Feb 2nd, 4:05 PM - 4:25 PM

Losing the Lake: Designing an Educational Computer Game on Water Resources in Southern Nevada

Michael Nussbaum
University of Nevada, Las Vegas, nussbaum@unlv.nevada.edu

Gale Sinatra
University of Nevada, Las Vegas

Frederick C. Harris
University of Nevada, Reno, Fred.Harris@cse.unr.edu

Sergiu Dascalu
University of Nevada, Reno, dascalus@cse.unr.edu

Sajjad Ahmad
University of Nevada, Las Vegas, sajjad.ahmad@unlv.edu

See next page for additional authors

Repository Citation
Nussbaum, Michael; Sinatra, Gale; Harris, Frederick C.; Dascalu, Sergiu; Ahmad, Sajjad; Crippen, Kent J.; and Owens, Marissa, "Losing the Lake: Designing an Educational Computer Game on Water Resources in Southern Nevada" (2010). 2010 Annual Nevada NSF EPSCoR Climate Change Conference. 48. https://digitalscholarship.unlv.edu/epscor/2010/feb02/48

This Event is brought to you for free and open access by the Conferences/Meetings (NNE) at Digital Scholarship@UNLV. It has been accepted for inclusion in 2010 Annual Nevada NSF EPSCoR Climate Change Conference by an authorized administrator of Digital Scholarship@UNLV. For more information, please contact digitalscholarship@unlv.edu.
Presenters
Michael Nussbaum, Gale Sinatra, Frederick C. Harris, Sergiu Dascalu, Sajjad Ahmad, Kent J. Crippen, and Marissa Owens

This event is available at Digital Scholarship@UNLV: https://digitalscholarship.unlv.edu/epscor/2010/feb02/48
Losing the Lake:
Designing an Educational Computer Game on Water Resources in Southern Nevada (Phase 1)

By E. Michael Nussbaum, Gale M. Sinatra, Marissa C. Owens, et al.
Background

• Interdisciplinary science grant
  – $100,000 each year for two years.

• Goal: To design and test an educationally useful computer game to educate middle- and high-school students, and the general public, about water and sustainability + effect of climate change on those
Core Team

<table>
<thead>
<tr>
<th>Name</th>
<th>Department</th>
<th>Institution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Michael Nussbaum</td>
<td>Educational Psychology</td>
<td>UNLV</td>
</tr>
<tr>
<td>Gale Sinatra</td>
<td>Educational Psychology</td>
<td>UNLV</td>
</tr>
<tr>
<td>Sajjad Ahmad</td>
<td>Civil &amp; Environmental Engineering</td>
<td>UNLV</td>
</tr>
<tr>
<td>Fred Harris</td>
<td>Computer Science &amp; Engineering</td>
<td>UNR</td>
</tr>
<tr>
<td>Sergiu Dascalu</td>
<td>Computer Science &amp; Engineering</td>
<td>UNR</td>
</tr>
<tr>
<td>Kent Crippen</td>
<td>Curriculum and Instruction</td>
<td>UNLV</td>
</tr>
<tr>
<td>Marissa Owens</td>
<td>Learning &amp; Technology graduate assistant</td>
<td>UNLV</td>
</tr>
</tbody>
</table>
Advisory Committee

<table>
<thead>
<tr>
<th>Name</th>
<th>Department</th>
<th>University</th>
</tr>
</thead>
<tbody>
<tr>
<td>David Hassenzahl</td>
<td>Environmental Studies</td>
<td>UNLV</td>
</tr>
<tr>
<td>William Smith</td>
<td>Environmental Studies</td>
<td>UNLV</td>
</tr>
<tr>
<td>Zhongbo Yu</td>
<td>Geosciences</td>
<td>UNLV</td>
</tr>
<tr>
<td>Matt Lachniet</td>
<td>Geosciences</td>
<td>UNLV</td>
</tr>
</tbody>
</table>
This view of Lake Mead was taken last July 26, during the seventh straight year of drought that had caused the lake to drop more than 100 feet to its lowest level since the late 1960s (2008).
Projections

• Colorado River supply will decrease over the next 30-50 years due to global warming (Barnett & Pierce, 2008).

