Gender Impacts on Game Design
Process and Products
An In-depth Analysis of Middle School Children's Conceptualizations of a Learning Game

Activities:
- Ask an Astronaut, Robotics Demo, Lego Robotics, VR Mars Flyover, Planetarium Show, Challenger Center Mars mission, Museum visit, Grow a Flower on Mars
- Video: Triton, Io, Lunar sports, Art & architecture on Mars, Getting to Mars, Landing, life on Mars, Exodus Earth, Titan & Europa, Contact
- Games: Great Solar System Rescue, Liftoff, Space Academy MX, Galactic Civilization, The SIMS, Adobe Atmosphere
- Brainstorms: Science (based on National Science Standards), Back-story, Game-world, Players (goals, abilities, appearance), Navigation (interface, interaction), Graphical Style, Sound

SPLA: 2 weeks of work & fun

Team logos designed by SPLA participants
Intertextuality
no text, much as it might like to appear so, is original and unique-in-itself; rather it is a tissue of inevitable, and to an extent unwitting, references to and quotations from other texts. These in turn condition its meaning; the text is an intervention in a cultural system.

Allen, Graham (2005) The Literary Encyclopedia
Teams = Collaboration?

- Engagement / active involvement essential for deep understanding
- Sociocultural theory (Vygotsky, 1978)
- Cognitive-developmental theory (Piaget, 1926)
- Cognitive-elaboration theory (O’Donnell & O’Kelly, 1994)
- Not just discourse, but a quality of discourse
  “It is not simply the activity of engaging in discourses that promotes peer learning but also the quality of that discourse.” (Chinn, O’Donnell & Jinks, 2000)

Collaborative Discourse

Collaboration is more than “simply placing pupils in groups to work or asking them to talk” (Hennessy & Murphy, 1999)
- “Adding or extending explanatory statements (or refuting another’s statement with reasoning)” (Van Meter & Stevens, 2000)
- “Proving elaboration and clarification of their own and each other’s descriptions” (Moschkovich, 1996)
- “Examining the strengths and weaknesses of multiple ideas considered from multiple perspectives” (Kruger, 1993)
  -- the essence: critically evaluating, selecting and developing each other’s ideas

What’s the key?

- Ownership
- Roles
- Contextual factors (instructor involvement, mediating tools, group makeup, the nature of the task)

The study

- Purpose: to understand the group dynamics during game design activity
- Approach: discourse analysis and ecology

Discourse Analysis

- To probe the effectiveness of design activity in fostering collaborative discourse
- To explore the impact of contextual factors on the frequency and quality of collaborative discourse

Coding Scheme

- Data – 5th graders’ one-week game design brainstorming sessions
Results – Collaborative Episodes

- High quality collaborative discourse

<table>
<thead>
<tr>
<th>Team</th>
<th>Design episodes</th>
<th># (%) of collaborative episodes</th>
<th># (%) with expansion</th>
<th># (%) with conclusion</th>
<th># (%) with reasoning justification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Angel girls (5G)</td>
<td>20</td>
<td>9 (22%)</td>
<td>3 (7%)</td>
<td>2 (5%)</td>
<td></td>
</tr>
<tr>
<td>Rocket lions (5B)</td>
<td>36</td>
<td>6 (17%)</td>
<td>1 (2%)</td>
<td>0 (0%)</td>
<td></td>
</tr>
<tr>
<td>Boys</td>
<td>47</td>
<td>12 (26%)</td>
<td>8 (17%)</td>
<td>4 (9%)</td>
<td></td>
</tr>
<tr>
<td>Girls</td>
<td>66</td>
<td>15 (23%)</td>
<td>8 (12%)</td>
<td>4 (6%)</td>
<td></td>
</tr>
<tr>
<td>All</td>
<td>166</td>
<td>37 (22%)</td>
<td>14 (8%)</td>
<td>10 (6%)</td>
<td></td>
</tr>
</tbody>
</table>

Results – Contextual Factors

- Facilitator Involvement

<table>
<thead>
<tr>
<th>Team</th>
<th>Facilitator involvement (# and % of turns)</th>
<th># of design episodes</th>
<th># (%) of collaborative episodes</th>
<th># with expansion</th>
<th># with conclusion</th>
<th># with reasoning justification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Angel girls (5G)</td>
<td>A lot (40; 25%)</td>
<td>21</td>
<td>9 (43%)</td>
<td>3 (14%)</td>
<td>2 (9%)</td>
<td>4 (19%)</td>
</tr>
<tr>
<td>Rocket lions (5B)</td>
<td>A lot (40; 31%)</td>
<td>26</td>
<td>11 (42%)</td>
<td>3 (11%)</td>
<td>2 (7%)</td>
<td>5 (19%)</td>
</tr>
<tr>
<td>Boys</td>
<td></td>
<td>57</td>
<td>16 (28%)</td>
<td>4 (25%)</td>
<td>2 (13%)</td>
<td>6 (36%)</td>
</tr>
<tr>
<td>Girls</td>
<td></td>
<td>51</td>
<td>14 (28%)</td>
<td>5 (36%)</td>
<td>2 (13%)</td>
<td>6 (36%)</td>
</tr>
<tr>
<td>All</td>
<td></td>
<td>166</td>
<td>37 (22%)</td>
<td>14 (8%)</td>
<td>10 (6%)</td>
<td>15 (9%)</td>
</tr>
</tbody>
</table>

Findings

- Game design activity is facilitative of collaborative discourse

The role played by the instructor and the nature of the task are crucial to the frequency and quality of this collaborative discourse

Ecology Mapping

- In an ecosystem, organisms are spawned, nurtured, and killed
- In a collaborative dialog, ideas are suggested, adopted, or rejected
- We excel at developing primitive, intuitive maps of our groups’ ecologies
- More sophisticated understanding may help form or reform groups

Killing: Violent but necessary?

