LOG PLAYER ACTIONS

Rules of thumb:
- Log actions, not interpretations
- Log only meaningful actions
- Log context information

Logging Sample

<table>
<thead>
<tr>
<th>ID</th>
<th>Game Time</th>
<th>Data Code</th>
<th>Data Description</th>
<th>Data_01</th>
<th>Data_02</th>
<th>Data_03</th>
</tr>
</thead>
<tbody>
<tr>
<td>1115</td>
<td>3044.927</td>
<td>2050</td>
<td>scrolled rope from [initial value] to [resulting value]</td>
<td>1/1</td>
<td>3/3</td>
<td></td>
</tr>
<tr>
<td>1115</td>
<td>3051.117</td>
<td>3000</td>
<td>selected coil of [coil value]</td>
<td>1/3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1115</td>
<td>3054.667</td>
<td>3010</td>
<td>added fraction at [position]; added [value] to yield [resulting value]</td>
<td>1/0</td>
<td>1/3</td>
<td>1/3</td>
</tr>
<tr>
<td>1115</td>
<td>3058.443</td>
<td>3000</td>
<td>selected coil of [coil value]</td>
<td>1/3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1115</td>
<td>3054.667</td>
<td>3010</td>
<td>added fraction at [position]; added [value] to yield [resulting value]</td>
<td>1/0</td>
<td>1/3</td>
<td>2/3</td>
</tr>
</tbody>
</table>

PROBLEMATIC IN-GAME BEHAVIOR

Levels were being solved incorrectly when signs were accidentally skipped because students made a whole with the wrong denominator.

Students were using the order in which resources were provided to guess at solutions to the levels, instead of using mathematical strategies.

MEASURES

Problematic In-Game Behavior:
- Number of levels solved incorrectly
- Percentage of attempts utilizing guessing strategies

Student Perception:
- Playing the game was boring
- I really got into the game
- I would have liked to play longer
- Beating the different levels made me feel good
- I learned from the game
  0 = I disagree
  1 = I disagree a little
  2 = I agree a little
  3 = I agree

Student Performance:
- Mean number of attempts per level
- Percentage of first attempts that were solutions
- Immediate posttest score
- Delayed posttest score

DATA-DRIVEN REVISIONS

Added keys to important signs

Changed resources to whole unit coils
RESULTS

Sample:
- 62 sixth grade students
- 31 in each condition
- 24 males, 30 females, 8 unreported
- 160 minutes of gameplay

Conditions
- Original (no modifications)
- Revised (whole units, keys)

<table>
<thead>
<tr>
<th>Measure</th>
<th>Original</th>
<th>Revised</th>
<th>d</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bad Solves</td>
<td>1.46</td>
<td>0.13</td>
<td>6.03</td>
</tr>
<tr>
<td>Guessing</td>
<td>17%</td>
<td>10%</td>
<td>5.14</td>
</tr>
<tr>
<td>Boring</td>
<td>1.70</td>
<td>0.93</td>
<td>3.67</td>
</tr>
<tr>
<td>Got Into</td>
<td>1.40</td>
<td>2.24</td>
<td>3.93</td>
</tr>
<tr>
<td>Play More</td>
<td>1.37</td>
<td>2.10</td>
<td>2.98</td>
</tr>
<tr>
<td>Feel Good</td>
<td>1.97</td>
<td>2.24</td>
<td>na</td>
</tr>
<tr>
<td>Learned</td>
<td>1.93</td>
<td>2.45</td>
<td>2.51</td>
</tr>
<tr>
<td>Attempts</td>
<td>2.88</td>
<td>2.62</td>
<td>na</td>
</tr>
<tr>
<td>First Try</td>
<td>11%</td>
<td>12%</td>
<td>na</td>
</tr>
<tr>
<td>Posttest 1</td>
<td>3.83</td>
<td>3.97</td>
<td>na</td>
</tr>
<tr>
<td>Posttest 2</td>
<td>8.05</td>
<td>7.61</td>
<td>na</td>
</tr>
</tbody>
</table>

Findings: Minor revisions to the game reduced identified problematic in-game behavior improved student perception of the game had no effect on in-game or paper-and-pencil performance

Access the CRESST website at: http://www.cse.ucla.edu/

Access the CATS website at: http://cats.cse.ucla.edu/index.php

USING ANALYSIS OF STUDENT STRATEGIES TO IMPROVE EDUCATIONAL VIDEO GAME DESIGN

Deirdre Kerr & Gregory K.W.K. Chung


Study Design:
- Log player actions
- Use data mining to identify problematic in-game behavior
- Make data-driven revisions
- Conduct a randomized trial to test the effects of the revisions

Research Questions:
- Do data-driven revisions...
  - change in-game performance?
  - impact perception of the game?
  - increase performance?