

immersive robotics

Girls Immersed in Robotics Learning Simulations

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Introduction

Project GIRLS is a Foundational Project in the Societal Impact theme that proposes to broaden participation of middle-school



Latina girls in CS and robotics with an immersive narrative of helping people affected by a natural disaster.



Participating students will build and code robots and drones in a week long program.

YEAR 2	Girls control group.	Boys and girls control group.
YEAR 3	Immersive narrative with girls.	Immersive narrative with girls and boys.

Broader Impacts

Test robotics curriculum immersed in a narrative to engage girls.	Broaden participation by engaging under-represented students in CS and robotics.
Engages 64 Latinx students including 48 girls in a week long robotics curriculum.	Based in Holyoke, MA with 45% Puerto Rican population and 29% poverty rate.

Curriculum Differentiation

Immersive Narrative Intervention	Control Group
Students given roles of first responders.	No roles given.
Maps of Puerto Rican cities with labelled points of interest like hospitals and airports. Buildings Model and crates of food and water for delivery.	Simple black and white maps and un-marked crates.
Dramatic use of video, audio, lighting, stories from hurricane survivors. Data dashboard.	Informational videos of technology. No data dashboard.
Game elements, gameboard, victory points, countdown, surprise elements.	No gamifying.
Cooperative, cross-team collaboration.	No cross-team collaboration.
VR (possibly clues, maps, training tools).	No VR.
Discussion of the social, ethical, economic, legal, and trust implications of co-robotics.	Some discussion of these issues.
Discuss how robots can be used to help people.	Discuss innovations like self-driving cars.

Project Partners

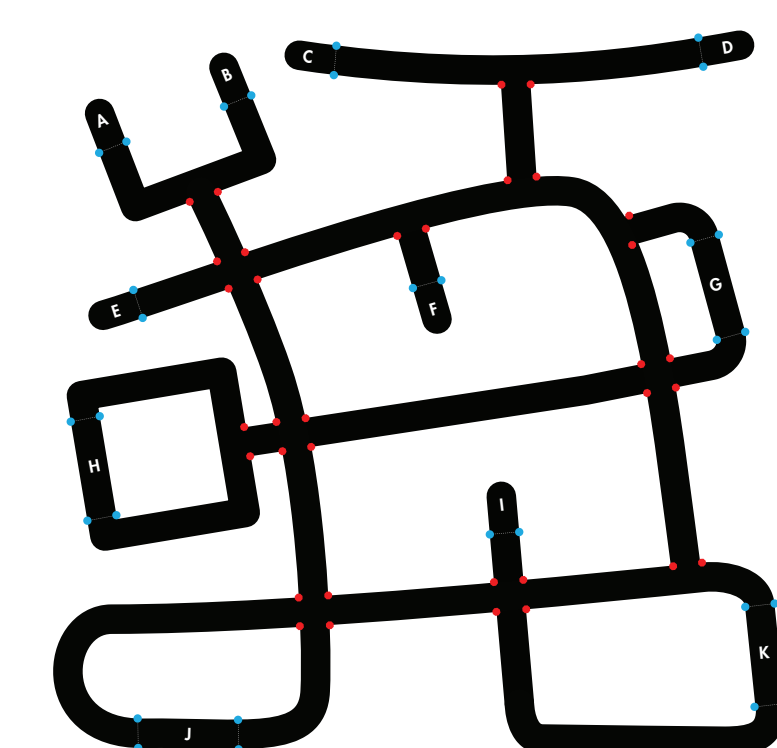


Research Questions

Do immersive experiences improve girls' learning and interest in computer science and robotics?

Does working in all girl vs. mixed gender groups affect girls' learning and interactions in robotics?

