Teach Your Students
Game Design in One Week

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today

1. Theory (10 min)
   - last opportunity to install AgentSheets: www.agentsheets.com
   - theory

2. Hands on (40 min): Make first part of Frogger game

3. Scalable Game Design Resources (10 min)
   - what to do next
   - Q&A
Brief introduction to Scalable Game Design initiative
**goal**: get computational thinking education into public schools

**approach**:
- **motivate**: start with game design at middle school by injecting 1-2 week modules to existing courses taken by most/all students, e.g., keyboarding, Power Pointing
- **educate**: advance to STEM simulation and/or sophisticated games, e.g., including Artificial Intelligence

**research**:
- **context**: will this also work in inner city schools, remote rural areas, Native American communities?
- **pedagogy**: what kind of scaffolding to increase participation of women?
- **learning outcomes**: can we measure computational thinking skills and track them over time?
- **skills**: do computational thinking skills transfer from game design to STEM simulation building?
“programming is hard and boring”
http://www.kunc.org/post/nostalgia-gaming-frogger-helps-teach-kids-computer-science
findings

- **Reach**: already > 8000 students (Alaska, Colorado, Ohio, Oregon, South Dakota, Tennessee, Texas, and Wyoming)
  - some schools: 600 students/year/school
  - starting internationally, e.g., Brazil site.
- **Broadening participation**: 45% girls, 55% boys; 44% white, 56% racial minorities
- **Motivation**: 61% of the girls, 71% of boys; 71% of white students, 69% racial minority students want to continue with similar courses
- **Learning outcomes**: We have found early indicators of transfer between game design and STEM simulation building.
measure skills

CTPA: Computational Thinking Pattern Analysis
Project First Pedagogy
Zones of Proximal Flow

Anxiety
Flow
Boredom

Skills
Challenges

Projects first, just-in-time principles

ZPD
Zone of Proximal Development

Csíkszentmihályi meets Vygotsky

AgentSheet & AgentCubes

City Traffic
the Sims
Bridge Builder
Pac Man
Forest Fire
Frogger

Simulations
Games

Computational thinking patterns:
0%
100%
motivation versus scaffolding
towards a theory of broadening participation

- More scaffolding leading to more guided discovery
- Less scaffolding leading to less self-directed discovery

- Motivation for boys: direct instruction, step-by-step tutorials
- Motivation for girls: open-ended exploration, inquiry-based guided discovery

More scaffolding leading to more guided discovery, less scaffolding leading to less self-directed discovery.
hands on

now YOU create the beginning of a frogger game
support

- please introduce yourselves to your neighbors
- if AgentSheets is not working on your computer work together
You are a frog. Your task is simple: hop across a busy highway, dodging cars and trucks, until you get the to the edge of a river, where you must keep yourself from drowning by crossing safely to your grotto at the top of the screen by leaping across the backs of turtles and logs. But watch out for snakes and alligators! (Sega, 1980)

Background and history:

http://en.wikipedia.org/wiki/Frogger
What are the Objects/Agents?

You are a frog. Your task is simple: hop across a busy highway, dodging cars and trucks, until you get to the edge of a river, where you must keep yourself from drowning by crossing safely to your grotto at the top of the screen by leaping across the backs of turtles and logs. But watch out for snakes and alligators!
What are the Objects/Agents?

- **Mark nouns**

You are a frog. Your task is simple: hop across a busy highway, dodging cars and trucks, until you get to the edge of a river, where you must keep yourself from drowning by crossing safely to your grotto at the top of the screen by leaping across the backs of turtles and logs. But watch out for snakes and alligators!
What are the Operations/Methods?

You are a frog. Your task is simple: hop across a busy highway, dodging cars and trucks, until you get to the edge of a river, where you must keep yourself from drowning by crossing safely to your grotto at the top of the screen by leaping across the backs of turtles and logs. But watch out for snakes and alligators!
What are the Operations/Methods?

- **Step #2: Mark verbs**
- You are a frog. Your task is simple: hop across a busy highway, dodging cars and trucks, until you get the to the edge of a river, where you must keep yourself from drowning by crossing safely to your grotto at the top of the screen by leaping across the backs of turtles and logs. But watch out for snakes and alligators!
using AgentSheets
Scalable Game Design resources

tutorials, lesson plans, grading sheets, ...
support

- Scalable Game Design Wiki
  - [http://scalablegamedesign.cs.colorado.edu](http://scalablegamedesign.cs.colorado.edu)
  - or Google “Scalable Game Design”
- game designs
- STEM simulation designs
- lesson plans
- sample games + simulations
- computational thinking patterns
Making 3D Creativity accessible to everybody through Gentle Slope 3D
thank YOU!

Questions?

http://scalablegamedesign.cs.colorado.edu
Scalable Game Design Arcade

Probot
Program the robot so it can get through the maze to the flag. The commands that you can use are “forward” “turn left” “turn right” and “change to red” (you need to be red to cross the lava). Use the drawing tool to place the commands into the boxes. Once you have placed the commands into the boxes, press spacebar to have the robot start. R resets everything. To win you must finish the game in 12 move or less, remember, commands on the same line all happen at the same time.

Run

Similarity Score to Four Tutorial Games
This score shows how much your game structure is similar to the tutorial games. Max value is 1

This game's similarity score to Frogger: 0.624
This game's similarity score to Sokoban: 0.715
This game's similarity score to Space Invaders: 0.644
This game's similarity score to Sims: 0.082

Similarity Score Matrix
Below Matrix shows other AgentSheets projects sharing similar programming structure.

This Matrix updates itself every 2 and half hours. It may have random projects right after your submission.
computational thinking is
about transfer

Michotte: “Perception of Causality”

def add(x):
    return x +
def derivative(expression):
    name = derivative(expression)
    label = symbol = sym_name = get_sym_name(expression)
    expression = expression[expression.find(1)+1]
    if instance(expression, str):
        print "", name[1], " % expression[1]
    else:
        print 
    else:
        print "", name[1], " %
    for child in name[1] + 1):
        children.append(derivative(child))
    print "", name[1], " % name,

loop, if, then, else, print, ...

collision, push, pull, diffusion, hill climbing, ...

program

frogger

avalanche

science simulation

game

phenomena