STEM Game Design: Students as Mentors and Designers

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Project Staff

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Project Partner

McKinley Technology High School

Washington, DC

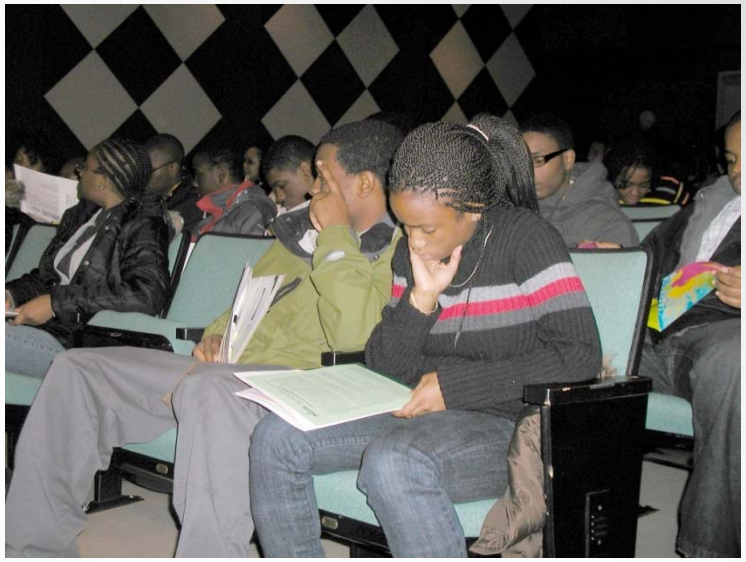
Biotechnology – **Information Technology** – Broadcast Technology

Project Participants

High School Students

200 Students to date

Middle School Students



Washington, DC – Maryland – Virginia

Project Goals

- Increase STEM Motivation
- Improve STEM Achievement
- Exposure to STEM Content & Careers

Project Approach

- Design and develop STEM video games
- Work with Scientists & Experts
- Site Visits and STEM Demonstrations
- Mentor Middle School Students
- Professional Development for Teachers

Implementation
(140 instructional hours)

- Fall Game Design Session
  - 10-weeks: Saturdays 10:00am – 12:00pm (60 students)
- Spring Game Design Session
  - 10-weeks: Saturdays 10:00am – 12:00pm (60 students)
- Summer Institute
  - Gaming Camp (60 mentors)
    - weekdays 10:00am – 2:00pm
- STEM Summits

Students as Game Designers

Fostering Metacognition

- Extends student learning by putting students in the role of game designers. Students are challenged to:
  - Become metacognitive about how games function
  - Use of audio, visuals and text to communicate ideas
  - Know what helps users understand a game and what makes a game fun

Design Studios

- In an engaging “design studio” environment, students learn technical skills that they apply on projects that have real value in the world (Hetland, Winner, Veenema & Sheridan, 2007).
  - They collaborate and critique each others’ work
  - They reflect on what they have made and envision new possibilities for their projects and their future work

STEM Summit

George Mason University

December 7, 2007

- 120 High School Students
- GIS – Dr. Barry Kronenfeld
- Design Studio Thinking – Dr. Kim Sheridan
- Game Design – Dr. Kevin Clark
- Information Technology and Engineering – Dr. Bernard White
- STEM Undergraduates

Students attend Innovations in eLearning Conference at George Mason

Students meet Sid Mier at Conference

STEM Summit
McKinley Technology High School
October 9, 2008

- Dr. Bernard Harris
  - 1st African American astronaut to walk in space
- 300 High School Students
- Advanced Technology Demonstrations
  - Computer Science
  - 3D modeling and simulation
  - Network engineering
- STEM Undergraduates

