EcoMOBILE and EcoXPT: Real and Virtual Immersive Experiences for Learning Ecosystem Science

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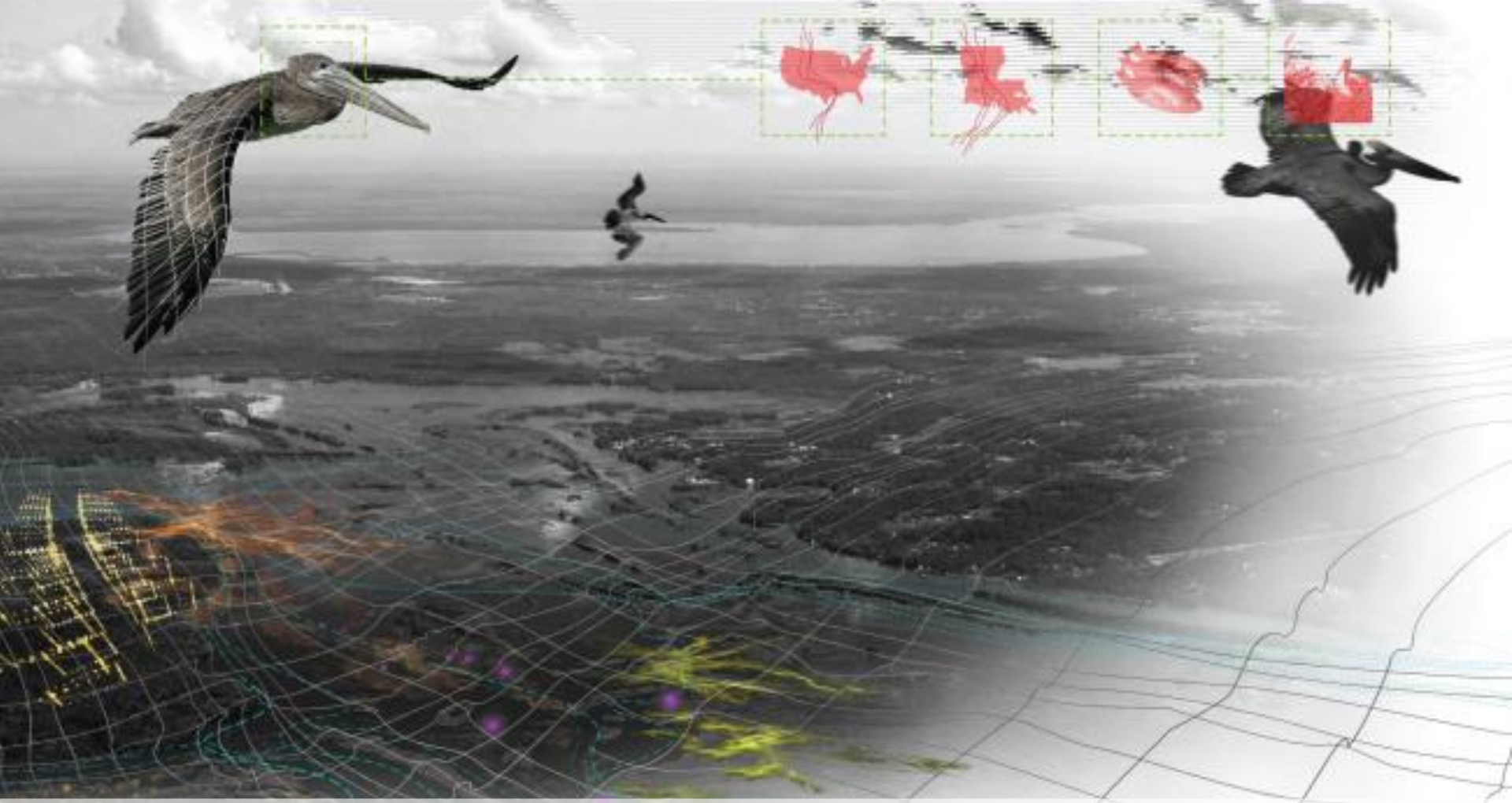
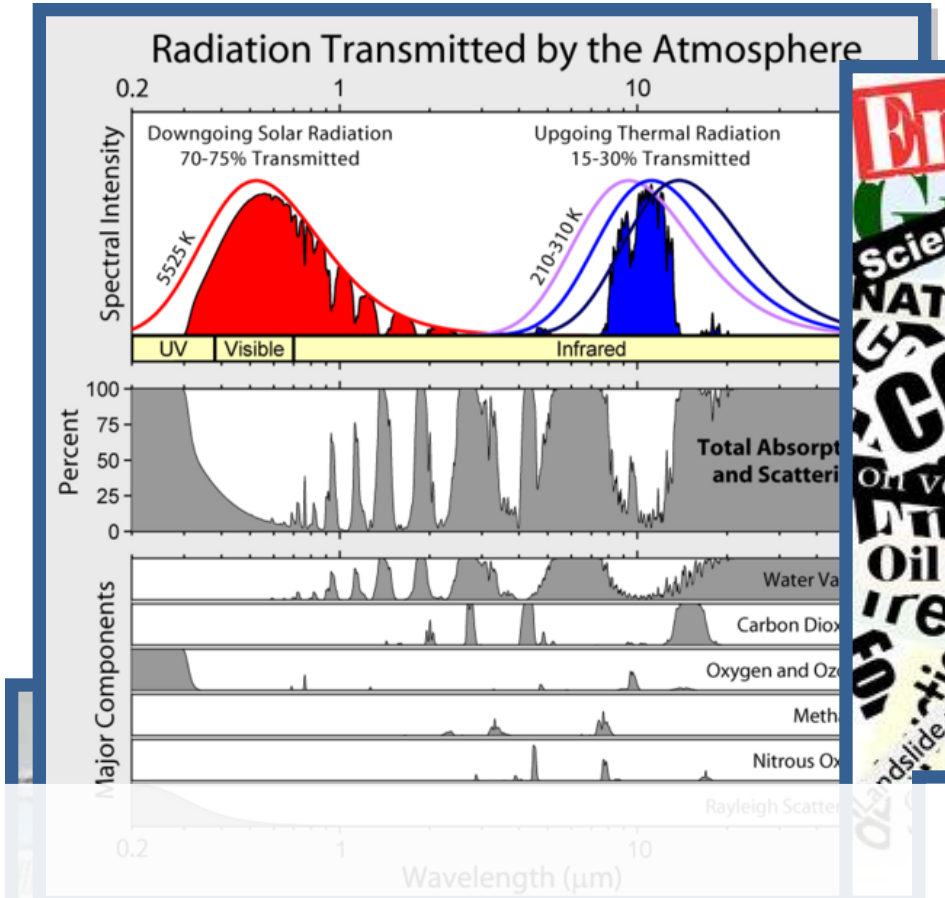
Wireless Reach from Qualcomm

