Computer Game Design in Middle School

Jill Denner & Teale Fristoe
Brief Bio

- 1989: BA Psychology, UCSC
- 1995: PhD, Developmental Psychology, Columbia University
- 1996-98: Post Doc, Psychology, UCSC
- Funding: grants from the National Science Foundation to increase diversity in computing
Collaborators

Shannon Campe, Eloy Ortiz, Gina Lepore, Jacob Martinez, Steve Bean

Linda Werner, Teale Fristoe, Noah Wardrip-Fruin, Michael Mateas
Children Programming Games

- Today I am going to talk about:
  - Why it is valuable
  - How to do it
  - The kinds of games children make
  - What they learn
Learning Objectives

- Identify gender differences and similarities in motivations for playing games
- Give at least three reasons why it is valuable to teach children to program games
- Describe several strategies for doing research on children making games
Pink and Purple Games

- 1990s: where are the girls?
- Focus on gender differences
Beyond “What do girls and women play?”

2000s
• How?
• Why?
• With whom?
Nick Yee: Maps of Digital Desires

- 40,000+ survey respondents
- 85% male
- EverQuest, World of Warcraft, City of Heroes, etc.
- Motivations for playing MMOs
<table>
<thead>
<tr>
<th>Achievement</th>
<th>Social</th>
<th>Immersion</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Advancement</strong></td>
<td>Socializing</td>
<td>Discovery</td>
</tr>
<tr>
<td>progress, power,</td>
<td>casual chat, helping others,</td>
<td>exploration, lore, finding</td>
</tr>
<tr>
<td>accumulation, status</td>
<td>making friends</td>
<td>hidden things</td>
</tr>
<tr>
<td><strong>Mechanics</strong></td>
<td>Relationship</td>
<td>Role-Playing</td>
</tr>
<tr>
<td>numbers, optimization,</td>
<td>personal, self-disclosure,</td>
<td>story line, character history,</td>
</tr>
<tr>
<td>templating, analysis</td>
<td>find and give support</td>
<td>roles, fantasy</td>
</tr>
<tr>
<td><strong>Competition</strong></td>
<td>Teamwork</td>
<td>Customization</td>
</tr>
<tr>
<td>challenging others,</td>
<td>collaboration, groups,</td>
<td>appearances, accessories,</td>
</tr>
<tr>
<td>provocation, domination</td>
<td>group achievements</td>
<td>style, color schemes</td>
</tr>
<tr>
<td></td>
<td>Escapism</td>
<td>relax, escape from real life,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>avoiding real-life problems</td>
</tr>
</tbody>
</table>

**Gender Differences:**
Females higher: Relationship and Customization
Males higher: Advancement, Mechanics, and Competition
Nicole Lazzaro
Are Boys Games Even Necessary?

“highly gendered design ignores what makes games fun”
“look at game play styles not demographics”

Four Fun Keys

- Hard fun: achieve, challenge strategize (raiding an enemy base or running a restaurant)
- Easy fun: experiment, explore fantasy, role play (soldier or archaeologist)
- Serious fun: change thoughts, feelings, behaviors
- People fun: socialize, spend time with friends

www.xeodesign.com/whyweplaygames.html
Why teach children to program games?

- To increase diversity in game content and play style
- So they can shape the future of games
- To develop thinking and problem solving skills
How do we teach 11-13 year olds?

- After school programs
- Technology electives
- 20-30 hours
- Pair programming
- Tools for children
Child-friendly Programming

✓ Prevent syntax errors
✓ Instant reinforcement and debugging
✓ Familiar terms or visuals

Creator
Alice
Agent sheets
Gamemaker
Scratch
Greenfoot
Cycle of Game Programming

The Use-Modify-Create Framework
Overall Research Questions

- What kinds of games do they make?
- What do they learn?
- What kinds of tools are needed?
The Research Process

- Identify research questions
- Collect systematic data
- Code and analyze the data
Research Questions

- What kinds of games do children make?
- Does programming a game engage children in computational thinking?
- Does programming a game increase children’s interest in studying CS?
- How does programming a game with a partner result in more or less complex thinking?
- What kinds of game authoring tools are engaging for girls?
What kinds of games do they make?

