Teach [3D] Game Design in One Week

Prof. Alexander Repenning
Prof. David Webb
Karine Laidley (AMSA Charter School)
8:30-9:00 The Scalable Game Design Strategy (theory and SW installation)
9:00 - 10:45 Making Frogger Game (and if time a small STEM sim)
10:45 - 11:00 Practice:
11:00-11:30 upload game, reflect and next steps
part #1
the broken pipeline problem
"programming is hard and boring"

3D Game Design with 3D modeling
AgentCubes

Conversational Programming
2D game design
AgentSheets 3

C++, Emacs

drag & drop
2D game design
AgentSheets 1, 2, Scratch

compute prime numbers
make iPhone game
Objective-C, Xcode

Story Telling
Alice

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We have all seen pictures of happy kids using computers and “learning” computer science but how sustainable are these pilot projects really?

- will it work for non self-selected kids with high levels of motivation across gender and ethnicity?
- will it work with non self-selected teachers with little to no CS background (especially at the elementary and middle school level) teaching CS in a principled and exciting way?
- will it work beyond basic training, research support and incentives?
Impact

- After School programs
  - Boulder Valley School District: CO most tech affluent; 55 schools, 28500 students.
  - Friday afternoon computer club: only one school left: 15 students/year/district (~ 0.05%), < 5% girls

- In School programs
  - Aurora Public School District: inner city; 65 schools, 40000 students
  - Game Design: 350 students/year/school
  - planned scale up could reach most of the 40,000 students
Sustainability

*Scalable Game Design Project*: What is the percentage of schools that advance beyond basic training, research support and incentives?

81% nationally could reach 40,000,000 K-12 students
“programming, oh no... I know what is going to happen. The teacher writes a program onto the blackboard, we type it into the computer and it never works” – student
part #2
strategy:
exposure, motivation, education, and pedagogy

scalable game design
strategy Exposure

Try the vegetables once!

sneak a one week game design unit in between keyboarding and PowerPointing of “forced electives”
results Exposure

- study: over 10,000 students in inner city, remote rural, and Native American Communities
- some middle schools expose 350 students per year
- 45% girls, 55% boys
- 48% underrepresented
- Alaska, California, Colorado, Georgia, Ohio, South Dakota, Texas and Wyoming...
Start with simple 2D games that everybody can build in a couple of hours. Gradually advance to sophisticated 3D games with advanced AI, visualization, ...
results Motivation

- 74% of boys, 64% of girls (100% for some schools); 69% of minority students want to continue
- used in elementary, middle, high schools and university level
Build computational instruments that analyze student produced projects for CT skills so that learning outcomes can be objectively measured
we have created the Computational Thinking Pattern Analysis instrument that can track student learning outcomes and indicators of transfer
strategy Pedagogy

Systematically investigate the interaction of pedagogical approaches and motivational levels

so that
teachers can broaden participation
Pedagogy is the key to broadening participation.
Design for Sustainability
Project First Pedagogy

Csíkszentmihályi meets Vygotsky
Zones of Proximal Development
conclusions

- It is time to move beyond self selected teacher + self selected student pilot projects
- Sustainability: **In-school programs can and should do game design based computer science education** to reach a large portion of children (Scalable Game Design study with schools around the USA and with > 10,000 students):
  - Most schools (81%) advanced beyond the training and without incentives.
  - Many schools (43%) advanced to STEM simulation building.
thank YOU! Questions?

http://scalablegamedesign.cs.colorado.edu
part #3

creating: 1 game + 1 STEM simulation
demo of AgentCubes

- Funky Disco Dancer
- Wizzard Quest
Gamelet design

Frogger
Problem Analysis
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! (Sega, 1980)

Background and history:

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

- Mark nouns

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What are the Operations/

- **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!
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