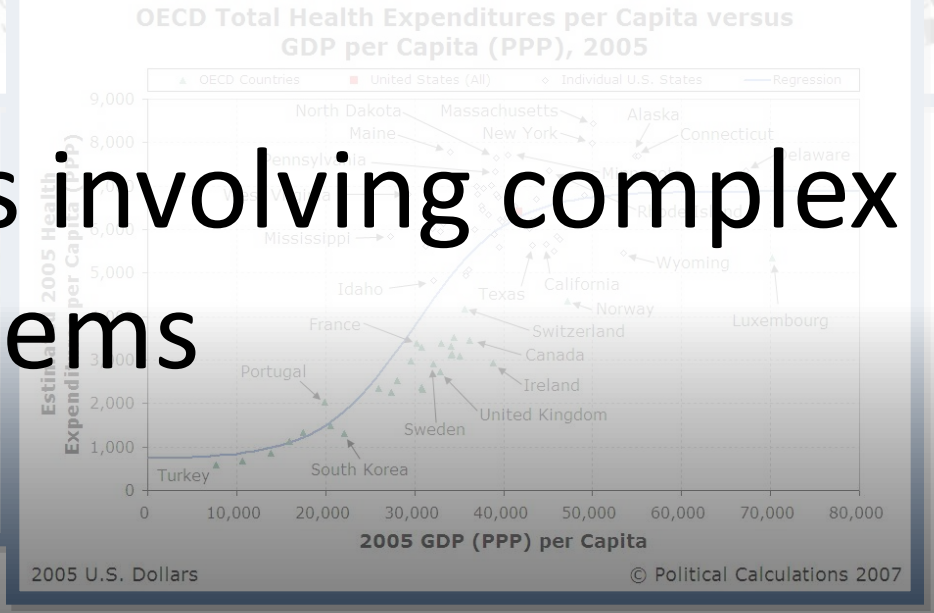
NSF



What if we were training the next generation of scientists to solve the world's problems?

(Responsive Systems Studio, Bradley Cantrell, Kim Nguyen, Josh Brooks, Devon Boutte, Martin Moser)