<table>
<thead>
<tr>
<th>Categories</th>
<th>% games by girls</th>
</tr>
</thead>
<tbody>
<tr>
<td>Address social issues</td>
<td>99%</td>
</tr>
<tr>
<td>Real-world settings</td>
<td>71%</td>
</tr>
<tr>
<td>Defy authority</td>
<td>64%</td>
</tr>
<tr>
<td>Teaches a prosocial lesson</td>
<td>53%</td>
</tr>
<tr>
<td>Personal triumph</td>
<td>51%</td>
</tr>
<tr>
<td>Humor</td>
<td>35%</td>
</tr>
<tr>
<td>Violent feedback</td>
<td>24%</td>
</tr>
</tbody>
</table>
The Story of Mr Kaboom

Mr. Kaboom sees Mrs. Boom at a very fine restaurant he has wanted to get revenge on her since she said she didn't want to marry him so he throws a pie at her.
The Bad Babysitter

Angela, Kevin's sister, got a phone call to go to an after prom party and they said no kids allowed. So she called her trustworthy neighbor Brian to babysit. Brian said yes. After the phone call he decided to call his girlfriend Kimi and they both walked to Kevin's house.

DO: c

They go to the mall!!!
Core Game Play Mechanics

- Collecting 38%
- Navigation 23%
- Trivia 17%
- Exploration 13%
- Racing 11%

move the monkey through the rings with the arrow keys
move the monkey through the rings left to right
Programming Concepts in the Games

• Programming
  – Use of variables
  – Conditional character interaction

• Code organization and documentation
  – Extraneous rules
  – Labels on rules, variables

• Design for usability
  – Clear instructions, goal
  – No bugs
Types of Programming in Games

- Conditions or events: 82%
- Door functionality: 59%
- Conditional character interaction: 57%
- Parallelism: 36%
- Character variable use: 29%
- Use of random: 32%
- Global variable use: 4%
- Variable test: 1%
Other kinds of data

- Self-report surveys: confidence, attitude
- Computer logging data: programming vs layout
- Videos of pair programming: support or undermine
What do they learn? (surveys)

- Computer skills
- Confidence with computers
- Problem solving skills
- Intention to study computing
- Parent support
How do they program? (logging, video)

- Scene layout versus programming
- Debugging is hard
- Effective and ineffective partners
Teale Fristoe

- I’m a grad student in the Expressive Intelligence Studio
- Research: engaging young children in computer science by making games
- This is me, teaching a child to program
Current Project: Kodu AI Project

- Working with Jill in the Santa Cruz area
- Using and modifying Kodu Game Lab, engage middle school students in computational thinking
Kodu Game Lab

- Developed at Microsoft Research by Matt MacLaurin, a banana slug!
- Allows programming with Xbox controller
- Designed for very young children (but great for prototyping!)
Research Question 1

- How can we strengthen or create game authoring tools that truly engage middle school students in computational thinking?
- Our theory: adapt the iterative design process
Research Question 2

- Is a gameauthoring tool that allows students to create character, narrative, and dynamic relationships more engaging for underrepresented students than a tool without these features?
- Our theory: yes.
The Plan

- A series of afterschool Kodu classes
- Various middle schools in Santa Cruz county
- Focus on girls, underrepresented in CS
Iterative Design Process
Modifications

- New language features for controlling characters
- Focus on personality and story
- Appealing for middle school girls
- Make sure things are functional
  - Not just dressing up
  - Example: Allowing characters to speak (pass messages) to each other
Demo!
What can research on children making games tell us?

- The content they are interested in (the story or narrative)
- The strategies they like (game play mechanics)
- How they understand computer science concepts
- How to improve the tools
How to get involved

• Summer work
• Fall course credit

Contact:
Jill Denner  jilld@etr.org
Linda Werner  linda@soe.ucsc.edu
Teale Fristoe  fristoe@gmail.com