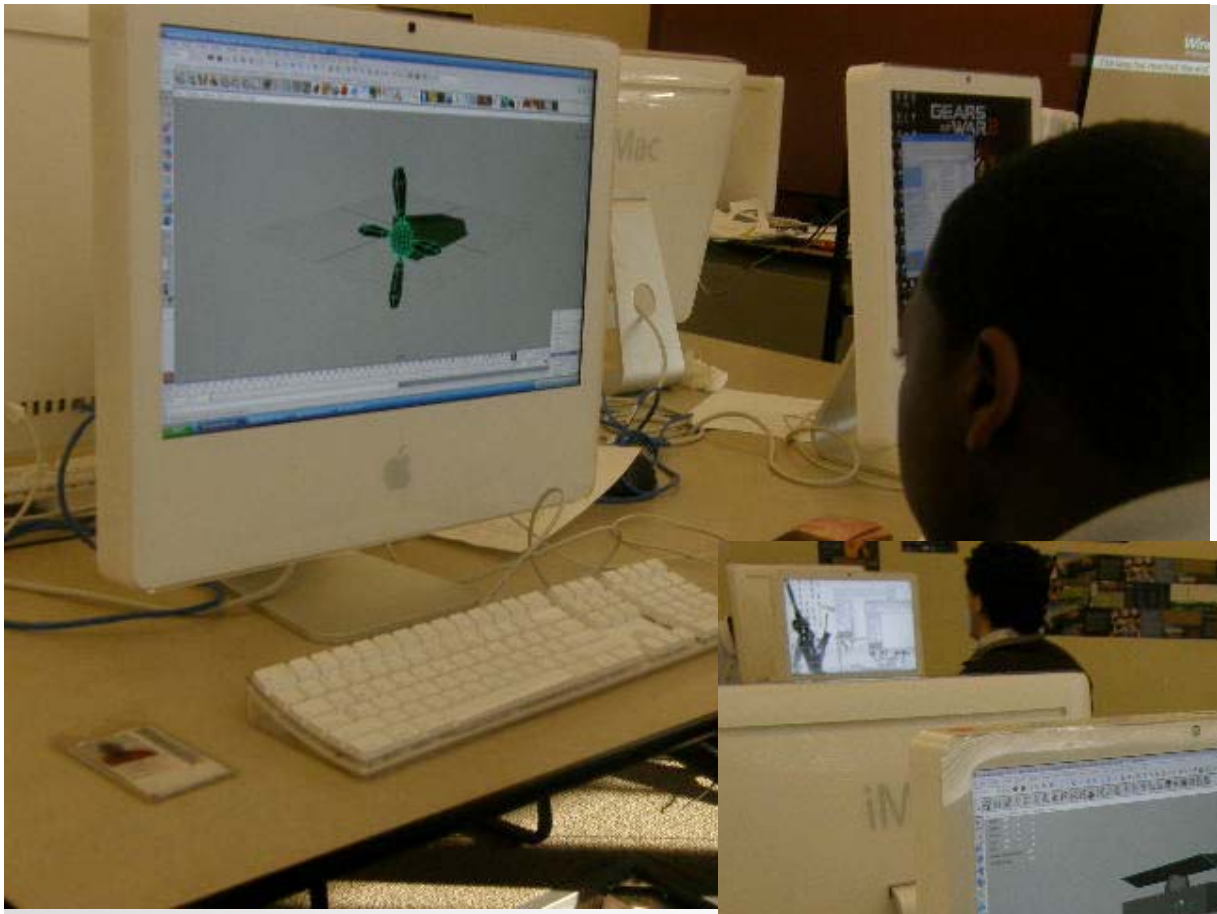
Dr. Bernard Harris participated in the rendezvous with the Russian Space Station, Mir. During the flight ,Dr. Harris became the first African American to walk in space. His space travel includes 129 orbits and 2.9 million miles. Dr. Harris is a national leader in promoting STEM achievement among minorities. The Dream Tour is an inspirational STEM experience for the conference participants.

Mario Armstrong – Host is able to translate technology for non-tech audiences through his radio shows, tv appearances and public speaking engagements. He hosts technology talk shows on XM radio, NPR, WYPR and WEAA. Recently, Mario was on CNN demonstrating the Ninendo Wii fit video game.

Kevin Clark PhD is Associate Professor at George Mason University and is the Lead Research Director for the NSF –ITEST grant that focuses on the Institute of Urban Game Design at McKinley Technology High School. Dr. Clark will discuss the upcoming plans for this innovative Saturday program that is open to students from the Maryland, Virginia and DC area.

Bill Bates is Vice President For Government Affairs at the Council on Competiveness. He is the co-author of the Council's ***Five For the Future*** that identifies critical issues that will determine America's ability to compete and prosper in the global economy.