Pressing problems involving complex systems

Default Causal Assumptions

Complex Systems

Multiple causes

Decentralized control

Outcomes depend on probability

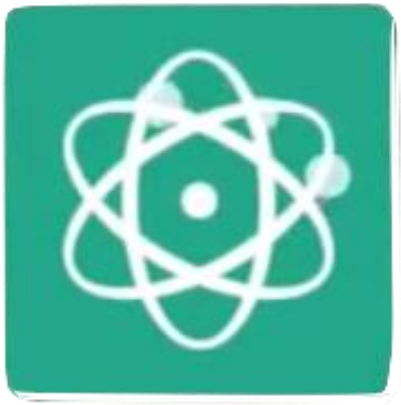
Emergent and unanticipated interactions

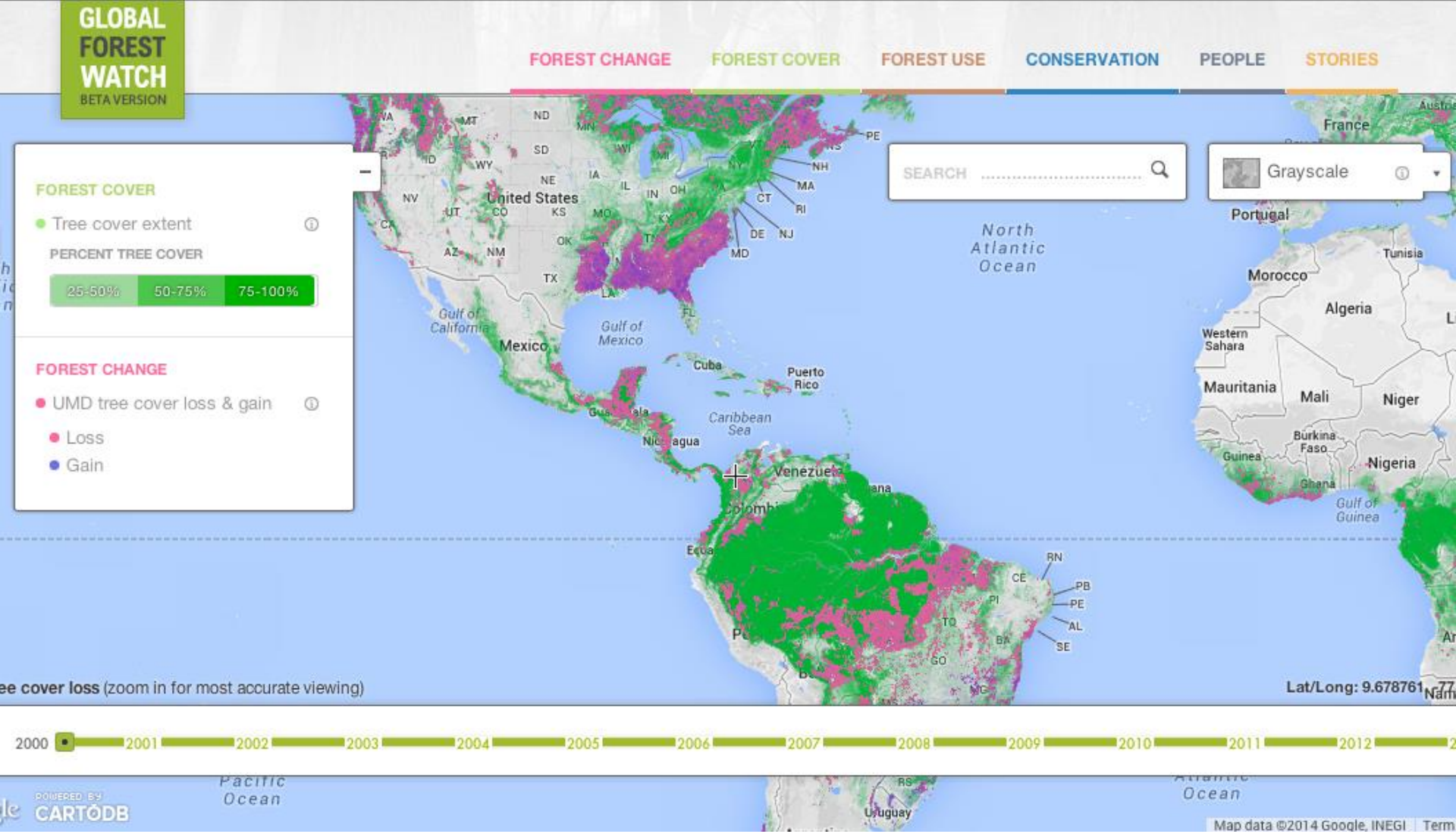
(Jacobson 2001, Grotzer & Tutwiler 2014)

What if we were training the next generation of scientists to solve the world's problems?

➔ Shift in thinking about complex systems

Smart cities

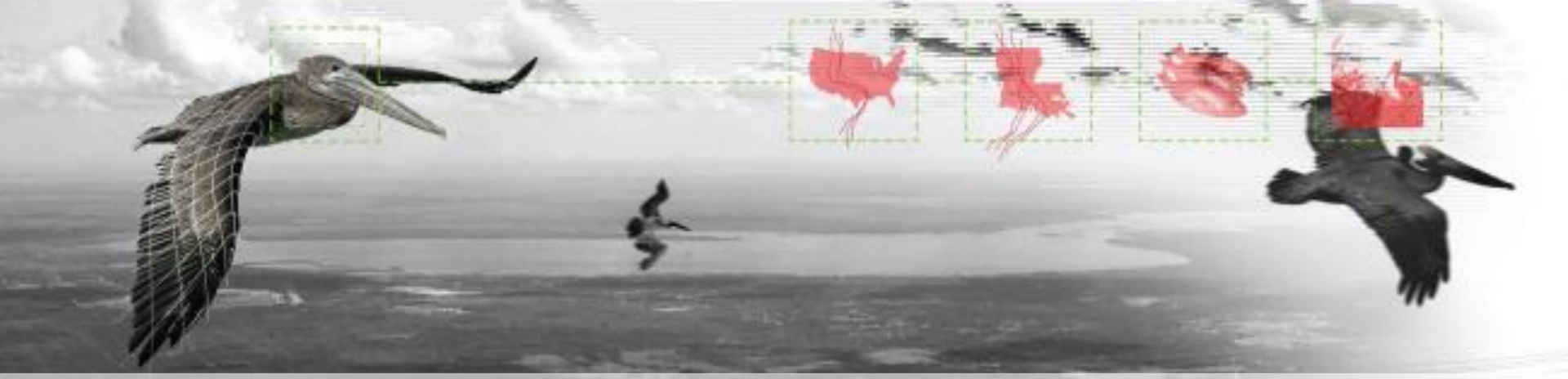




Global Forest Watch integrates satellite technology, open data and crowdsourcing to provide real time information on forest health

Integration of ecology with STEM
Technology-enabled
Big data

(Nicolle Rager-Fuller, National Science Foundation)



What if we were training the next generation of scientists to solve the world's problems?