Chris Crawford: "Sometimes the most brilliant design stroke is to kill the idea" (2003)
How I mapped the ecologies

- Interactions identified and classified as spawn, nurture, or kill.
- MoNOSeros: You should start off on earth I think, and then stop off at the moon for refueling and maybe then play sports for a little while; [Spawn: stages, Spawn: sports]
- MoNOSeros: And I think food fights should be a part of the trip as well; [Spawn: food fights]
- Telescopium shouts, "No man, No sports! Get that into your head!" [Kill: sports]

Map: Neptune Jihad (8B)

Map (close up)

Additional descriptive stats

- In each group...
- ...two dominant student-designers
- ...teacher-facilitator very influential (but never killed ideas)
- ...at least one student-designer with minimal influence (i.e., few observed interactions)
- !!

Confounded: Researcher-Observers

- Each group had two researcher-observers
- For each group, most interactions only found in one observer’s notes
- What we notice influences what we can know
- Other limits and possible confounds, e.g., watercooler talk, snapshot in time, ideas about game design

Synthesis: Applying Both Lenses

- Angel Girls (5G)
- Similar findings
- Much collaborative discourse
- Many ideas spawned then nurtured by others
- Two student-designers dominate
- Strong teacher-facilitator influence
What do They Think When We Say “Learn?” Children’s Conceptions of Learning as Instantiated in Games
Steven Tuckey

Introduction…
(and my excuse to overuse PowerPoint)
Imagine a parent asking their child…
“What did you learn in school today?”

What does “learn” mean to them?

Research Aims
“Learning” is explicit in the design goals:
- What do student-designers think about others’ learning?
- How do they facilitate learning within their designed game environment?

The Problem
- How can you tell what someone thinks about learning?
  
  Examine the kinds of learning experiences they design for others.

Previous work
- Surprisingly little on young (k-8) student meta-cognition
- Main focus
  - What students think of their own learning
  - Measured by intervention-oriented techniques
- Students designing learning experiences for others?
- “Learning,” in general?

Relevant Literature
- Ingrid Pramling (1990)
- Alison King (1989)
- Jin Li (2002)
- Yasmin Kafai & Mitchel Resnick (1996)
Literature Summary

- Little research on how kids think about learning
- Students “learn” in multiple contexts, but “learning” is not easy to operationalize
- How students design a learning experience for others is a valid window into their own concept of learning

Study Specifics

- Primarily qualitative
  - Not causal
  - Descriptive and interpretive
  - Entire groups as units of analysis
- Use of Nvivo software
  - Organized, searchable for all groups
  - Prefab categories
    - Construct validity?

Methodology

Data sources for triangulation
Outside Observer Notes

Basis for Inference

Methodology, cont.

- Mediating factors
  - Notes twice removed
  - Facilitators and student experiences
- Creating categories
  - Intersection of game design / learning
  - Motivation, Realism, Educational Aspects, Aesthetic Considerations, and Relationships

Methodology, cont.

Sample of Presentation Analysis Grid

<table>
<thead>
<tr>
<th>Desiderata</th>
<th>Motivation</th>
<th>Realism</th>
<th>Educational</th>
<th>Aesthetic</th>
<th>Relationships</th>
</tr>
</thead>
<tbody>
<tr>
<td>Birth is at war; players must colonize to save earth (high value)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Collaboration is practical; ask for it; be an “realistic” as possible with characters that look “real”; Real navigation is important</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Findings

When analyzed separately, each data category yielded interesting patterns

- Outside Observer Notes
  - Patterns in the Notes
  - Patterns in the Brainstorms

- Presentations
  - Patterns in the Presentations

The task, of course, is to look for overarching themes and connections
Findings, cont.

- **Education**
  - Embedded procedural tasks
  - Similar to that of "school science"
- **Motivation**
  - High-stakes environment
  - "Spoonful of Sugar"
- **Realism**
  - Linear, hierarchical
  - Ask for "realistic"
- **Aesthetics**
  - Serve to motivate learning
- **Relationships**
  - Very important for girls (3/4 made it required)

Findings, cont.

- Stronlgy "constructionist"
  - Aesthetics
  - Game play
- More "instructionist"
  - Science content
  - Learning
- Realism $\rightarrow$ motivation $\rightarrow$ education

Discussion – Camp Effects

- Activity structure influence on "learning"
- Motivate how you are motivated?
  - "There is a national emergency – the United States has a serious shortage of space scientists" (1-1-1 Event description)
- Conformity based on similarity of experiences
- Uniqueness of camp environment
- Centrality of aesthetics and story, not learning
  - Uniformity across groups

The Moral?

"Learning" seems to be seen as extra baggage for a game.

and...

How you "teach" shapes how students think they can "learn."

Further Study

- How well does this study measure conceptualizations of learning?
  - Follow-up with students on patterns
- When does a game-player think they are "learning" during the activity?
- How do entertainment-oriented games embed necessary learning tasks?

Do Girls Prefer Games Designed by Girls?

Carrie Heeter