Cultivating Creativity to Integrate Computation and Science Problem Solving in Informal Learning

H. Chad Lane, Brian Guerrero, Jeff Ginger, Kriti Mathur, & Win Lawson

Project URL: https://publish.illinois.edu/stemc-minecraft/

Project Overview: We investigate the design of a Minecraft-based integrated learning environment for computational thinking, creative scientific problem solving, and data science. Research focuses on knowledge gains and changes in interest in STEM.

> Minecraft is an effective and motivating environment for the acquisition of coding skills and creative scientific problem solving for middle school STEM learning.

Lessons Learned & Insights Gained

- STEM-based problem prompts in a game environment lead to high levels of engagement (as compared to, say, programming math equations).
- Learners rapidly learned a real-world programming language (Lua): Average 11% gain in knowledge/skill occurred in between 6-10 hours of contact time.
- Computational creativity as a strategy to extend human capability was evident in several dimensions, kids enjoyed having a new power to affect the world

Equity

- We have taught over 50 diverse participants in Illinois, California, and Colorado to code creatively during camps/afterschool events.
- Our content provides a wide range of choices for interest-driven learning. Projects are self-selected from across STEM subject areas with a high degree of customization and personalization possible throughout the experience.

New Challenges & Next Steps

- Next challenge: integrate data science with current Science+CT content. How can we integrate data collection, analysis, and visualization skills in Minecraft?
- What are the best methods to analyze learner code and in-game behaviors?
- Flexible and effective computational creativity takes time, how can this be achieved in a combined formal/informal learning context?