- ➔ Shift in thinking about complex systems
- ➔ Training in tech-enabled, big data approaches scientists use to study complex systems

Crosscutting Concepts

Cause and Effect
Systems and system models
Stability and Change

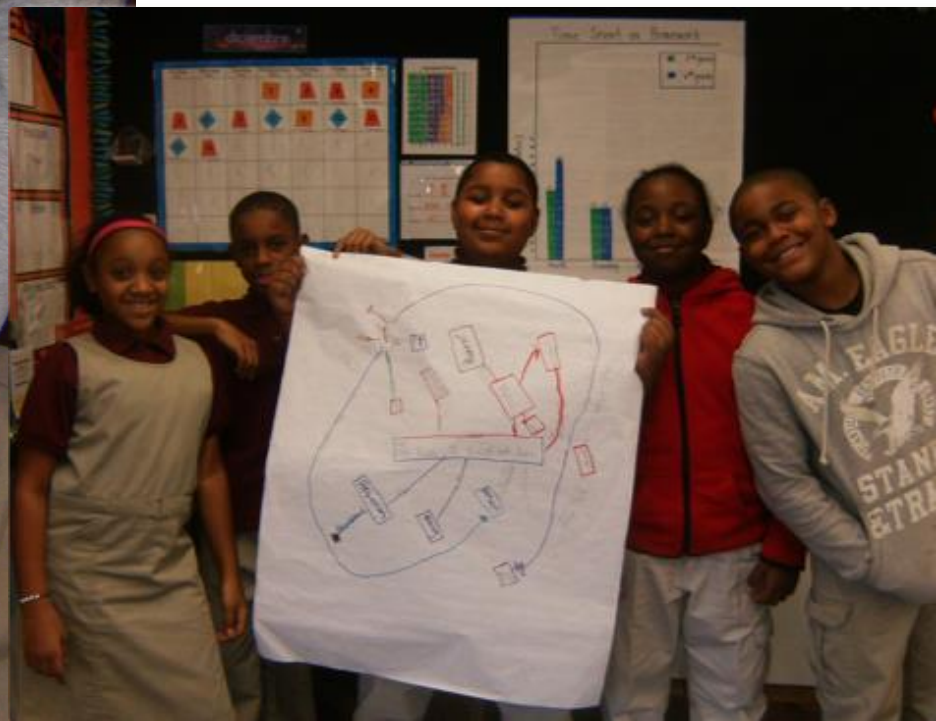
Practices

*"…**direct involvement** gives [students] an appreciation of the **wide range of approaches** that are used to investigate, model, and explain the world."*

Still need 1.) Curricula and 2.) Support

EcoMUVE – Multi-User Virtual Environment

Collaborative construction of concept maps



EcoMUVE shifts student thinking about causality in complex systems

(Grotzer, et al. 2013; Tutwiler

How do we help students apply these ideas to real world systems?

