STEM Fuse – GAME:IT

GAME:IT Learning Objectives, Standards & Skills

We take great pride in the fact that **GAME:IT** is not simply a terrific introductory level computer programming course, but a lot more. We not only focus on programming skills, but also on each discipline related to STEM (science, technology, engineering and math).

Using game design and development as the teaching vehicle, **GAME:IT** exposes your students to a wide range of concepts and technical skills in six separate areas that will greatly help them succeed in the future.

GAME:IT 's learning objectives were designed to align very closely with ISTE's NETS for students and 21st Century Skills Technology Core Standards.

GAME:IT provides instruction in six critical areas:

1. Technical skills related to software development, computer programming & graphic design
2. Creative, innovative & critical thinking
3. Communication and collaboration as an individual and part of a team
4. Using appropriate and accessible digital tools for research and learning
5. Using engineering, physics & mathematical concepts critical to game development
6. Post-secondary and career options & resources related to STEM

1. Technical Skills

A. Programming through a drag-n-drop method
B. Programming by writing code using GML
C. Follow technical and increasingly complex programming instructions in order and detail
D. Program original game projects
E. Use digital design resources and color theory to draw and animate sprites, objects, platforms, backgrounds and loops
F. Become familiar and competent in using game engines (Game Maker); open files, save files, create and program original material, integrate separate files into a final game project, create and edit audio sound effects & music
G. Technical writing; user instructions, game directions, game rules and document development process within a development team

2. Creative, Innovative & Critical Thinking

A. Learn steps of the engineering design cycle (discover- evaluate, design- evaluate, develop- evaluate, deliver-evaluate) and how it works as a practical problem solving method
B. Use gained technical skills to improve game programs
C. Use gained technical skills to create, design & program original working games
D. Troubleshoot existing game programs to fix bugs and ensure performance
E. Test fellow classmate's games to ensure performance
F. Perform self-evaluations of projects against the required established directives
G. Perform evaluations of classmate's projects against the required established directives
H. Develop a marketing plan for original programmed game to include; target audience, current competition, delivery options, product pricing, logo design and strategy to spend budgeted funds

3. **Communication & Collaboration**

    A. Form game development groups to achieve directive of creating original game
    B. Assign tasks to members of development group to achieve directive of creating an original game
    C. Use the engineering design cycle within the development team to achieve directive of creating original game
    D. Project management; students will have opportunity to lead a development team, assign tasks, evaluate progress, facilitate communication among team members and ensure that project is completed within time deadline
    E. Conduct two in-class presentations including demonstration of original game

4. **Using Digital Research Tools**

    A. Use appropriate internet websites to gather and analyze research on a variety of subjects including; game development, marketing statistics, color and design theory, post-secondary education options and careers in game development & technology
    B. Use appropriate wiki's and blogs to engage other (distance) users of Game Maker for research, ideas and help

5. **Engineering, Physics & Math**

    A. Learn how the process used in designing and developing software can be applied to other design and development projects like bridges, buildings and machines
    B. Learn how basic physics concepts like gravity, acceleration, velocity, speed, trajectory, Newton's Laws of Motion, force & elasticity are used in game development
    C. Use required mathematical techniques to perform physics calculations in determining how physics is used in gaming compared to the real world
    D. Use knowledge of math & physics to evaluate behavior in games in the "virtual world" as compared to the "real world"

6. **Further Career, STEM & Post-secondary Education Options**

    A. Research how technical & communication skills used in game design translate to other technology industries and businesses
    B. Research required post-secondary diplomas, certificates & degrees needed to gain employment in game development and other technology based industries
    C. Research career trends, wage data and employment opportunities in game development and technology based industries

http://www.iste.org/standards/nets-for-students/nets-student-standards-2007.aspx

1. Creativity & Innovation

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

a.   apply existing knowledge to generate new ideas, products, or processes.
b.   create original works as a means of personal or group expression.
c.   use models and simulations to explore complex systems and issues.
d.   identify trends and forecast possibilities.

2. 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:

a. interact, collaborate, and publish with peers, experts, or others employing a variety of digital environments and media.
b. communicate information and ideas effectively to multiple audiences using a variety of media and formats.
c. develop cultural understanding and global awareness by engaging with learners of other cultures.
d. contribute to project teams to produce original works or solve problems.

3. Research and Information Fluency

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

a. plan strategies to guide inquiry.
b. locate, organize, analyze, evaluate, synthesize, and ethically use information from a variety of sources and media.
c. evaluate and select information sources and digital tools based on the appropriateness to specific tasks.
d. process data and report results.

4. 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:

a.   identify and define authentic problems and significant questions for investigation.
b.   plan and manage activities to develop a solution or complete a project.
c.   collect and analyze data to identify solutions and/or make informed decisions.
d.   use multiple processes and diverse perspectives to explore alternative solutions.

5. Digital Citizenship

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

a. advocate and practice safe, legal, and responsible use of information and technology.
b. exhibit a positive attitude toward using technology that supports collaboration, learning, and

productivity.

    c. demonstrate personal responsibility for lifelong learning.

    d. exhibit leadership for digital citizenship.

6. Technology Operations and Concepts

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

    a. understand and use technology systems.

    b. select and use applications effectively and productively.

    c. troubleshoot systems and applications.

    d. transfer current knowledge to learning of new technologies.

Compare to 21st Century Learning & Innovation Skills

http://www.p21.org/index.php?option=com_content&task=view&id=254&Itemid=120

Creativity and Innovation

Think Creatively

- Use a wide range of idea creation techniques (such as brainstorming)
- Create new and worthwhile ideas (both incremental and radical concepts)
- Elaborate, refine, analyze and evaluate their own ideas in order to improve and maximize creative efforts

Work Creatively with Others

- Develop, implement and communicate new ideas to others effectively
- Be open and responsive to new and diverse perspectives; incorporate group input and feedback into the work
- Demonstrate originality and inventiveness in work and understand the real world limits to adopting new ideas
- View failure as an opportunity to learn; understand that creativity and innovation is a long-term, cyclical process of small successes and frequent mistakes

Implement Innovations

- Act on creative ideas to make a tangible and useful contribution to the field in which the innovation will occur

Critical Thinking and Problem Solving

Reason Effectively

- Use various types of reasoning (inductive, deductive, etc.) as appropriate to the situation

Use Systems Thinking

- Analyze how parts of a whole interact with each other to produce overall outcomes in complex systems

Make Judgments and Decisions

- Effectively analyze and evaluate evidence, arguments, claims and beliefs
- Analyze and evaluate major alternative points of view

- Synthesize and make connections between information and arguments
- Interpret information and draw conclusions based on the best analysis
- Reflect critically on learning experiences and processes

Solve Problems

- Solve different kinds of non-familiar problems in both conventional and innovative ways
- Identify and ask significant questions that clarify various points of view and lead to better solutions

Communication and Collaboration

Communicate Clearly

- Articulate thoughts and ideas effectively using oral, written and nonverbal communication skills in a variety of forms and contexts
- Listen effectively to decipher meaning, including knowledge, values, attitudes and intentions
- Use communication for a range of purposes (e.g. to inform, instruct, motivate and persuade)
- Utilize multiple media and technologies, and know how to judge their effectiveness a priori as well as assess their impact
- Communicate effectively in diverse environments (including multi-lingual)

Collaborate with Others

- Demonstrate ability to work effectively and respectfully with diverse teams
- Exercise flexibility and willingness to be helpful in making necessary compromises to accomplish a common goal
- Assume shared responsibility for collaborative work, and value the individual contributions made by each team member