

Recommended scope and sequence for creating Games in Scalable Game Design:

	Games						
	Frogger	Journey	PacMan	Sokoban	Ultimate PacMan	Space Invaders	Sims
<b>Computational Thinking Patterns</b>							
Collision	X	X	X	X	X	X	X
Absorb	X	X	X		X	X	
Generate	X	X	X			X	
Transport	X						
Hill Climbing		X	X		X	X	X
Diffusion		X	X		X		X
Polling		X	X	X			
Pull				X			
Push				X			
Seeking					X		X
Collaborative Diffusion					X		
Script						X	
Multiple needs							X
Perceive/Act Sync							

## Simulation Readiness

Agent Attributes		X	X		X	X	X
Simulation Properties		X	X	X			X

## Resources Available

Curricula Available	X	X	X	X			
Tutorial Available	X	X	X	X	X	X	X

Key:

**X:** New skill based on scope and sequence implementation order

**X:** Previously encountered skills

**X:** Available on the Scalable Game Design wiki

**F:** Future resource under construction

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## Scope and Sequence (Continued)

Recommended scope and sequence for creating Simulations in Scalable Game Design:

Computational Thinking Patterns	Simulations						
	Forest Fire Simulation	Contagion Simulation	Predator-Prey - Basic	Predator-Prey - Intermed.	Predator-Prey - Advanced	Heat transfer simulation	Impulse wave generation
Collision	X	X	X	X	X		
Polling	X	X	X	X	X		
Perceive/Act Sync	X						X
Absorb			X	X	X		
Multiple needs			X	X	X		
Hill Climbing					X		
Diffusion					X	X	
Seeking					X		
Collaborative Diffusion					X		
Pull							
Push							
Generate							
Transport							
Script							

### Simulation Readiness

Agent Attributes	X	X	X	X	X	X	
Simulation Properties	X	X	X	X	X	X	

### Resources Available

Curricula	F	F	F				
Tutorials	X	X	X				
Sample Project Available	X	X	X	X	X	X	X

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### ISTE Standards<sup>1</sup> achieved based on creation of games and simulations through Scalable Game Design

#### Creativity and Innovation

*Students demonstrate creative thinking, construct knowledge, and develop innovative products and processes using technology. Students:*

**Apply existing knowledge to generate new ideas, products, or processes:**

- Design and develop games
- Design and develop computational science models

**Create original works as a means of personal or group expression.**

- Design original games
- Model your local environment, e.g., ecology, economy

**Use models and simulations to explore complete systems and issues.**

- Model scientific phenomena, e.g., predator / prey models
- Create visualizations

**Identify trends and forecast possibilities.**

- Build predictive computational science models, e.g., how the pine beetle destroys the Colorado pine forest
- Build live feeds to scientific web pages (e.g, weather information), process and visualize changing information

#### Communication and Collaboration

*Students use digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and contribute to the learning of others. Students:*

**Interact, collaborate, and publish with peers, experts, or others employing a variety of digital environments and media:**

- Students work in teams to build and publish their simulations as web pages containing java applets.

**Communicate information and ideas effectively to multiple audiences using a variety of media and formats.**

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<sup>1</sup> ISTE Standards for Students (ISTE Standards•S) are the “standards for evaluating the skills and knowledge students need to learn effectively and live productively in an increasingly global and digital world.” <http://www.iste.org/standards/standards-for-students>

## Scope and Sequence (Continued)

Effectively combine interactive simulations, text, images in web pages

### **Develop cultural understanding and global awareness by engaging with learners of other cultures.**

Students and teachers from the four culturally diverse regions interact with each other

### **Contribute to project teams to produce original works or solve problems.**

Define project roles and work collaboratively to produce games and simulations

## **Research and Information Fluency**

*Students apply digital tools to gather, evaluate, and use information. Students:*

### **Plan strategies to guide inquiry.**

Explore web sites and identify interesting connections

### **Locate, organize, analyze, evaluate, synthesize, and ethically use information from a variety of sources and media.**

Find relevant related web-based information, compute derivative information

### **Evaluate and select information sources and digital tools based on the appropriateness to specific tasks.**

Understand validity of information, e.g. Scientific journal information vs. Personal blogs

### **Process data and report results.**

Write programs to access numerical information, define functions to process data and create output based on voice or plotting to represent data.

## **Critical Thinking, Problem Solving, and Decision Making**

*Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources. Students:*

### **Identify and define authentic problems and significant questions for investigation.**

Define research questions and explore approach of exploration

### **Plan and manage activities to develop a solution or complete a project.**

Outline sequence of exploratory steps

Experience complete bottom-up and top-down design processes

Employ algorithmic thinking for creating programs to solve problems

### **Collect and analyze data to identify solutions and/or make informed decisions.**

Collect data as time series, e.g., collect group size of predator and prey, export time series to excel, explore various types of graph representations, e.g.,  $x(t)$ ,  $y(t)$  or scatter  $y=f(x)$

### **Use multiple processes and diverse perspectives to explore alternative solutions.**

Experience and understand design trade-offs, e.g. Bottom-up vs. Top-down

# Scope and Sequence (Continued)

## Digital Citizenship

*Students understand human, cultural, and societal issues related to technology and practice legal and ethical behavior. Students:*

### **Advocate and practice safe, legal, and responsible use of information and technology.**

Learn how to use tools to locate resources, e.g., images with google image search, but understand copyright issues

### **Exhibit a positive attitude toward using technology that supports collaboration, learning, and productivity.**

Stay in the flow, where design challenges match design skills

Experience success through scaffolded game design activities

Mentor other students

### **Demonstrate personal responsibility for lifelong learning.**

Explore options of going beyond expected learning goals

### **Exhibit leadership for digital citizenship.**

In a collaborative setting become a responsible producer of content for diverse audiences

## Technology Operations and Concepts

*Students demonstrate a sound understanding of technology concepts, systems, and operations. Students:*

### **Understand and use technology systems.**

Know how to organize files and folders, launch and use applications on various platforms

### **Select and use applications effectively and productively.**

Know how to orchestrate a set of applications to achieve goals, e.g., make game and simulations using Photoshop (art), AgentSheets (programming), and Excel (data analysis).

### **Troubleshoot systems and applications.**

Debug games and simulations that are not working

### **Transfer current knowledge to learning of new technologies.**

Reflect on fundamental skills at conceptual level. Explore different tools to achieve similar objectives.