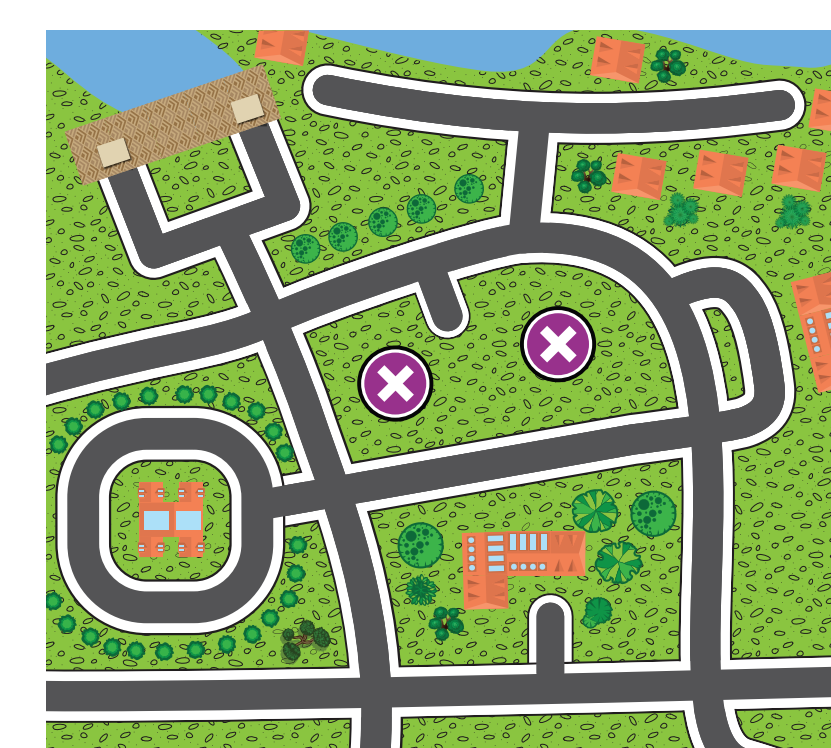
Year One Activities



Control Challenge Map



Forklift and Container



Immersive Challenge Map



CSTA Lending Library



Girls Inc.



CSTA Drone Workshops

Curriculum

Co-robotics Activity	CS and Robotics Concepts
Design and build robots	Robotics terminology, engineering, design
Program robot movement	Sequential coding
Program robots for line following and delivery	Sensors, conditionals, loops
Create mobile app to control robot	Event-driven programming
Program robots to detect IR beacons	More complex looping and selection
Fly drones with controllers and video feeds	Flight and video concepts
Program drone grid pattern for mapping	Conditionals, loops, mapping concepts
Final challenge with robots, drones, students	Co-robotics concepts and programming

Methodology

Research Design: Mixed Methods

- Quasi-Experimental and Observational
- Two x Two Group Design
- Intervention (Immersive Environment vs. Control Group)
- All Girl Group vs. Mixed Gender
- n = ~64

Data Collection

- Pre-Post Content Test, Self-Efficacy, Career Interest Surveys
- Field Notes using Collaboration Observation Protocol
- Video and Audio Collaborative Problem-Solving Conversations
- Individual and Artifact Interviews
- Final Problem Solutions (program and execution)

Data Analysis

- Ancova (repeated measures) – Pre-post data
- Levels of Coordination in Collaboration – Video/Audio Data Collaboration Observation Protocol
- Microgenetic Analysis of Conceptual Development – Video/Audio Data and Artifact Interviews
- Classification of Final Solution – Coding, Execution
- Thematic Analysis - Interviews

Timeline

	Year 1 9/18-8/19	Year 2 9/19-8/20	Year 3 9/20-8/21
Phase I - Develop Curriculum and Assessment			
Development of co-robotics curriculum			
Development of immersive simulation			
Pre/post content test, surveys, interview questions			
Pilot aspects of curriculum in Holyoke Codes workshops			
Revise curriculum and update assessments			
Phase II - Conduct Experiment			
Recruit participants, collect informed consent/assent			
Control groups with Girls Inc. and Boys & Girls Club			
Experimental groups with Girls Inc. and Boys & Girls Club			
Conduct data collection and perform data analysis			
Phase III - Disseminate Results			
Create and update project web site			
Prepare and submit conference proposals			
Make curriculum available on website			