Dr. Bernard Harris, 1st African American Astronaut in Space

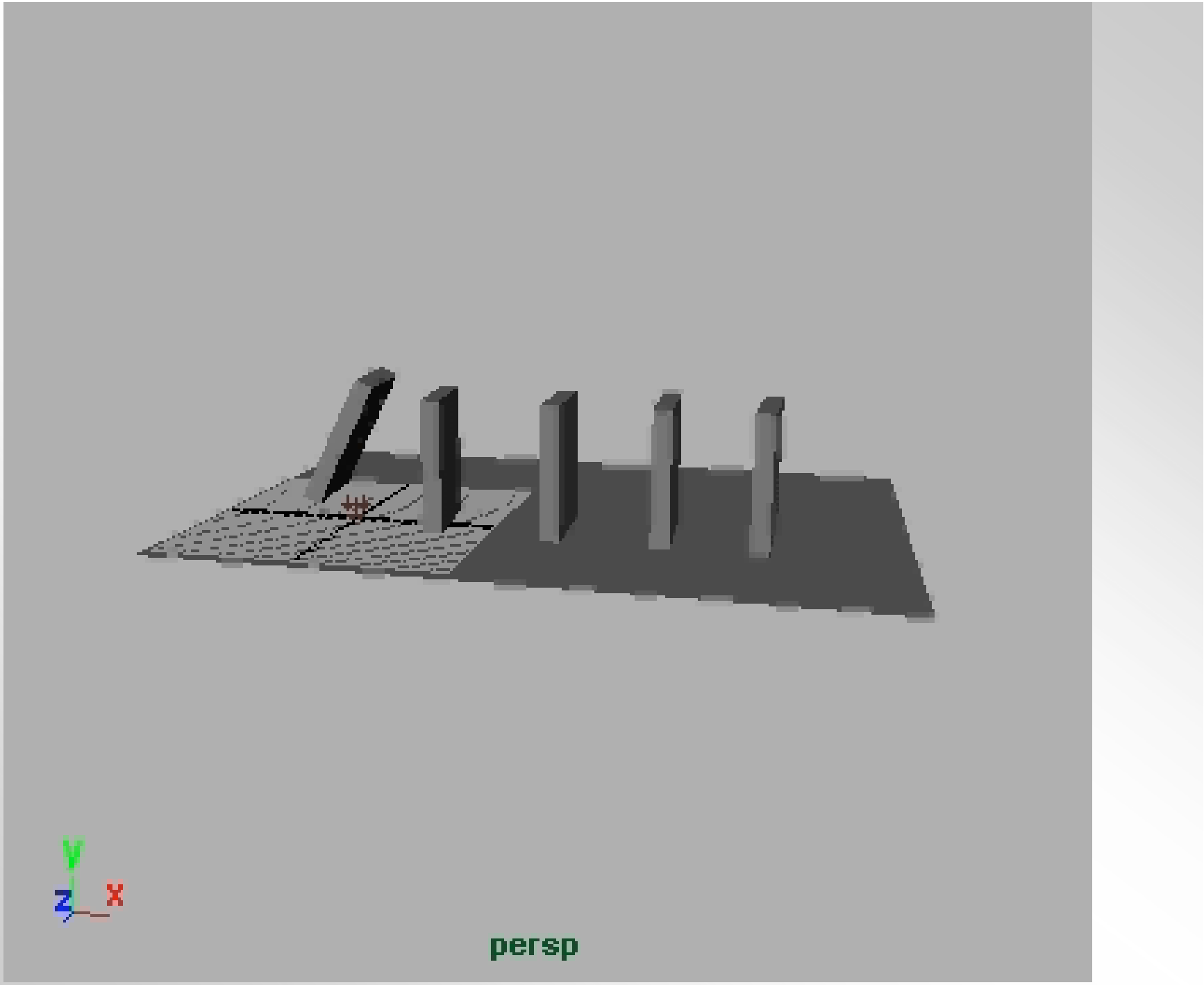

GEARS OF WAR

STEM Curriculum

- **Maya**: A 3D modeling software application that is currently being used by the video game industry. Students use it to create and manipulate objects and models, important images from other sources into the program, apply image rendering, animate their images, and even to practice GIS modeling concepts.
  - Buildings and monuments in Washington, D.C.
  - Animated spaceships
- **Alice**: A programming environment that allows students to engage in object-oriented programming techniques. Students taking this class were given an introduction to using an actual programming language to create if-else statements, loops, arrays, searches and sorts on objects in order to create their own computer games.

