Development of an interactive water management role-playing game as an educational tool representing the central Nebraska Platte River valley social-economic-ecological system

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Abstract for DBER Group Discussion on 2014-10-16

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Title:
Development of an interactive water management role-playing game as an educational tool representing the central Nebraska Platte River valley social-economic-ecological system

Abstract:
As members of the National Science Foundation's Integrative Graduate Education and Research Traineeship (IGERT), we have gained valuable experience abroad in Europe learning about and participating in research that utilizes serious role-playing games representing a watershed with its land use and river system. The focus of this research is on the development of such a game representing the central Platte River valley and its dynamics according to the activities played by the players and uncertain streamflow inputs. The game is adapted specifically from two other games, one called Wat-A-Game, developed at the French public institutes IRSTEA and CIRAD (https://sites.google.com/site/waghistory/), and one called Lords of the Valley, developed at the Poland-based Centre for System Solutions (https://lordsofthevalley.games4sustainability.com/). We present an overview of these other games, compare how our newly developed game differs, and then details of the development of our game, including a look at the game board, role instructions, and the flow of the game. Finally, we discuss our plans for testing the ability of the game to quickly introduce to and teach students about the Platte River social-economic-ecological system.
Water Management Role-Playing Game of the Platte River Valley

Nathan Rossman, Anil Giri, Zion Schell, Noëlle Hart, Victoria Chraïbi

DBER Seminar

October 15, 2014
NSF-IGERT

Integrative Graduate Education and Research Traineeship

Resilience and Adaptive Management of Stressed Watersheds
Systems Perspective

- **Ideas Thinking**: Systemic solutions for complex problems
- **Collaboration Practice**: Facilitating collaboration and change
- **Learning Communication**: Testing and communicating plans and strategies
Serious Role-Playing through Games
Lords of the Valley

Center for Systems Solutions
Wrocław, Poland
http://crs.org.pl
Lords of the Valley
Tisza Valley, Hungary
Poland
Wat-A-Game

Player Green's LPCs with 1 action

Water tokens

Player Pink's LPCs with 3 actions

Role Long defines 2 activities

Role Large defines 1 activity

Player Green

Player Pink

IRSTEA-CIRAD

www.watagame.info
What about... Platte River game?
Similarities with European Games

Scarcity

Trade offs

Representation of real system:
Hydrology
Net Returns
Differences from European Games

Institutions

Quantifying some aspects:
Biodiversity index
Results

Debriefing
Representing the Platte System
Representing the Platte System

Central Platte
Representing the Platte System

Game Board
Game Play

3 basic stages of play:

1. Pre-growing season

Planting decisions are made and finalized
Game Play

3 basic stages of play:

2. During growing season

Water is moved through the system
Game Play

3 basic stages of play:

3. Post-growing season

Money exchanged based on agriculture & hydropower

Incentives paid out to influence next year’s behavior
Game Play
Role: Surface Water Irrigator (SWI)

• Pre-season
  – Decides how much to plant, and either high- or low-intensity methods

• During
  – Decides how much water to divert

• Post-season
  – Is paid based on agricultural results minus property tax
  – Is incentivized by FWS to use less water
Game Play

Role: Nebraska Public Power District (NPPD)

• During
  – Decides how much to release from Lake Mac for hydro
  – Decides how much to intake/release from Small Reservoir 1 for hydro

• Post-season
  – Is paid based on hydropower production
  – Is incentivized by NGPC to keep reservoir levels higher
Game Play

Role: Central Nebraska Public Power & Irrigation District (CNPPID)

• Pre-season
  – Decides how much to plant
  – high- or low-intensity methods

• During
  – Decides how much to intake/release from Small Reservoir 2 for hydro and agricultural needs and how much to divert to their fields

• Post-season
  – Is paid based on hydropower production
  – Is incentivized by NGPC to keep reservoir levels higher
  – Is incentivized by FWS to consumptively use less water
Game Play

Roles: Groundwater Irrigators (GWI-1, GWI-2)

• Pre-season
  – Decides how much to plant
  – high- or low-intensity methods

• During
  – Can take up to their max. groundwater allotments

• Post-season
  – Is paid based on agricultural results minus property tax
  – Is incentivized by NRD to use less aquifer water
  – Is incentivized by FWS to consumptively use less water
Game Play
Role: Fish and Wildlife Service (FWS)

• During
  – At beginning, stores water in environmental account at Lake Mac
  – At end, releases any or all of the environmental account to manipulate water in critical habitat

• Post-season
  – Advises biodiversity of critical habitat
  – Incentivizes irrigators to use less water if necessary
Game Play

Role: Nebraska Game and Parks Commission (NGPC)

• Post-season
  – Advises biodiversity of reservoirs
  – Incentivizes NPPD and CNPPID to retain water in the reservoirs
  – Is paid a fixed amount, based on external Game and Parks-related operations (mostly permits)
Game Play

Roles: Natural Resource District (NRD)

• Post-season
  – Incentivizes SWI, CNPPID, GWI-1, GWI-2 (specifically GWI-1 and GWI-2 to lower effects on groundwater)

In actuality, only directly incentivizes GWIs; role extends to SWI and CNPPID in that they also fund conservation efforts specifically relating to consumptive water use.
Evaluating the Game

A Framework for Evaluating Simulations as Educational Tools - Schumann et al. (2001)

Kirkpatrick’s Framework

- Reaction
- Learning
- Behavior
- Results
Evaluating the Game

A Framework for Evaluating Simulations as Educational Tools - Schumann et al. (2001)

Kirkpatrick’s Framework

- Reaction
- Learning
- Behavior
- Results
Evaluating the Game

Reaction = student satisfaction

- Perceived learning
- Opinion of the game
- Suggestions for improvement

Post game survey
Evaluating the Game

Learning = attitude change, increased knowledge, or improved skill

• Objective knowledge
• Attitude changes

Pre and post game survey
Thanks!