

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

| | Games | | | | | | |
|--|---------|---------|--------|---------|-----------------|----------------|------|
| | Frogger | Journey | PacMan | Sokoban | Ultimate PacMan | Space Invaders | Sims |
| Computational Thinking Patterns | | | | | | | |
| 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 Standards¹ 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.

¹ 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.