STEM Curriculum

- **Game Maker**: 2D game design software allows students to create their own video games. Students create games from a library of object models and include features such as characters, objects, and actions. These actions are included by choosing elements from menus, representing programming and code.
- **Civilization**: Role-playing game that allows students to become a part of history. Students pick a historical period of time and begin to build empires by exploring lands, discovering new methods in the arts and sciences.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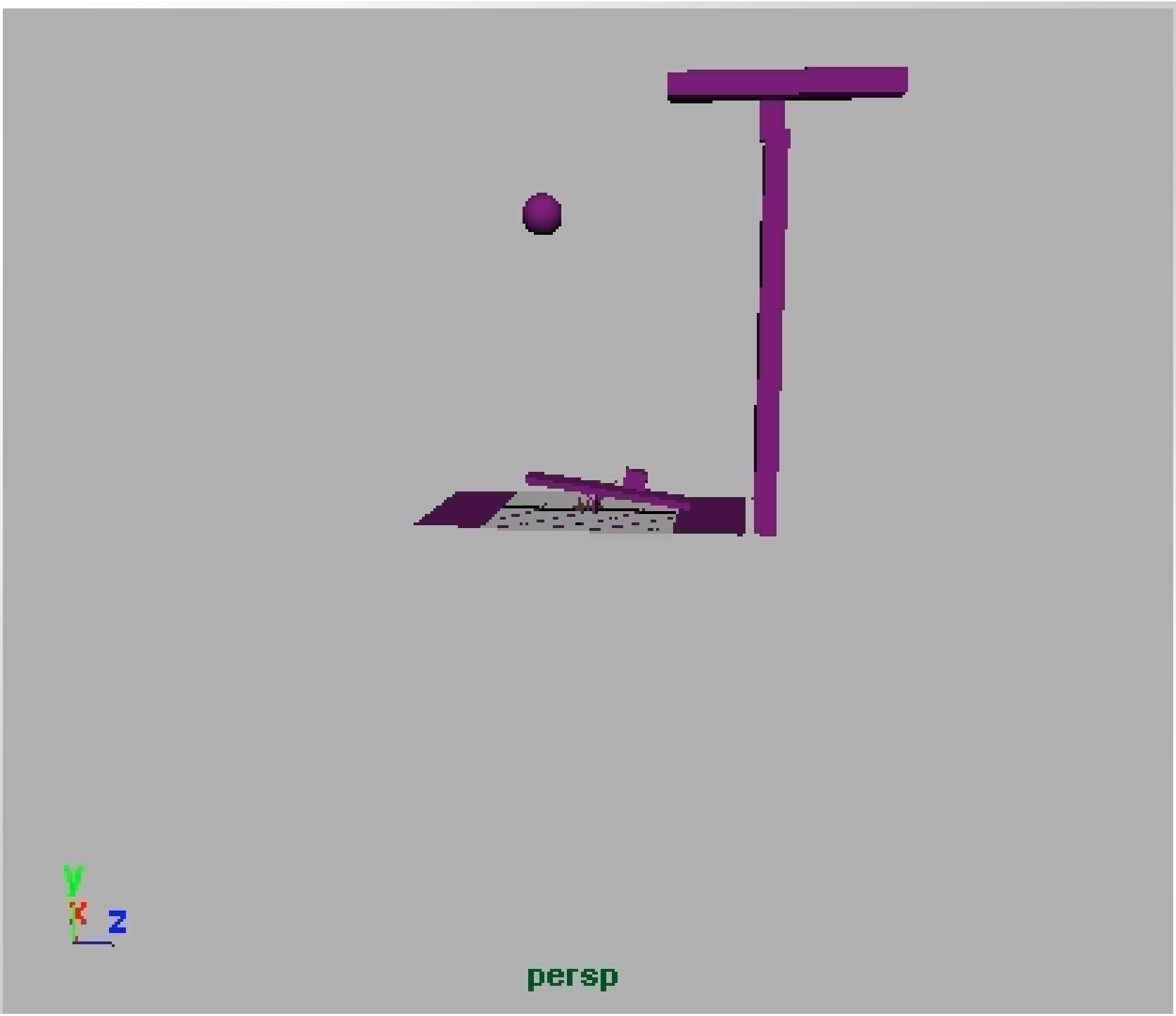
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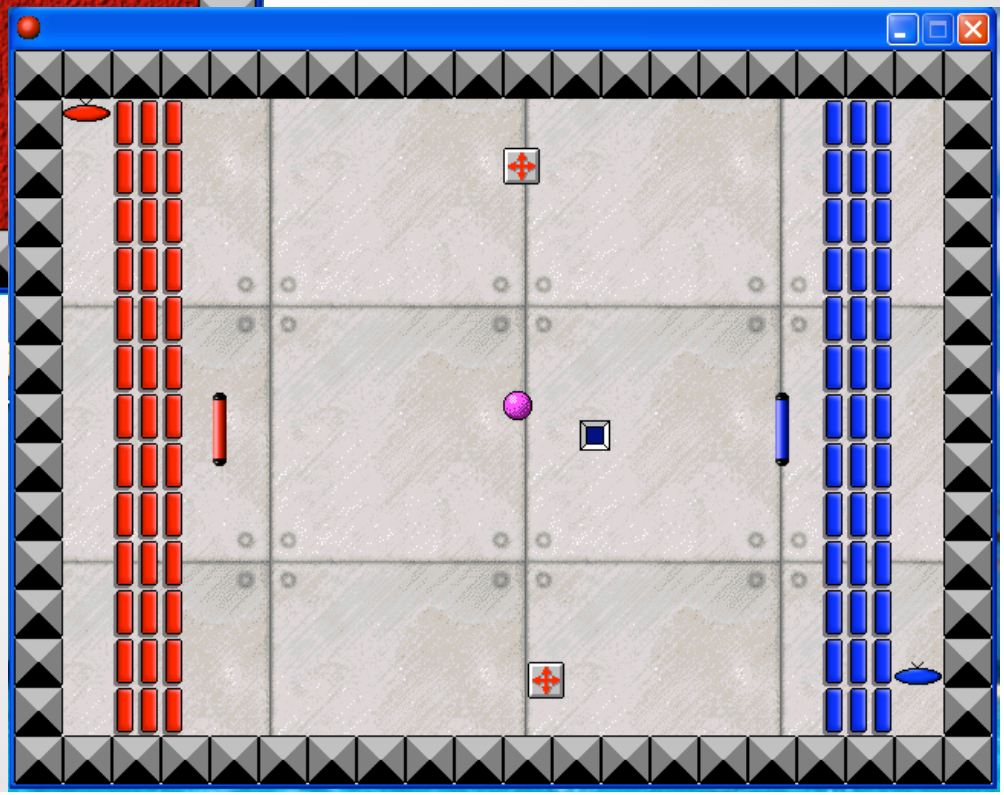
Game Maker



Mentorship

High School students with strong technological skills work with higher education experts to become mentors and instructors in the “Be the Game” Program

Examples:

- A McKinley high school student taught middle and high school students to use GIS and make a mock-up version of McKinley high school’s layout.
- A high school senior veteran of the “Be the Game” program taught the “MissionMaker” each week.
- In each workshop session, a more advanced student is designated to assist individual students experiencing difficulties

4 week summer mentor training

1 week intensive training

20 High school students identified with strong technology skills and mentorship potential will participate in a 1 week training program that hones their technical skills and teaches them how to teach (e.g., designing lessons, providing individualized help, tutoring, and running a “design studio”)

3 week internship as instructor in “Gaming Camp”

These students will try out their teaching skills by acting as instructors (under supervision of adult instructors) a three week “gaming camp” for middle school students

Evaluation

- Pre- and post-assessment that capture participant perceptions of their STEM content knowledge, self-efficacy, confidence, self-concept, problem-solving, and collaborative approaches to learning
- Assessment Measures/Instruments
  - Demographic data survey.
  - Pre- and post-intervention assessments (e.g., higher-order thinking, self-perception, and ITEST indicators)
  - Classroom observations;
  - Web-based student logs;
  - Individual and collective ITEST session evaluations (feedback)

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