The Playground Game: Inquiry-based Learning About Research Methods and Statistics

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The playground game

Games are fun?

Hard fun!

(Seymour Papert)

Educational problem

Overview

Game design

Game authoring

Game experiment

Game evaluation

Playground game evaluation

Quantitative results

Test score before 0.515 (SD=0.086)

Test score after 0.571 (SD=0.099)

Effect size 0.65

$t(111) = -5.67, p<0.01, r=0.383$

Playground game evaluation

Qualitative results

• "...highly motivating"
• "...completely absorbed in the game and part of the story"
• "...highly realistic."
• "...it makes statistics concrete."
• "...the game amplifies a critical attitude toward proclaimed pros and cons in research"
• "...great quality of tutor feedback."
• Inquiry-based: "...I would have liked more concrete instructions what to do."

Statistics....

There are lies, damned lies and statistics

- There are lies, damned lies and statistics

- 10 km/h
- 20 km/h
- Average/mean speed: 13.3 km/h

The problem

- Professionals need statistical and methodological knowledge

- Statistical processing is taught as highly mechanical operation

Edwardians and Edwardians

- "There are lies, damned lies and statistics"
Overview

Game design
Game authoring
Game experiment
Game evaluation

The playground problem case

In what district should the Playground be best located for maximum reduction of obesity?
Overview

Educational problem
Game design
Game authoring
Game experiment
Game evaluation

Game creation

- Game platform
- Game content
- Game scenes
- Programming
- User interface
- User management

EMERGO

Game content
- Wireframe
- Rule composer
- CSS
- User management

COMPONENTS

Wireless
AR
Visio
Messages
Browser

Wireless
AR
Visio
Messages
Browser

CSS graphics

Wireless
AR
Visio
Messages
Browser

CSS graphics
### Educational problem

- Educational problem overview
- Game design
- Game authoring
- Game experiment
- Game evaluation

### 2x2 design: 4 conditions

<table>
<thead>
<tr>
<th>Neutral score system</th>
<th>Error-discouraging score system</th>
</tr>
</thead>
<tbody>
<tr>
<td>Condition A</td>
<td>Condition B</td>
</tr>
<tr>
<td>Condition C</td>
<td>Condition D</td>
</tr>
</tbody>
</table>

#### Error rate

\[ TE_1 = \frac{N_{\text{errors}}}{N_{\text{decisions}}} \]

- \( N_{\text{errors}} \) is the number of errors
- \( N_{\text{decisions}} \) is the number of decisions
- \( K_{\text{prior}} \) is the player's prior knowledge ratio

#### Speed of action

- \( TE_2 = \frac{1 - K_{\text{prior}}}{T_{\text{decisions}}} \)
- \( TE_3 = \frac{1 - K_{\text{prior}}}{T_{\text{total}}} \)

- \( T_{\text{decisions}} \) is the time required for all decisions
- \( T_{\text{total}} \) is the total time required for the game

### Trial-and-error indicators

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Expression</th>
</tr>
</thead>
<tbody>
<tr>
<td>Error rate</td>
<td>[ TE_1 = \frac{N_{\text{errors}}}{N_{\text{decisions}}} ]</td>
</tr>
<tr>
<td>Speed of action</td>
<td>[ TE_2 = \frac{1 - K_{\text{prior}}}{T_{\text{decisions}}} ]</td>
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<td>[ TE_3 = \frac{1 - K_{\text{prior}}}{T_{\text{total}}} ]</td>
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</tbody>
</table>

### Outcomes

- Error-discouraging score: no effect observed
- User characteristics: no effect observed
- Learning gains in all conditions
- Acoustic cueing: more trial-and-error

### Summary Playground game

- Content-based game
- Component-based engine, rule composer
- Browser-based
- Quick authoring
- Easy adjustment
- Cascaded stylesheet templates

### Thank you for your attention!

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