Motivation

- School gardens have been adopted by many as offering valuable outdoor learning experiences, with numerous psycho-social and nutritional benefits. (Veen, 2017)
- Classroom curriculum is not geared to incorporate the rich academic opportunities that these experiences could potentially offer. (Schroeder & Brown, 2011)
- With the unveiling of Next Generation Science Standards (NGSS Lead States, 2013), teachers are tasked with creating new models of instruction and assessment, yet few structures exist connecting these standards to the outdoor environment.

Theory

Agent-based modeling environments such as NetLogo can help users understand how macro-scale phenomena emerge from micro-scale instances. (Wilensky & Reisman, 2006)

The garden is a rich space that connects to intuitive science, providing access points to learners who might not initially engage with formal science. (Bell et al., 2009)

When making sense of a simulation, especially useful to “loop” from real data to model and back. (Knezek et al., 2010)

Contribution: Gardens as student-generated real world contexts for exploring simulations

Literature cited


Williams, D. R., & Dixon, P. S. (2013). Impact of garden


Results

Interviewer: What are the ways that you think you would use to figure out how this program works?

Jorge: Well since I saw the coding, that I think like white and black, and that’s like taking off the nutrients out of the soil, which makes the plants grow not as fast, like grow slower, but when it’s all brown, it’s like really nutrient, and like how in the beginning, the plants were growing really fast, but now that it’s white, the plants are growing maybe slower.

Interviewer: Yeah, so you figured that out by reading the code you said?

Jorge: Yeah because I saw that nutrients was like brown.

Interviewer: How can a garden simulation model motivate and enhance science learning in an outdoor setting?

How can a garden simulation model motivate and enhance science learning in an outdoor setting?

1. Existing Knowledge Generates Ideas for Model Additions

2. Code Drives Inferences about Ecosystem Properties

3. Garden Experience Begs Perception of Applicability

Design

- Revise garden simulation: Crop diversity allows for greater student ownership and connections to real garden
- Develop guiding tasks: Can you figure out how to harvest the most crops?
- Consult with site school teachers about curricular connections, classroom implementation

Conclusions and Next steps

- Review garden simulation: Crop diversity allows for greater student ownership and connections to real garden
- Develop guiding tasks: Can you figure out how to harvest the most crops?
- Consult with site school teachers about curricular connections, classroom implementation

Protocol & Implementation

Site: Public middle school where garden instruction is currently being developed to link with academic classes.

Participants

- (3) 6th grade females engaged in two units of academic-themed garden instruction with their science class and math class
- (3) 6th grade males—little previous garden instruction due to staffing and space issues at the school

Interview

15 minute semi-structured, computer focused

Individual (except one child, where one of the pair left early)

Protocol piloted with a 9th grade student

Introduction: Who I am, purpose of interview

Set up: Brief functionality tutorial, interact with simulation

“This is the set up button, you click it once you’ve set the sliders to the values you want.”

Exploration: Freely explore patterns and simulation dynamics, concurrent think-aloud

What do you think might happen if you click that button?

Reaction: Provide feedback and answer questions about classroom/garden applicability

“Do you think you learned anything new by playing with this model?”

Additions students proposed:

- Weather (Jorge)
- Predators (Jorge)
- Worms providing compost (Catie)
- Row planting (Catie)
- Crop variety (Catie)
- Irrigation system (Catie)
- Compost pile (Jorge)

Conclusions:

- How can a garden simulation model motivate and enhance science learning in an outdoor setting?
- Motivation: School gardens have been adopted by many as offering valuable outdoor learning experiences, with numerous psycho-social and nutritional benefits. (Veen, 2017)
- Classroom curriculum is not geared to incorporate the rich academic opportunities that these experiences could potentially offer. (Schroeder & Brown, 2011)
- With the unveiling of Next Generation Science Standards (NGSS Lead States, 2013), teachers are tasked with creating new models of instruction and assessment, yet few structures exist connecting these standards to the outdoor environment.

Next steps:

- Review garden simulation: Crop diversity allows for greater student ownership and connections to real garden
- Develop guiding tasks: Can you figure out how to harvest the most crops?
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Research

- What can grade 6/7/8 students code in a reasonable amount of time?
- How can the model be used to make predictions and claims about ones own space?
- What is the impact of providing contextual or guiding information before introducing the model?