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| **Lesson Title:**  Jaguar Security System | |  |
| **Grade Level:** 5th | **Quarter:**  3rd |
| **Standards:**  Science  **S5P3**. Students will investigate the electricity, magnetism, and their relationship.  b. Determine the necessary components for completing an electric circuit.  c. Investigate common materials to determine if they are insulators or conductors of electricity.    Math  **MGSE5.G.1**  Use a pair of perpendicular number lines, called axes, to define a coordinate system, with the intersection of the lines (the origin) arranged to coincide with the 0 on each line and a given point in the plane located by using an ordered pair of numbers, called its coordinates. Understand that the first number indicates how far to travel from the origin in the direction of one axis, and the second number indicates how far to travel in the direction of the second axis, with the convention that the names of the two axes and the coordinates correspond (e.g., x-axis and x-coordinate, y-axis and y-coordinate). | | |
| **Lesson Essential Question:**   * How can I determine the necessary materials to create an electric circuit? * How can I determine the difference between an insulator and conductor of electricity? * How do I understand a coordinate grid? | **Vocabulary:**    Electricity  Electric Circuit  Insulators  Conductors | |
| **Lesson Materials:**  -Schematic drawings of various structures (homes, banks, museums, jewelry stores, etc.)  -wires (alligator clips are best)  -bulbs  -batteries  -battery clips  -bulb clips  -paper clips -poster board  -overhead projector (if students wish to project their schematics and draw them on large posters)  -markers  -tape  -scissors  -computers for the use of Microsoft PowerPoint and research | **Lesson Assessment:**  Student Journal  Teacher Observations  Group Presentation  Group schematic drawings | |
| **STEM Challenge Overview:**  Students will design, plan and budget a security system. | | |
| **Teacher Background:**  This STEM challenge can be as complex or simple as you choose to make it. It’s important that you have and provide students with adequate background knowledge of the components of a security system, their purpose, and the importance of determining WHAT students are trying to protect. The following website contains short descriptions of each component as well as pricing information that students will need later in the project:  <http://www.alarmcontacts.com/>  <http://www.homesecuritystore.com/c-174-alarm-accessories.aspx>  It is recommended to try and bring in a guest speaker to talk about security installation and the parts of a system. This will help tie the project to real-world jobs and help to motivate students.  **Prep**: Print schematic drawings of the type of structure that the students are going to design their systems for. These can be easily found and saved from an internet image search. | | |
| **INSTRUCTION** | | |
| 1. **Ask/Engage (day 1)** | | |
| Have the class brainstorm and discuss: Why do we need alarms? Where do you see alarms?  Show the short video on how to make a simple alarm: <https://www.youtube.com/watch?v=3P0MFdWSnNs>. The video shows a schematic drawing of the alarm and explains how the alarm works. Allow students to experiment with different types of materials to determine what makes good insulators and conductors. This will help students to determine what components they want to use for their challenge.  Introduce the challenge to the class and have students complete the ask/engage part of their student journal.  **Challenge:**  You have been chosen to work with the Jaguar Security Company to design a state-of-the-art security system for one of our high priority clients! You will be presenting your plan, budget, and one working component of the security system to the clients in hopes that they will choose to purchase it from the company. | | |
| 1. **Imagine/Brainstorm (day2)** | | |
| **Criteria:**  Your PRESENTATION must have:  - An introduction of your team and the goals of your security system  - An illustrated schematic drawing of your security system including the location of all the components of your system  - One working component of your system- you may use a bulb to signal an alarm  - A detailed cost analysis of your system including the final cost to the client, to the company, and how much profit the company will receive.  -Schematics need to be drawn on a coordinate grid and write out the coordinates for the alarm components.  .  **Constraints:**  - Use the materials provided  - Complete the challenge in the time allotted  Have students individually think of a solution to the problem and draw and label their design. | | |
| 1. **Plan/Design (day 2)** | | |
| Each student will present their ideas to their team.  Teams will collaborate and decide on a final design plan.  Students draw and label their final design plan and make a list of needed supplies.  Build their design according to their plan. | | |
| 1. **Create / Test (day 3)** | | |
| Student teams build their design according to their design plan.  Students will need access to a computer if necessary. | | |
| 1. **Evaluate/Improve –** and repeat Steps 1-5 **(day 4)** | | |
| Students evaluate their design for success.  Did it meet the established criteria?  Did their final design match their planned design?  How would students improve their design? | | |

****Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Jaquar Security System STEM Challenge

5th Grade

**Challenge**:

You have been chosen to work with the Jaguar Security Company to design a state-of-the-art security system for one of our high priority clients! You will be presenting your plan, budget, and one working component of the security system to the clients in hopes that they will choose to purchase it from the company.

**Criteria:**

Your PRESENTATION must have:

- An introduction of your team and the goals of your security system

- An illustrated schematic drawing of your security system including the location of all the components of your system

- One working component of your system- you may use a bulb to signal an alarm

- A detailed cost analysis of your system including the final cost to the client, to the company, and how much profit the company will receive.

-Schematics need to be drawn on a coordinate grid and write out the coordinates for the alarm components.

**Constraints:**

- Use the materials provided

- Complete the challenge in the time allotted

**Materials:** Various materials will be provided by your teacher.

1. **ASK / ENGAGE:** What is the problem you are being asked to solve?

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1. **IMAGINE/BRAINSTORM:** What are some possible solutions to the problem that you are trying to solve? After you brainstorm, draw and label your ideas below.

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| **Idea #1** | **Idea #2** |

1. **PLAN/DESIGN:** Share your ideas with your group and collaborate to decide on a final design plan. Draw your team’s design below and make a list of the materials that you will need to complete your design.

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| **Team Design Plan** | **Materials List** |

1. **CREATE/TEST**: Use your Final Design Plan to create and build your solution. Test your design. Did it work? Why or Why not?

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1. **EVAULATE/IMPROVE:**  How well did your design work? Did your solution solve the problem within the given constraints?

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How can you improve your design? How can you make it better? Draw and label your improved design below.

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| **Improved Design Plan** |