EcoMUVE + EcoMOBILE

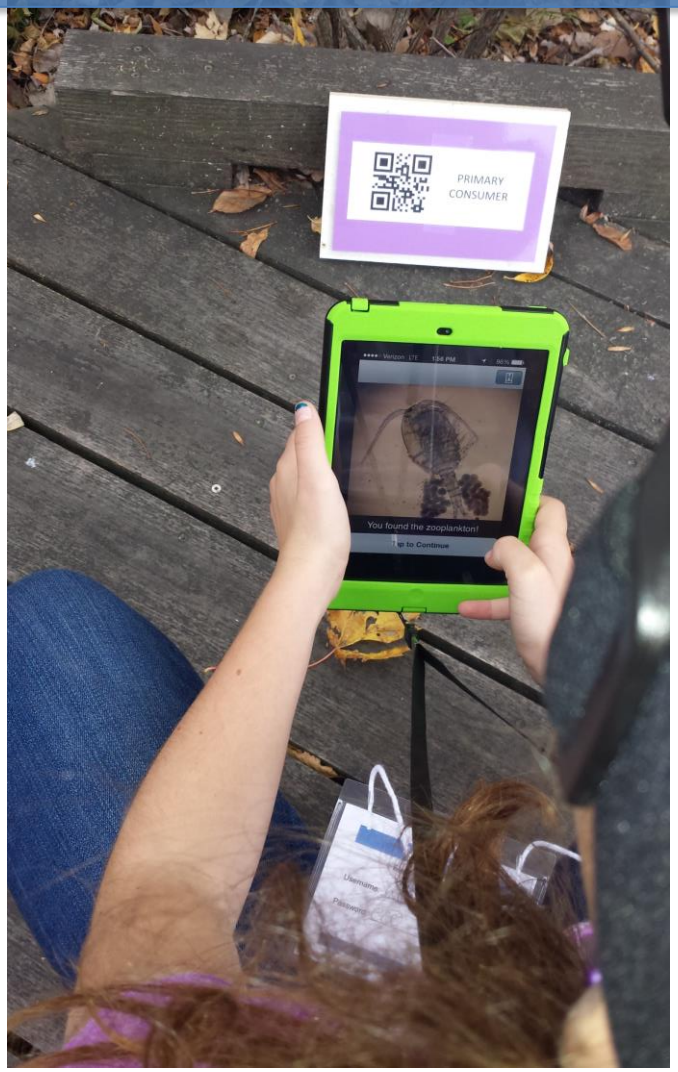
EcoMOBILE

Augmented Reality and Environmental Sensors

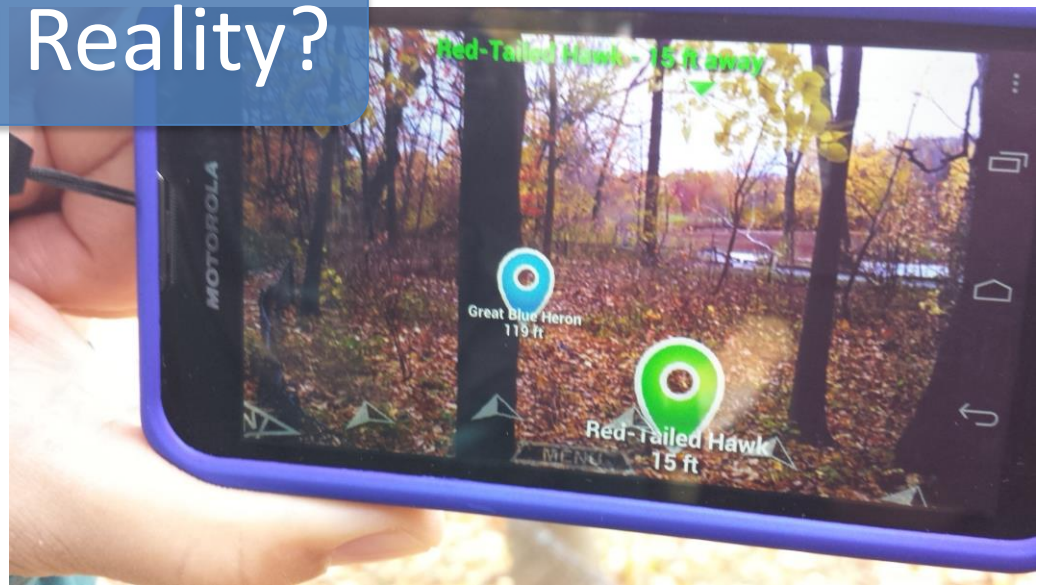

上環
西
W
九龍(西)
康樂廣場
機場快綫站
愛丁堡廣場
九龍


Sheung Wan
西 W
Kowloon (W)
Connaught Place
Airport Express Station
Edinburgh Place
Kowloon

What is Augmented Reality?

