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

Michael Nussbaum  
*University of Nevada, Las Vegas*

Gale Sinatra  
*University of Nevada, Las Vegas*

Fred Harris  
*University of Nevada, Reno*

Sergiu Dascalu  
*University of Nevada, Reno*

Sajjad Ahmad  
*University of Nevada, Las Vegas*

*See next page for additional authors*

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**Presenter Information**

Michael Nussbaum, Gale Sinatra, Fred Harris, Sergiu Dascalu, Sajjad Ahmad, Kent Crippen, and Marissa Owens

# **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

Michael Nussbaum	Educational Psychology	UNLV
Gale Sinatra	Educational Psychology	UNLV
Sajjad Ahmad	Civil & Environmental Engineering	UNLV
Fred Harris	Computer Science & Engineering	UNR
Sergiu Dascalu	Computer Science & Engineering	UNR
Kent Crippen	Curriculum and Instruction	UNLV
Marissa Owens	Learning & Technology graduate assistant	UNLV

# Advisory Committee

David Hassenzahl	Environmental Studies	UNLV
William Smith	Environmental Studies	UNLV
Zhongbo Yu	Geosciences	UNLV
Matt Lachniet	Geosciences	UNLV



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.
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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?

**SIMULATE**

Background Knowledge Quiz

Household

Community

Global Warming

Lake Mead Simulation(s)

Background Knowledge Quiz

Household

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Global Warming

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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.

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**I NEED A DRINK!**