

SIEMENS STEM DAY ACTIVITY

CRACK THE MAZE CODE

OBJECTIVES

Students will be able to:

- create unique characters and obstacles using visual block code.
- design one or more unique levels of a maze game using an online coding program.
- test the functionality of the program and rewrite the visual block code to make it more efficient.

STEM LESSON FOCUS

Engineering Design Cycle

- Creating or Prototyping

21st Century Skills

- Creativity

GRADE RANGE

9–12

OVERVIEW

Students will design one or more unique levels of a maze game using a free online coding program. Students will create their own character and obstacles and subsequently write the visual block code to maneuver their character successfully through the maze. In addition, students also will be given the opportunity to test the game and check for bugs. More advanced students may create additional levels of increasing difficulty.

MATERIALS

- Computers connected to the Internet
- Paper
- Pencils

HAVE YOU EVER WONDERED...

How video gaming designers coded your favorite video games? Or, how computer programs are tested for “bugs”?

MAKE CONNECTIONS!

How does this connect to students?

Coding impacts nearly every occupation of the 21st century. Therefore, learning about coding early on will prove advantageous for students in the future

How does this connect to careers?

Game Designer:

Works with a team to design and develop computer and video games. Game designers write code using various computer programming languages and they are responsible for designing characters, levels, art, and animation.

Software Developer:

Works individually or as part of a development team to build programs for desktop computers, servers, iPads, etc.

User Experience Designer:

Studies how consumers interact with online products and makes changes to improve that experience. Sometimes this may involve reworking the flow of an entire website.

How does this connect to our world?

The demand for coders is projected to grow twice as fast as most other jobs. Given the limited supply of coders around the world, many companies, such as Google and Facebook, are providing lucrative salaries to attract qualified employees.

Please allow for more classroom time if you want students to further explore careers.

BLUEPRINT FOR DISCOVERY

1. As a warm-up to the lesson, invite students to create a step-by-step algorithm for how to go from their current position to the cafeteria. Students should write out every step in an easy to read flow chart.
2. Next, have students choose a partner in the class to test the program for “bugs”. If the student is not able to complete the task using only the instructions provided, students will need to consider ways to rewrite the algorithm.
3. Explain to students that coding entails giving instructions to a digital device, using a language (“code”) that it understands, so that it accomplishes exactly what you want it to do. Lead a discussion on the importance of writing precise step-by-step instructions, testing programs for “bugs”, and making any necessary adjustments as needed.
4. Explain to students that they will be programming a maze game using one of the following online block coding programs. The object is to create their own character and obstacles and subsequently write the

visual block code to maneuver their character successfully through the maze. Keep in mind that the programs tend to work best using the Google Chrome web browser.

- Scratch
<https://scratch.mit.edu>
 - Tynker Coding for Kids
<https://www.tynker.com/>
 - Alice
<http://www.alice.org/>
 - Snap
<http://snap.berkeley.edu/>
5. First, allow students to create or select a character (sprite) that they will use to navigate through their maze. They may draw the character by hand or upload an image. Next, students will use the tools in the coding program to create the walls of their maze. Make sure students decrease the size of the sprite so that it is small enough to navigate through the maze.
 6. Based on their maze design, students will program their sprite to maneuver in different directions, being careful not to touch the walls of the maze. To do this, they will need to use the “motion/movement” and “sensing” features of the toolbar. The general features of the toolbar are fairly similar between different block coding programs; however, they may vary slightly in their names. The visual blocks are color-coded to make them more user-friendly.
 7. Once they’ve programmed the sprite to reach the end of their maze, they will need test the functionality of their program by allowing another student to play their maze game while they watch them. Any unsuccessful attempts signify “bugs” in the program. Students will need to rewrite (“debug”) the visual block code to make the program function efficiently. Examples of troubleshooting measures include checking for instructions that may be misplaced or checking for any incorrect numbers or signs within visual blocks. Redundancy in the code can be avoided by incorporating loops that tell the program to repeat some of the instructions for you. However, remind students to make sure they have the right instructions inside the right loops.
 8. If time permits, more advanced students may create additional levels of increasing difficulty.

TAKE ACTION!

1. Challenge students to add extensions to their project by incorporating special messages, sound, scores, additional obstacles, new backdrops, and even another competing character (enemy to avoid).
2. Visit <https://code.org/learn> to find additional coding exercises (including “Hour of Code”) that use visual block coding, including some with popular movie and television themes.

NATIONAL STANDARDS

Technology Education

- 17:** The Designed World—Students will develop an understanding of and be able to select and use information and communication technologies.
- Q.** Technological knowledge and processes are communicated using symbols, measurement, conventions, icons, graphic images, and languages that incorporate a variety of visual, auditory, and tactile stimuli.
- 10:** Design—Students will develop an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving.
- F.** Troubleshooting is a problem-solving method used to identify the cause of a malfunction in a technological system.