• Project will refine existing estimates by studying various global climate change models, link to a water resources model (including Lake Mead) developed by Sajjad Ahmad.
Nature of project

• Primarily social science—adding to knowledge of conceptual development and change.

• Develop mental models of water supply and use in Southern Nevada and of climate change.

• Game design--managing cognitive load, holding interest.
Nature of project (cont.)

• Educating students, primarily middle schoolers.
  – Target audience for Level 1 of game, eighth grade.
  – Target audience for Level 2 of game, tenth grade.
  – Game will be made available over the Internet.

• Outreach component:
  – Place stand-alone version of game in informal learning environments, such as the Springs Preserve.
Study 1: Conceptions and nonconceptions about water & climate change

• In-depth interviews of 10 UNLV students.
Examples of Questions

1. Where does the water in the CO river come from?

2. Why are Lake Mead water levels dropping?

3. What is causing climate change?
Generally knew

• Las Vegas gets water from Lake Mead.
  – For some it was likely a guess.

• Water levels are declining
Misconceptions

• Nevada uses most of the water, more than any other state.

• Dwindling lake levels are due to population growth in Las Vegas valley.

• Mental link to mountain snow pack was weak.
Nonconceptions

- Each of the seven states has a fixed water allocation.

- Return credit system

- Greenhouse effect—only one person could explain it.
  - And relationship to climate change.
Implications

• College students’ lack of understanding of water resource issues in our region provide rationale for developing educational simulations.

• Marissa Owens will be presenting a poster with the findings on it.
Time Line Overview

- Fall 2009, Developed general specifications
- Spring 2010. Build prototype
- Fall-Spring 2011:
  - Evaluation, refinement, dissemination.
Learning targets

1) Lake Mead is a complex input-output system embedded in a larger input-output system involving the Colorado River Basin.

2) Climate change affects water availability (inputs) within this system, and to a lesser extent, outputs.

3) Humans impact the system through the amount of water that they use (output) and through using carbon-based fuels. These variables are controllable through education and public policy.

4) Scientists build models to better understand the importance of different variables in the system, to make predictions, and to guide decisions.
Learning targets

1) Lake Mead is a complex input-output system embedded in a larger input-output system involving the Colorado River Basin.

2) **Climate change affects water availability (inputs)** within this system, and to a lesser extent, outputs.

3) Humans impact the system through the amount of water that they use (output) and through using carbon-based fuels. **These variables are controllable through education and public policy.**

4) Scientists build models to better understand the importance of different variables in the system, to make predictions, and to guide decisions.
Household

Community

Global Warming

Lake Mead Simulation(s)
Background Knowledge Quiz

Household

Community

Global Warming

Lake Mead Simulation(s)
Background knowledge quiz

Las Vegas Valley
Household

• Fix leaky toilets
• Replace showerheads
• Remove lawns
• Plant trees
• Replace windows
Community

• Turn off the Bellagio fountains.
• Require xerxes scape.
• Control population growth.
• Gray water.
• Watering schedules.
Global Warming
How much time until So. Nevada loses water supply?
How much time until So. Nevada loses water supply?
Background Knowledge Quiz

Household

Community

Global Warming

Lake Mead Simulation(s)
Background Knowledge Quiz

Household

Community

Global Warming

Lake Mead Simulation(s)

Discussion Board (Pipeline)  State allocations  Scientific modeling; data portals
Time Line Overview

• Fall 2009, developed:
  – learning targets.
    • Content want to convey
  – ideas for the game and system.

• Spring 2010:
  – Develop prototype, text, and study protocols.

• Fall-Spring 2011:
  – Focus groups, controlled studies, refinement dissemination.
Additional tasks

• Dissemination

• Adapt game to play in the visualization theater or CAVE.

• Prepare NSF grant proposal.
Additional tasks

• Dissemination

• Adapt game to play in the visualization theater or CAVE.

• Prepare NSF grant proposal.

I NEED A DRINK!