

LESSON 1: CREATIVE SOLUTIONS

Goal: Students will work in pairs to design and test a solution to an engineering problem and will apply their solution to game design.

Time Required: Two to three 45-minute periods

Standards: NGSS K-2-ETS1-1; 3-5-ETS1-1

Materials Required: Table tennis balls, building materials (paper, rubber bands, paper clips, etc.), colored pencils, Student Activity Sheet 1

Preparation: Assemble sets of materials for each pair of students. Set up pairs of desks or stacks of books with a one-foot gap between them.

Optional: Ask students to bring in props from home.



Lesson Steps:

- 1 Explain** how scientists try different solutions to solve problems. Then brainstorm inventions that helped solve problems. Explain that many of these inventions happened after trial and error—or by accident!
- 2 Present** students with a design challenge. Using only the materials provided, they will work in pairs to invent a way for a table tennis ball to roll across a gap between two desks. Students and their partners will design, test, and redesign their solutions to the problem using Part A of Student Activity Sheet 1.
- 3** After students have developed their solutions, **lead** a final test session to determine which design was the most effective. Students will then complete Part B of Student Activity Sheet 1.
- 4 Discuss** with students how these types of challenges apply to game design:
 - Game developers design challenges for players to solve. They include tools that players can use to solve those problems.
 - Apply today’s lesson to a game course. If a character had to cross a large gap in the game course, which tools could players use to solve this challenge? (Possible answers: *clouds that float, switches that reveal new platforms in the course*)



Real-World Connection:

Games like *Super Mario Maker™* for *Nintendo 3DS* allow students to design game levels in 2D and to create challenges for players to solve.

Extension Activity: Ask students to revisit and write about a real-life challenge they had at school and the strategy they used to overcome it. Encourage the use of diagramming or storyboarding in telling the story.

Game Rated:



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CREATIVE SOLUTIONS

How can you get an object across a gap? Use this activity sheet to design your solution to the challenge.



PART A: PLAN YOUR DESIGN

- 1 What is your goal? _____
- 2 Draw a diagram of your group's solution, labeling all the parts of your design, to make the table tennis ball cross the gap.

PART B: REFLECT

Mark the parts of your design that worked well with a ★ and draw a circle around those parts that could be improved.

- 1 Describe how your design met the goal. _____

- 2 Describe how your design did not meet the goal. _____

- 3 How could your design be used in a video game? What would it help the player to do? _____

LESSON 2: GAME DESIGN 101

Goal: Students will analyze and solve problems in order to design their own game course.

Time Required: Two to three 45-minute periods

Standards: NGSS K-2-ETS1-2; 3-5-ETS1-2

Materials Required: Index cards, graph paper, Student Activity Sheet 2

Preparation: Write the physical obstacles listed in Step 2 on index cards. Each group will need one card.



Lesson Steps:

1 Explain that environments present different physical obstacles. Over time, people have developed tools to overcome these obstacles. For example, people who need to cross a river could build boats, construct a bridge, or even develop their swimming skills.

2 Divide students into small groups. Provide each group with an index card listing a physical obstacle. Each group will brainstorm ways that people have overcome this obstacle.

- A person wants to visit someone, but there is a mountain in the way.
- A person wants to cross an ocean.
- A person lives in a place that floods often.
- A person wants to land on the moon.
- A person wants to see what is on the ocean floor.

3 Distribute Student Activity Sheet 2. Explain to students that they will take on the role of game designers. Have students use the questions on the activity sheet to plan their own game course. Tell them to use their imaginations as well as their ideas from the earlier brainstorm.

4 Once students have developed their ideas, distribute graph paper so that they can draw and label their game course.

Real-World Connections:

- Provide inspiration by giving examples of objects that appear in *Super Mario Maker* for Nintendo 3DS courses, such as warp pipes and trampolines.
- Did you know the original *Super Mario Bros.* game was designed using graph paper? Share this video with your class to learn more: <http://bit.ly/2vXPZsx>

Extension Activity: After students design their own game course, they will write a story from a game character's point of view. What does the character think and feel as he or she completes the task?

FINAL PROJECT

For their final project, students will build a three-dimensional version of their game courses. Recommended materials include shoe boxes, construction paper, and paper towel rolls, but this can be customized based on the needs of the class.

- 1** Before students begin, work with the class to develop a list of success criteria for the project.
- 2** After students complete their game courses, ask them to reflect on the process of turning a two-dimensional drawing into a three-dimensional creation. What was challenging?

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GAME DESIGN 101

It's time to design your own game course. Your video game character needs to move through this course to rescue your teacher! Use the questions below to help plan your game course.

PART A: PLANNING QUESTIONS

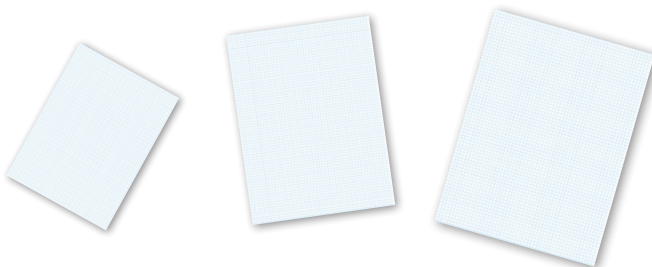
1 Where is your game course located? (e.g., *underground, underwater, in the sky*)

2 Based on the setting you chose, what challenges will the player face in getting from one end of the course to the other? (e.g., *the player may need to break through rocks or walls*) _____

3 Based on the setting you chose, what tools would help the player complete the course? (e.g., *vines to swing from place to place, flippers to swim*)

PART B: TIME TO CREATE

Taking what you have learned, make a drawing of your course on graph paper and label the different obstacles and solutions you chose.



WORKING & WINNING TOGETHER

Many children (and adults!) love video games—and these can be a great way to get children interested in science, technology, and game design. Through lessons at school, your child is learning about finding creative solutions in game design.

Try these activities to promote creativity and problem-solving at home:

Obstacle Course

Allow your child to create a life-size game course by creating an obstacle course in your home or yard. Have the entire family compete. Your child may want to make adjustments to the course to make it more (or less) challenging!



Team Building

Try traditional team-building activities to build problem-solving skills. In the “human knot,” everyone in the group holds the hand of two other people, and the goal is to untangle the group so that everyone is standing in a circle. In the “tarp flip,” everyone in the group stands on a tarp, and the goal is to flip the tarp over without any member of the group touching the ground.

Beat the Clock

Turn playground time into a beat-the-clock challenge. How quickly can your child move from one end of the playground to another? Add additional challenges: How quickly can he do this without touching the ground? How quickly can she do this without using her hands?



Game Design

The Super Mario Maker™ for Nintendo 3DS game allows kids to build their own game courses.

Have your child design his or her own course, then use your child’s game for a family game night!



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OVERVIEW

Imagine, Design, Create will inspire students to use the principles of game design and engineering to build critical thinking, problem-solving, and other essential STEM skills. The program's key themes—design, creativity, and experimentation—will come alive with hands-on lessons and classroom activities that challenge kids to play, create, and collaborate.





Related Next Generation Science Standards

Grade 2

-  **K-2-ETS1-1.** Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.
-  **K-2-ETS1-2.** Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.



Grades 3–4

-  **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.

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