Virtual Performance Assessments

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How can we best measure scientific inquiry skills?
Why are virtual assessments powerful?

Advances in Technology

Advances in Statistics

More powerful, robust and comprehensive measurements of student understanding

Research on Cognition & Learning
Immersive Virtual Assessment Project

- Funded by Institute of Educational Sciences (IES)
- Three year grant (now in year 2)
- 8th grade science inquiry learning in a standardized testing setting
- National Science Education Standards & College Board Standards for College Success: Inquiry & Life Science
Goals of this Project

• Proof of Concept for Virtual Performance Assessments (VPAs):
  – Potentially higher validity than physical performance assessments
    • No challenges of physical materials
    • Virtual worlds enable performances impossible in classrooms
  – Establish higher reliability and usability than physical performance assessments, as well as lower cost
    • Detailed tracking of participant behaviors
    • Respectable psychometrics compared to paper-and-pencil item-based tests

How practical is this to implement in school settings?
What the Immersive Virtual Assessment Is

• 3-D Immersive environment based on authentic setting

• Highly secure, cross platform application

• Realistic causal model for experimentation
How it works

- Simulates authentic scenarios
- Allows students to take on identity of a scientist
- Students respond to visual cues over text
- Captures student data unobtrusively
Affordances of Immersive Interfaces

• The types of behaviors immersive interfaces can enable
  – Complex situations with tacit clues
  – Simulated scientific instruments
  – Virtual experimentation
  – Simulated collaboration in a team

Documented in Event-logs and Chat-logs
Event Logs as Observational Data

Indicates with Timestamps

- Where students went
- Who they talked to
- What data they gathered

unobtrusive observational data
Demo of Assessment

Save the Kelp in an Alaskan Bay
Orientation
Experimentation

Mission: Re-Locate Kelp Beds

There are four areas you have been exploring around the kelp:

- North Coast (by the power plant)
- North East Coast (by the logging)
- South East Coast (by the Wharf)
- South (by the Glacier)

Step 1. Select an area where you would like to plant kelp by clicking on a part of Glacier Harbor below.
Experimentation

Mission: Re-Locate Kelp Beds

There are four areas you have been exploring around the kelp:

- North Coast (by the power plant)
- North East Coast (by the logging)
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- South (by the Glacier)

**Step 1.** Select an area where you would like to plant kelp by clicking on a part of Glacier Harbor below.

You have selected North East Coast.

You may change your location by clicking on the map but you will NOT be able to make changes once you have clicked Save and Submit. When you are ready to move on to the next step, click 'Save and Submit' below.
Passing of Time
Welcome back. Six weeks have passed and we want you to check on your experiment. Remember you re-located kelp in North East Coast.

Go gather data on your experiment. Find out what happened to the kelp after you re-located one bed. (Click the forward arrow below to begin collecting data.)
Explore replanted kelp bed
Second Experiment
Second Experiment

Based on the graphs and your prior experiment, what object below do you think is causing the problem with the turbidity in Glacier Harbor?

- Sea urchins
- Power plant discharge
- Logging operation
- Wharf
- Glacier
Based on the graphs and your prior experiment, what object below do you think is causing the problem with the turbidity in Glacier Harbor?

![Object Options]

What type of evidence led you to this conclusion?

[ ] Dust
[ ] Polluted water
[ ] Boating operation
[ ] Wharf
[ ] Glacier

You can run an experiment by removing an object from Glacier Harbor. Do you want to remove the glacier?

[ ] Yes
[ ] No

[Save and Submit]
Explain your reasoning for removing the glacier.

Next, tell me your hypothesis.

If I remove the [poor] then the [help population] will [increase].
because the [safety] will [increase].

You identified the turbidity in Glacier Harbor as the problem. You are about to remove the glaciers.
Removing an object from the bay

By clicking this button you will remove the logging operation and return to Glacier Harbor. You will have 10 minutes to collect data. When time is up, you will return here to state your findings.

Run the Experiment
Demo of What happens when remove an object