**Computer Gaming**

Target Grade Level(s): 4th and 5th grade

Subject(s): Computer Science

Author(s): Tara Riddle (Salem Woods Elementary), Gayla Boast (Silver Lake Elementary), Erica Taggart (Silver Lake Elementary), Nicole Mazza (Boeing, Software Engineering Manager), Amy O’Dell (Boeing, Propulsion Engineer)

**Problem Statement:**

Over 175 million video games are sold each year in the United States alone. Due to the high demand for new games which grows each year the demand for video game designers has also grown. Games R Us, a large video game design company, has hired a group of junior game designers to develop new games to meet the growing customer demand.

Your team must design a new game and present your product to the leadership team of Games R Us, your goal is to get approval from the Games R Us executives to produce your game.

**Constraints for the teacher to be aware of:**

* Your deadline will be\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (insert deadline here)
* Your game should have a consistent theme and a name
* Your game should work - When you push the green flag it does what you want it to do
* Your game should have the minimum requirements:
  + A game space that includes a background, a player, and obstacles
  + Clearly written instructions
* Cost: Computing time costs money
  + If your code uses 1-19 blocks: $40
  + If your code uses 20-39 blocks: $60
  + If your code uses 40-59 blocks: $80
  + If your code uses more than 60: $100
* Earning Potential
  + Meeting all of the requirements $30
  + User input $5
  + Having more than 1 player: $5
  + Keeping score (points) : $5
  + Multiple levels: $10
  + Obstacles: $5
  + Background music $5
  + Timer $ 5

**Additional information for the teacher to understand:**

The “Computer Gaming” PBL has a computer science focus. Students may have little to no experience with computer coding despite possible experience playing video games. It is highly recommended that the teacher has an opportunity to familiarize themselves with blockly coding before teaching this unit (Code.org, Scratch, etc.). It is also recommended that teachers create a teacher account on Scratch (<https://scratch.mit.edu/educators/register>). This will allow the teacher to create and monitor student projects.

“Computer Gaming” begins with teaching what an algorithm is and progresses through activities that familiarizes the students with Scratch. At the end of the unit, students will research and create their own video game. The students will need to consider the constraints (see above). A real-world connection for students to understand is that each line of code costs money. Therefore, they need to keep their workspace clear of unneeded code and that programmers are looking for the most efficient way to program.

**Unit Overview and Table of Contents**

\*\* It would be helpful if prior to this unit the teacher and students have some experience with blockly coding (Code.org, Scratch, etc).

Lesson 1: Unplugged: Algorithms (sequential instructions)

Lesson 2: SCRATCH scavenger hunt (familiarization with Scratch terminology)

Lesson 3: 10 Block Challenge Activity (students self-discover with 10 specific blocks of code)

Lesson 4: Bouncing Ball Activity (students problem solve to program a ball to bounce around the stage;

conditional logic)

Lesson 5: Game Research Day (research games on Scratch to identify common characteristics; begin to

brainstorm team game design)

Lesson 6: Creating Video Game

\*\*Appendix: Glossary, Reference List, Engineering Notebook, Video/Book recommendations

**Provide the following items for the entire unit:**

**Standards (NGSS, CCSS, CTE):**

**Washington State Computer Science Learning Standards (3-5)**

1B-A-2-1

Apply collaboration strategies to support problem solving within the design cycle of a program

1B-A-5-3

Create a plan as part of the iterative design process, both independently and with diverse collaborative teams (e.g., storyboard, flowchart, pseudo-code, story map).

1B-A-5-4

Construct programs, in order to solve a problem or for creative expression, that include sequencing, events, loops, conditionals, parallelism, and variables, using a block-based visual programming language or text-based language, both independently and collaboratively (e.g., pair programming).

1B-A-5-5

Use mathematical operations to change a value stored in a variable.

1B-A-3-6

Decompose (break down) a larger problem into smaller sub-problems, independently or in a collaborative group.

1B-A-3-7

Construct and execute an algorithm (set of step-by-step instructions) that includes sequencing, loops, and conditionals to accomplish a task, both independently and collaboratively, with or without a computing device.

1B-A-6-8

Analyze and debug (fix) an algorithm that includes sequencing, events, loops, conditionals, parallelism, and variables.

1B-D-5-12

Create a computational artifact to model the attributes and behaviors associated with a concept (e.g., solar system, life cycle of a plant).

1B-D-5-13

Answer a question by using a computer to (e.g., sort, total and/or average, chart, graph) and analyze data that has been collected by the class or student.

**Next Generation Science Standards (NGSS)**

3-5 ETS1-1

Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost

3-5 ETS1-2

Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.

3-5 ETS1-3

Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

**Common Core State Standards (CCSS) Mathematical Practices**

1. Make sense of problems and persevere in solving them.

3) Construct viable arguments and critique the reasoning of others.

6) Attend to precision.

7) Look for and make use of structure.

8) Look for and express regularity in repeated reasoning.

**Soft Skills:**

**Partnership for 21st Century Learning (P21)**

* Think creatively
* Work creatively with others
* Reason effectively
* Use systems thinking
* Make judgements and decisions
* Solve Problems
* Communicate clearly
* Collaborate with others
* Create media products
* Apply technology effectively
* Adapt to change
* Be flexible
* Manage goals and time
* Work independently
* Be self-directed learners
* Interact effectively with others
* Manage projects
* Produce results
* Guide and lead others
* Be responsible to others

**Locally and/or Personally Relevant for Students:**

Companies like Amazon Game Studios and Nintendo are doing game development right here in Seattle. There are many different type of jobs that get involved in the development of a game including:

* Animator: responsible for the portrayal of movement and behavior within the game
* Assistant Producer: Works with the game’s production staff to ensure timely delivery of the product
* Audio Engineer: Create the soundtrack for the game including music, sound effects, character voices, and spoken instructions
* Creative Director: Responsible for the overall look and feel of a computer game
* Development Operations Engineer: Responsible for creating the online infrastructure for online games which ensures the stability and security of the web services
* Game Designer: devise what the game consists of and how it plays, they define all of the core elements of the game
* Game Programmer: Design and write the computer code that runs and controls a game

**Connections to career and educational pathways:**

How will students learn about connections to career and educational pathways into the unit/lessons?