Co-Robotic Games for Low-Resource Learners
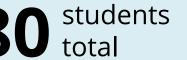
Carnegie Mellon University

BOYS & GIRLS CLUBS OF WESTERN PENNSYLVANIA

Co-design with STEM-disidentified youth in low-resource afterschool settings

6 research sites **80** students total **20** weeks x 1hr

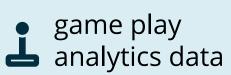**120** hours codesign videos student design artifacts game play analytics data
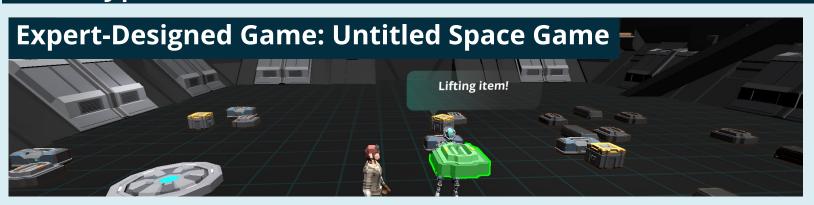

Career affinity

Computing bias

Findings

- Leading codesign as a minoritized researcher entails a multi-faceted negotiation of power (Uchidiuno, et al., 2021).

- Game design facilitates connections between multiple interests, e.g., art, dance, programming, gameplay.

- Students want to make and play different games, even in the same room.

- Codesigning a game may prime learners to think critically about games in everyday life.

Updating robot games to cobot games

Collaborative robots – *cobots* – are designed to work with humans, not replace them. What learning affordances are created in educational games when learners program robots to *assist* them in a game instead of being the game? What game designs work best?

Prototypes

Expert-Designed Game: Untitled Space Game

Lifting item!

Game designers and subject matter experts created a short game where players program a cobot to help clean out a cargo bay.

Codesigned Game 1: Super Slime Battle

Codesigned with afterschool clubs. Players defend a base against waves of enemies with a cobot that can fight or gather items. Programming is part of a Use-Modify-Create cycle tied into retries.

Codesigned Game 2: Acceleration City

Codesigned with a rural club. A multiplayer open-world driving game where the cobot must intelligently boost, magnetize, and otherwise help the player under fluid rules playground-style.

Codesigned Game 3: Zillah City

Codesigned with an urban club serving low-SES African American students. A third-person shooter with a cobot that captures enemies stunned by the player.

Findings

- Cobots allow programming to become a part of any game, without turning it into a Programming Game.
- There are many viable ways to implement programming into gameplay, warranting further exploration.

Directions

- Codesigning one additional cobot game with a team of low-SES African American girls.
- Continued iteration on all games.
- Produce a multigame package allowing free choice over game, but consistency of learning content.
- Model learning pathways around cobot programming. Do roles assigned to the cobot evolve predictably?