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 shortage of US 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 the IT standards (NETS). Learning goes far beyond application use and programming. Game design also accentuates creativity, innovation, communication, critical thinking, and problem solving.

The Right Tool for the Task
AgentSheets® is a revolutionary authoring tool that was originally developed at the University of Colorado. AgentSheets is the only tool fulfilling all these educational requirements:
- **low threshold**: simple enough to make a working Frogger-like game in 3 hours or less from scratch.
- **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 scratch. 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, 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:

Local Projects
The Boulder Valley School District in Colorado has just introduced AgentSheets to all of its middle schools. The results include motivated students, engaged teachers, and excited parents:

International Projects
AgentSheets is used around the globe. One project that we are particularly excited about introduces AgentSheets to all 12,000 schools in Greece. This program is supported by the European Commission and the Greek Ministry of Education.

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 AgentSheets/AgentCubes systems are universally accessible across gender and ethnicity.

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

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

Statewide Projects
The University of Colorado Science Discovery Outreach program reaches 400 teachers and 2000 students in over 20 Colorado locations. AgentSheets-based Science Discovery courses for games and computational science are very popular.

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