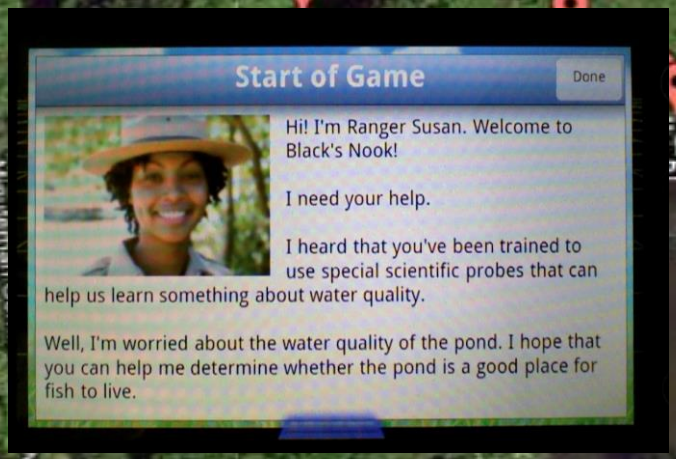


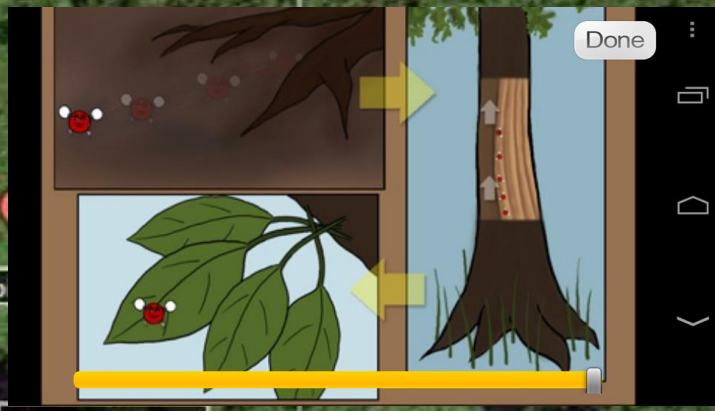
QR code-based

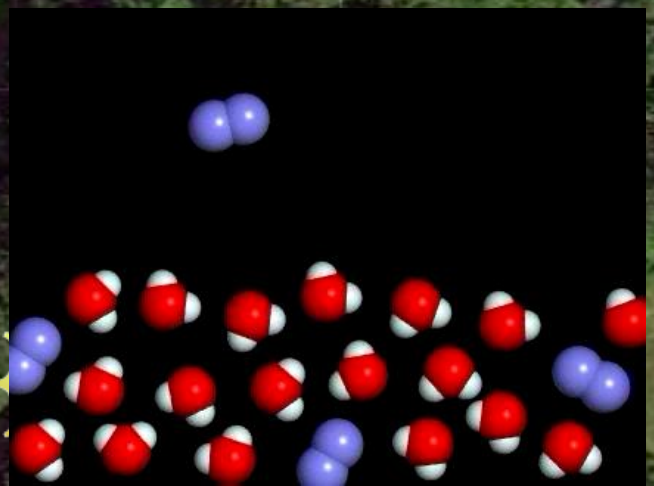


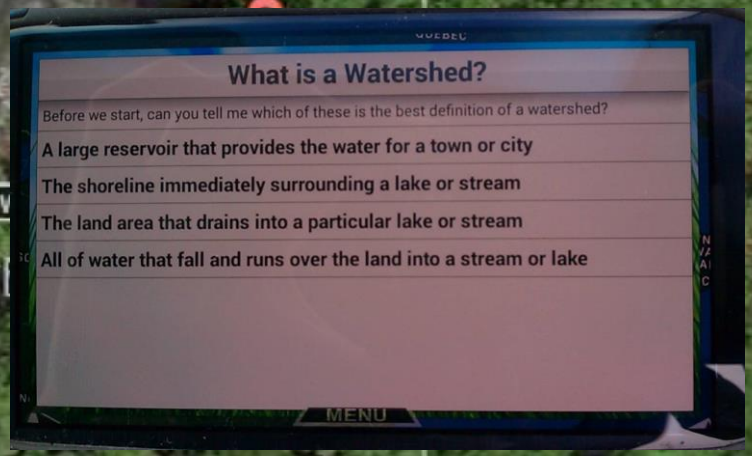
Location-based

EcoMOBILE







