Designing for the Cooperative Use of Multi-user, Multi-device Museum Exhibits

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Goals

For Software-based Science Center Exhibits

Study purpose: explore the design space for multi-user, software based science center exhibits.

2 Design goals:

1

Be consistent with philosophy of playfulness of physical exhibits

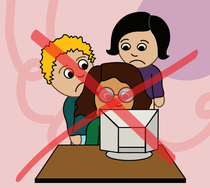
- Be phenomenon-centric
- Be highly-interactive

Avoid highly-scripted, linear activities

2

Support groups of visitors

- Allow all to access software input
- Allow all to access software output

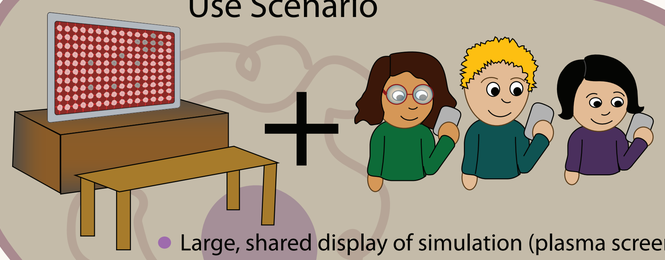


Avoid access-limited situations

Design

Of the Test Application

Use Scenario



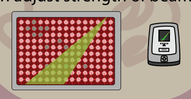
- Large, shared display of simulation (plasma screen)
- Seating for up to 4 visitors
- Visitors use individual wireless devices (here, handheld computers) to play

Player Roles

- Each acts on different parts of the simulation
- Players' actions are complementary

Player Role: Radiation

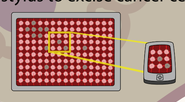
- Views overview of patient
- Use stylus to choose beam entry & exit points
- Can adjust strength of beam.

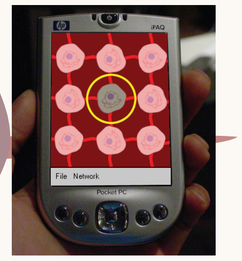


Radiation interface on HP iPaq

Player Role: Surgery

- Views a small region of patient
- Uses handheld buttons to navigate view
- Use buttons or stylus to excise cancer cells





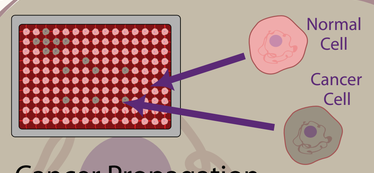
Surgery interface on HP iPaq

Player Role: Proton Beam

- Views overview of patient
- Use stylus to choose beam entry point & direction
- Can set depth of beam penetration

Proton beam interface on HP iPaq

Cancer Propagation Simulation



- Cells & vessels simulated in real-time
- Tumors grow & metastisize
- Treatment options affect cell health, genetic damage, & bloodflow

Cancer simulation running on a Tablet PC

Pilot Study

Individual User Interface Impact

Questions: do individual, private interfaces:
distract users from attending to partners' actions?
affect users' ability to participate in shared activity?

1

Condition: Individual input only

- Input provided via handheld
- No output via handheld
  - Least likely to distract
  - Lowest cognitive load

n = 14

2

Condition: Individual input & Individual output

- Input provided via handheld
- Handheld output: screens display a "zoomed-in" region of the simulation
  - Likely to distract
  - Higher cognitive load

n = 15

3

Condition: Full implementation

- Input provided via handheld
- Handheld output: screens display output for chosen role
  - Likely to distract
  - Higher cognitive load
  - In situ = higher external distractions

n = 54

Comparing 1 & 2

- All players assigned surgery role
- Sessions conducted in a lab off main museum floor

Condition 3

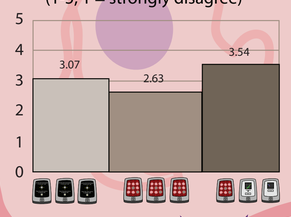
- Players could choose roles (under Design, see player role descriptions)
- Implemented in life-science region of museum floor
- Players join & leave at will

Results

Preliminary Analysis

Awareness (self-reported)

I was aware of how well my partners were doing at all times.
(1-5, 1 = strongly disagree)



P(T <=t) two-tail < 0.02

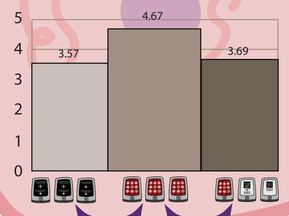
Awareness: Expected:

Awareness: Implication:

- Different roles may make players more curious about, & in turn attend to, their partners' actions
- Could counteract inherent distraction of individual output display.

Contribution (self-reported)

I was able to contribute as much or more as my partners did.
(1-5, 1 = strongly disagree)



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Contribution: Expected:

Contribution: Implication:

- Players in 1 & 2 had same roles, should have been same rating
- Possible explanation: pace of games in 1 & 3 was fast, pace in 2 was slow
- Pace of game important factor to consider in multi-user exhibits