Serious Games for Building Skills in Introductory Algebra and Computer Science Courses

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What are serious games?

- Serious games are games with a purpose beyond entertainment

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Serious games: taxonomy

Surveyed SIGCSE papers from 1995 - 2016

- Making games a "snap" with Stencyl: a summer computing workshop for K-12 (SIGCSE 2014, Jiangjiang Liu et al.)
- Life’s a Game and the Game of Life: How Making a Game Out of it Can Change Student Behavior (SIGCSE 2013, Adrienne Decker and Elizabeth Lane Lawley)
• Using Game Days to Teach a Multiagent System Class (SIGCSE 2004, Leen-Kiat Soh)

• Design Insights into the Creation and Evaluation of a Computer Science Educational Game. (SIGCSE 2016, Britton Horn et al.)
Memory model - short-term to long-term memory

• Atkinson and Shifrin’s Memory model
• Jonathan Sweller’s Cognitive Load Theory
Solve for x game

Score: 0  Time: 2  Level: 1/10

Time:  
- 15
- 2
- 2
- 8

Balance:  
- 8
- 8

Solve for x using the operations on both sides of the equation

2x = 8

8 8

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Exponent multiply game
Interval notation game
Complete the for loop, then click Run

```java
for( int i = 0 ; i<9 ; ++i )
  JumpTo(i);
```

Run
If/else conditional game
Future games

• Set notation (CS-oriented)
• Nested for-loops
• Interval counting
Discussion

• Preliminary Survey Data:
  • Ways to improve the games
  • “The game made me more focused on completing the game rather than understanding the concept”

• Challenges
  • How to collect improvement data
  • Difficult to conduct a controlled study
Our Website

• http://www.cs.ucr.edu/~vahid/seriousGames/