

Scalable Game Design

Scalable Game Design

Our main goal is to bring computer science to middle schools with the ultimate aim of developing a larger IT workforce. Our approach called Scalable Game Design uniquely balances educational and motivational concerns. In their very first lesson, students make their own simple Frogger-like game which they can publish to the Web. Students then continue gradually to learn about sophisticated topics such as Artificial Intelligence to make complex games and computational science applications

The IT Education Crisis

The increasing lack of U.S. IT workers has become a national crisis. At the middle school level students make crucial career decisions that rarely include computer science. Middle school IT coverage does not typically include programming and is often little more than keyboarding, web browsing and application use training. In Colorado, for instance, there is no school district with a systematic coverage of programming at the middle school level.

Broadening Participation Computer clubs and after school programs are great, but ultimately students need to learn computer science during normal school hours to provide general access. Students participate in scalable game design modules that are part of required computer education courses such as exploratory wheels. This

broadens participation by embracing every student—including women and minorities.

Exceeding the Standards

Scalable Game Design is not just about motivation. It teaches important computer science concepts and addresses learning standards. Learning goes far beyond application use and programming. Game design also accentuates creativity, innovation, communication, critical thinking, and problem solving.

The Right Tools for the Task

AgentSheets/Cubes are revolutionary authoring tools that was originally developed at the University of Colorado.

AgentSheets and AgentCubes are the only tool fulfilling all these educational requirements:

- **low threshold:** simple enough to make a working Frogger-like game in 3 hours or less.

- **high ceiling:** powerful enough to enable middle school students to implement sophisticated AI algorithms e.g., to find shortest path in maze.
- works for **game and computational science** applications
- supports the **transition to traditional programming** such as Java.

Education Anywhere, Anytime

We are teaching game design in a broad variety of contexts. Students range from elementary school to CS graduate students, projects range from simple arcade games to sophisticated simulations, and student cultures cover the USA, Europe and Asia.

“My 6th graders were bummed out that class was over and they ran out of time using AgentSheets. Several said they were going down to the counseling office to put computers as their first elective choice now.”

— Greg Peters, Teacher, Monarch K-8

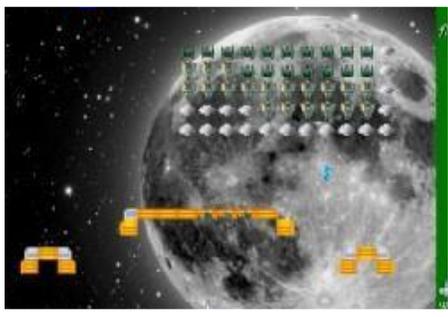


Getting into the Flow

It's not easy to build and design a working game from the ground up. We use the psychological notion of Flow to gradually develop design skills that match design challenges. By scaffolding through game design patterns, students progress from simple arcade games to games that require sophisticated Artificial Intelligence. Throughout this process the students develop IT fluency based on intellectual capabilities, fundamental IT concepts and contemporary IT skills as defined by the National Academies of Sciences.

Things to Do

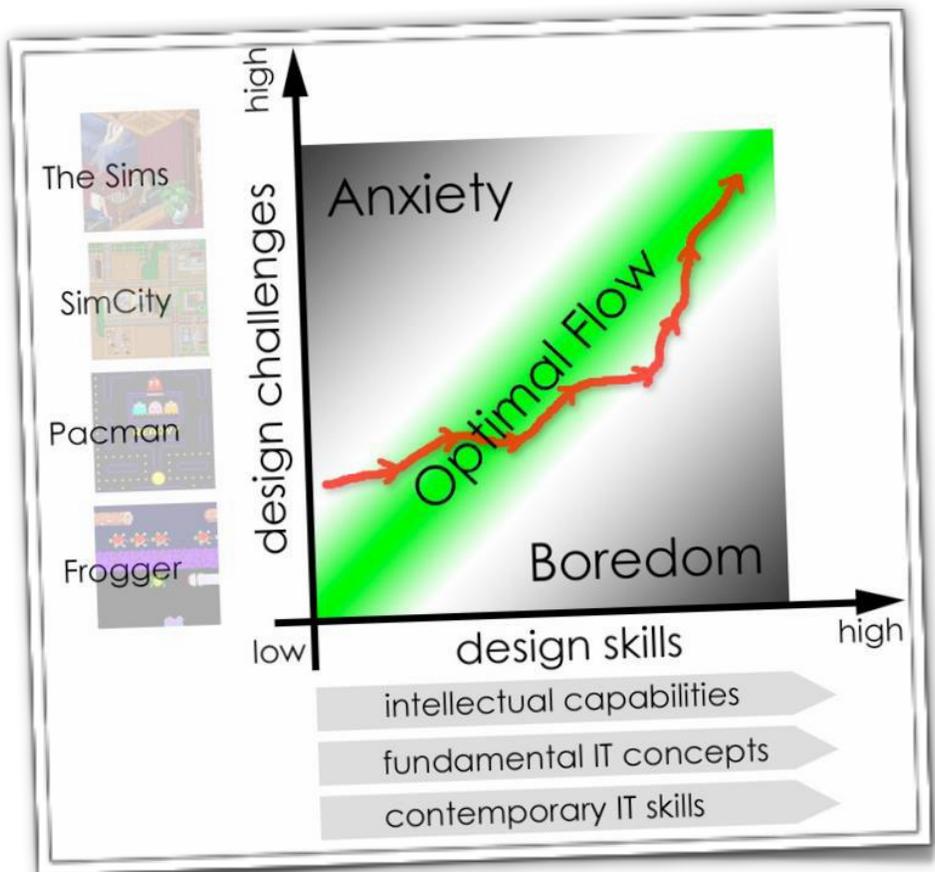
Start by building your favorite classic arcade game. Remember Frogger, Centipede, Sokoban, Space Invaders, Pacman, Tank War? Here is an AgentSheets version of Space Invaders:



Move on from games to computational science. AgentSheets and its 3D cousin AgentCubes are made for computational science applications. Simulate ecosystems, chemical processes, social interactions, or traffic patterns:



AgentSheets/AgentCubes include scientific visualization. Plot 2D and 3D values, colorize and even export data to 3rd party software packages such as Microsoft Excel.



Local Projects

Eleven Colorado school districts use Scalable Game Design in their schools, from Le Veta to Aurora Public Schools. The results include motivated students, engaged teachers, and excited parents:

"A year ago, the boy could barely read. And now he's doing OOP [object oriented programming]—I love that!"
— David Brode, parent

National Participants

Through classroom implementations, outreach, workshops, camps, and large scale events like Computer Science Education Week, Scalable Game Design has reached more than 220,000 students in 7 years of research and education.

National Projects

The Shodor Education Foundation teaches computational science using AgentSheets at national conferences, universities and schools across the country.

International Projects

Scalable Game Design and AgentSheets, AgentCubes has reached schools in 7 countries: Brazil, Germany, Greece, Mexico, Slovakia, Switzerland, and Thailand, with more inquiries coming in.

Evaluation

In addition to testimonials from IT directors, teachers, parents, and students, we have formal evaluations conducted by the School of Education at the University of Colorado. The evaluations showed clearly that Scalable Game Design's educational approaches are universally accessible across gender, ethnicity, prior programming experience, and academic achievement.



Project made possible through support from:

University of Colorado Boulder
National Science Foundation
AgentSheets, Inc.

Contact:
Yasko.endo@colorado.edu

http://sgd.cs.colorado.edu/wiki/Scalable_Game_Design_wiki