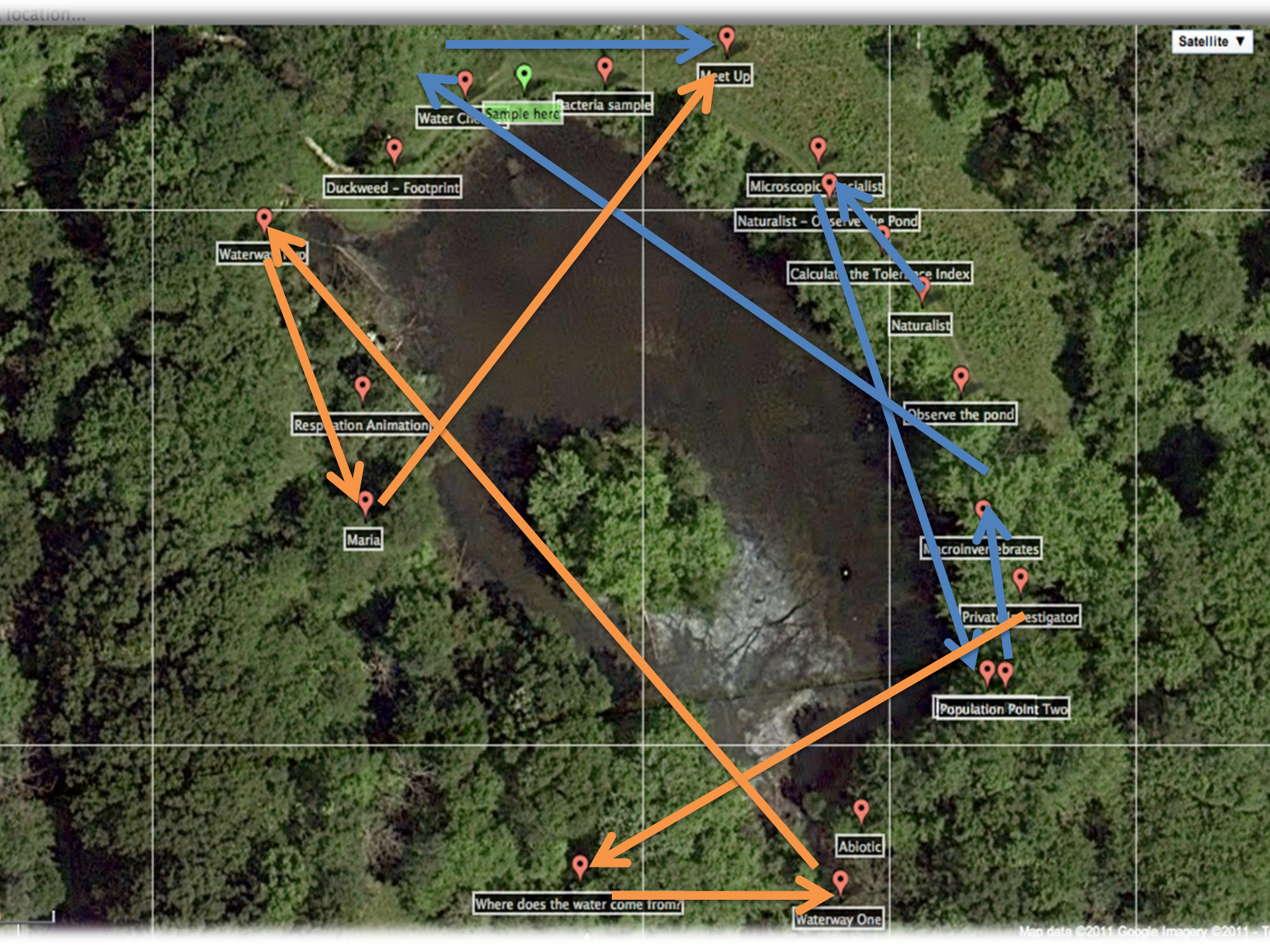


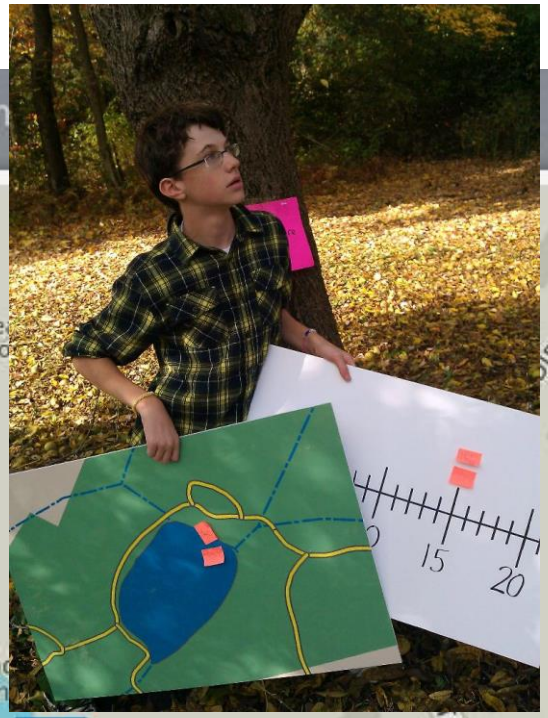
Private Investigator

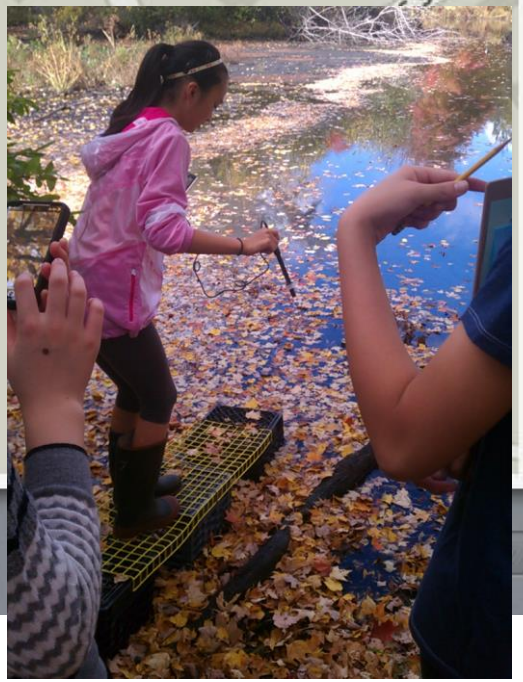
Observe the pond

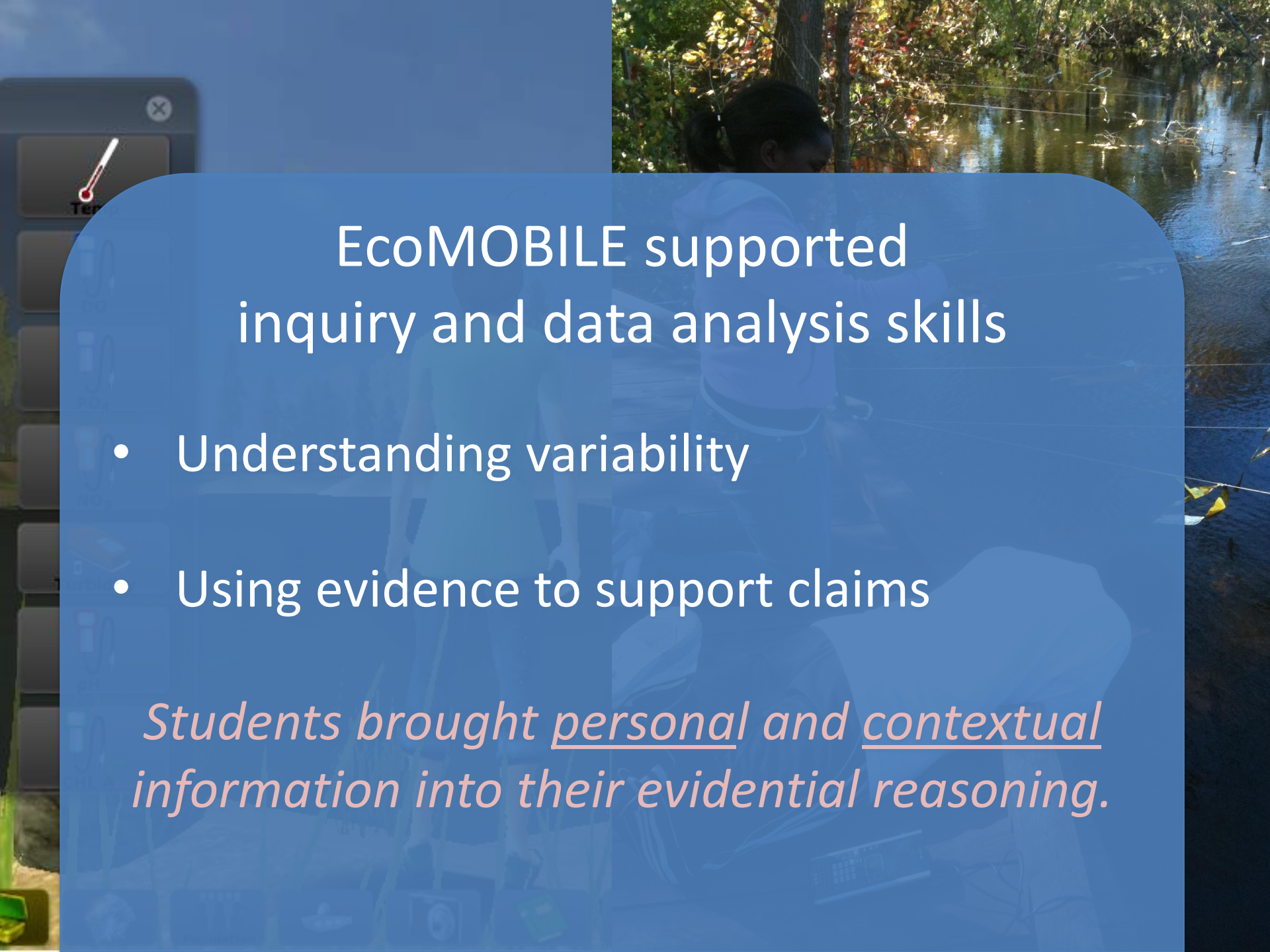
Where does the water come from?

