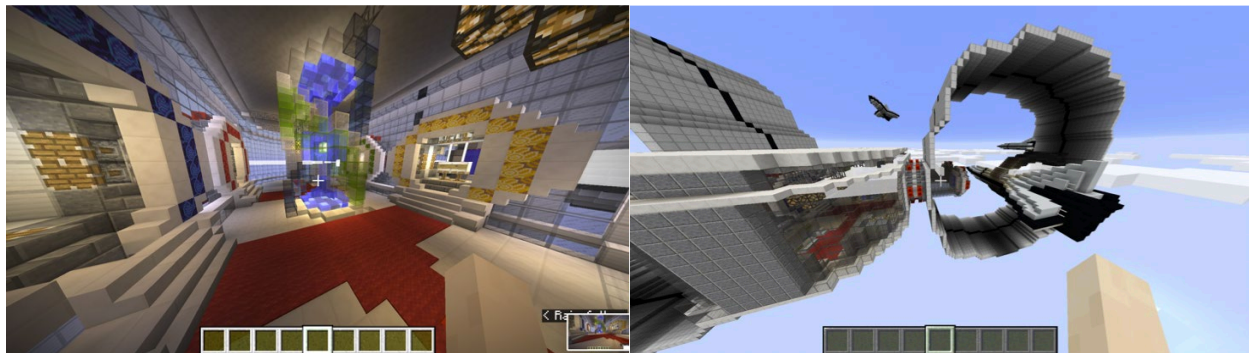


Figure 1: The main “hub” on our server that include portals that transports players onto different planets (left). The “hub” viewed from outside. It is modeled after a space station (right).

The “Hub” & Alternate worlds

Our server features a main “hub” [Figure 1] where anyone who enters can access portals that teleport to earth in the following conditions: 1.) normal baseline earth, 2.) earth with no moon [Figure 3], 3.) earth with a different tilt [Figure 4], and 4.) Earth at a much cooler temperature [Figure 5]. Portals were color coded to ease navigation of the entire group (e.g., the instructor could say, “Everybody go to the red gate!”). We designed the maps to encourage exploration of each terrain and to create a sense of adventure, thus we decided on using an aircraft as means of transporting between different spots on a single map. This

was particularly important to highlight how vastly different the terrain can differ within one planet, and to raise questions from participants on the conditions that can or cannot sustain life.

These world explorations are supplemented by short science lectures about each world. For example, the lecture on colder-Sun explains why a planet's color emission is counterintuitive; red-hot actually means that the planet is much cooler, whereas the hottest glow on the sun emits a blue-green color. Following lectures, campers were asked to write out scientific observations on wooden signs, a preexisting object in the game commonly used to denote a message to other players. After campers are prepped with knowledge about MC and ways to build and manipulate within the game, we ask them to form their own "what-if" hypothetical questions.



Figure 3: Baseline Earth (left). Earth at a tilted axis, which exposes one side of the planet constantly to the Sun (right).

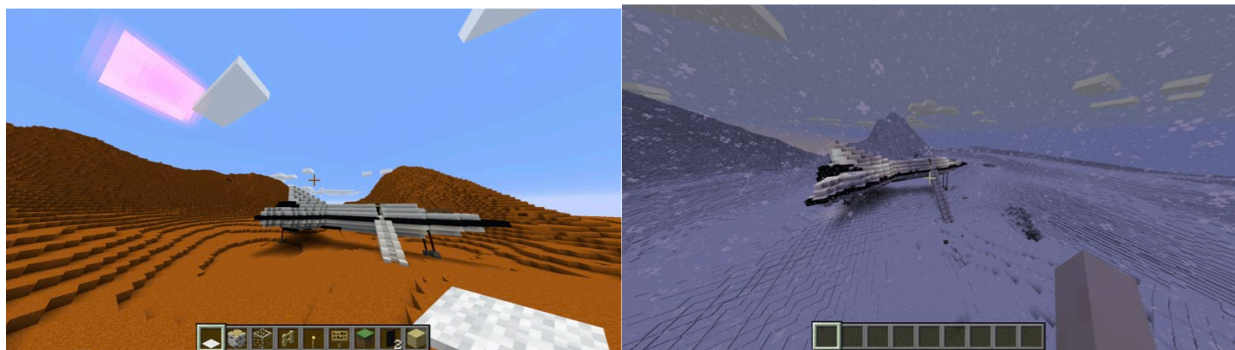


Figure 5: Earth at a cooler temperature. Each screenshot shows a different part of the same planet.

About the Team

WHIMC is an NSF-funded research project conducted by an interdisciplinary team of researchers at the University of Illinois at Urbana-Champaign, the University of Maine, and the Phillip and Patricia Frost Museum of Science in Miami. Collaborators and data collection sites include the C-U Community FabLab, The Children's Museum of Indianapolis, Learn 01 in Miami, and the Urbana Neighborhood Connections Center.

Acknowledgement

This material is based upon work supported by the National Science Foundation under Grant No. 1713609. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.