Parker Meadow


Satellite
Meet Up
Sample here
Duckweed – Footprint
Naturalist – Observe the Pond
Naturalist
Observe the pond
Maria
Abiotic
Where does the water come from?
Waterway One
Population Point Two
Map data ©2011 Google Imagery ©2011







EcoMOBILE supported inquiry and data analysis skills

- Understanding variability
- Using evidence to support claims

Students brought personal and contextual information into their evidential reasoning.

Helping teachers be the guide on the side

"I was able to work a little more one-on-one and with small groups, I just traveled around and checked in with kids, I wasn't directing things, that felt really different to me, and I really liked it… It felt more like what I like to think of teaching as being - not just directing top-down."

(Photo: Alan English)

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EcoMUVE and EcoMOBILE

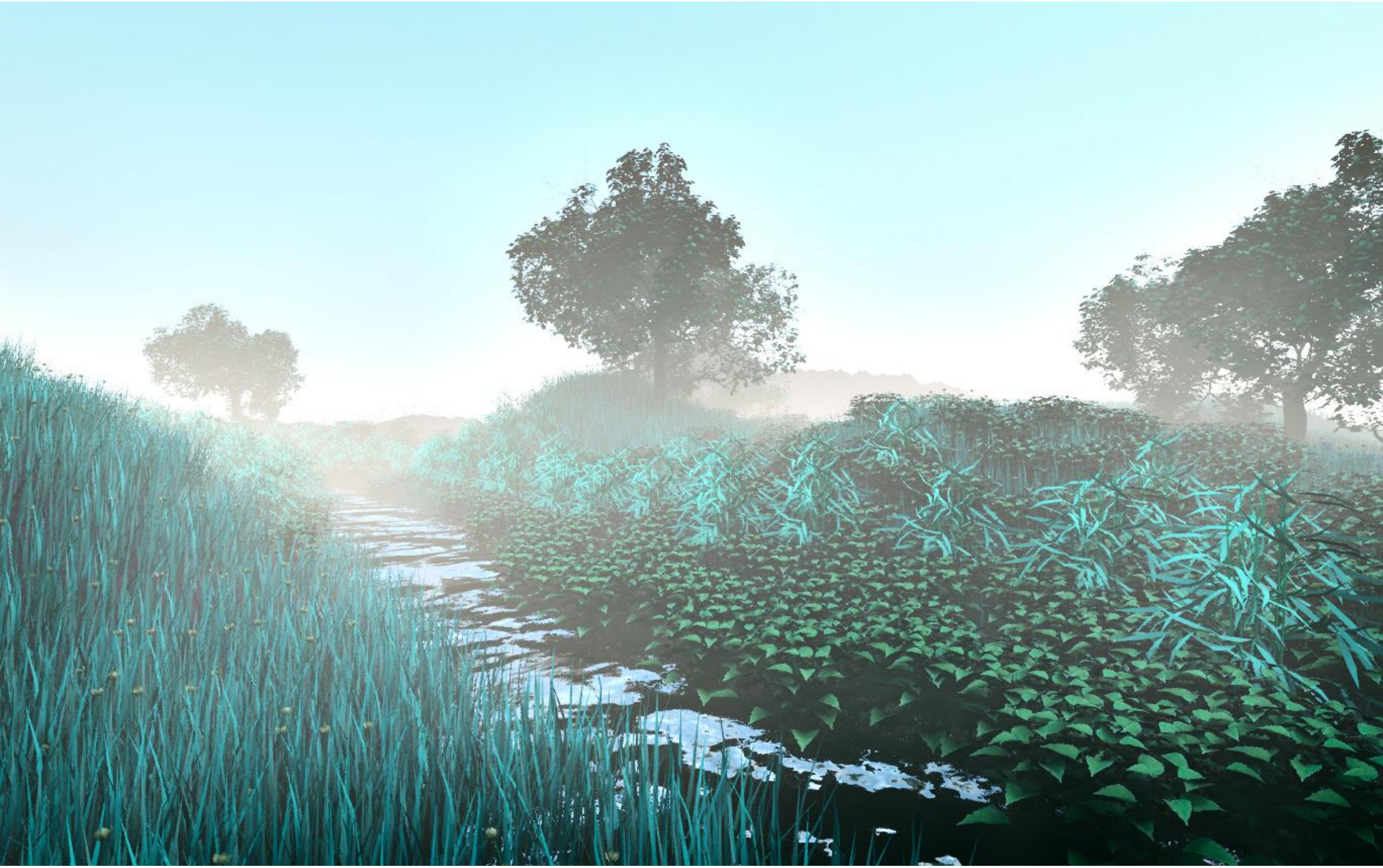
understand and apply

- Experimentation helps to distinguish among potential causal factors
- Ecosystem experiments are nearly impossible to carry out in classrooms

*How might adding experimentation to the **virtual world** support causal reasoning?*

EcoXPT – Coming Soon

(Grotzer, et al. 2013; Tutwiler



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Wisdom Tools – Lyle Turner and Andrew Nelson

T561 and T543 students

(Photo: Alan English)