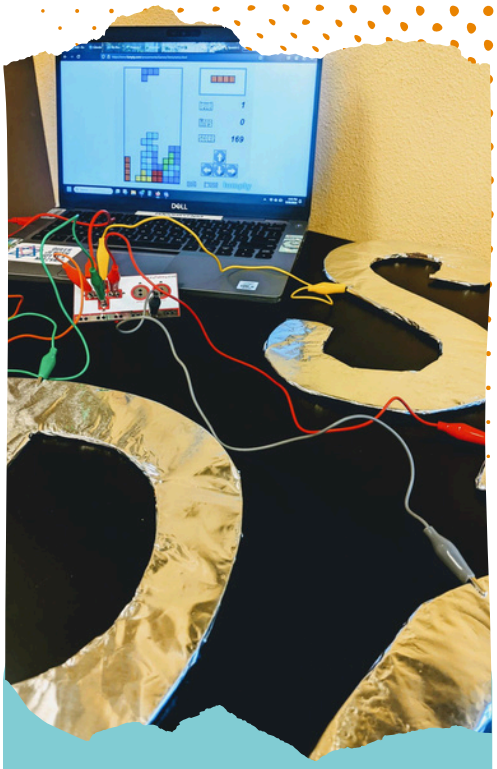
Hi-Five Tetris

NGSS Alignment:

- Science and Engineering Practices:
  - Planning and Carrying Out Investigations
    - Make predictions about different materials' conductivity
  - Asking Questions and Defining Problems
    - Get curious about how our skin protects us from electricity and why we are conductive
- Crosscutting Concepts:
  - Patterns
    - Notice a pattern in what is conductive vs. insulating so that you can predict whether something will conduct electricity
  - Systems and System Models
    - How is our skin affected by being part of the system of our body?
  - Energy and Matter
    - Understand how electricity flows in a circuit
- Disciplinary Core Ideas
  - Physical Science
    - 2-PS1-1, 2-PS1-2, 4-PS3-2, 5-PS1-3, MS-PS2-3
  - Engineering Design
    - K-2-ETS1-3, 3-5-ETS1-2, 3-5-ETS1-3, MS-ETS1-1, MS-ETS1-2,



Materials:

- Makey Makey kits
  - Boards
  - Alligator clips
  - Jump wires
  - USB cables
- Laptops
- Tin foil
- Cardboard
- Assorted conductive/insulating objects
  - Fruit
  - Paper clips
  - Playdoh
  - Wooden blocks
  - Paper
  - Rubber ducks
- Worksheets
- Pencils
- Optional: Conductivity meters

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Recommended Procedure:

- Prep:
  - Build your Tetris controller
    - Cut out large cardboard shapes and cover them in tin foil
    - You will need an “R” for “Right,” an “L” for “Left,” a “D” for “Drop,” a circular arrow for “Rotate,” and a “G” for “Ground”.
  - Set up Tetris on a large screen at the front of the room and connect your Makey Makey.
    - Pull up a simple browser Tetris game. We recommend this one.
    - Connect your cardboard shapes to the Makey Makey board with the alligator clips. Make sure that each piece is plugged in to its corresponding spot on the board (the “R” should be plugged in to the right arrow, “G” should be plugged into “Earth,” etc.)
  - Set up test stations around the room for each working group
    - Pull up the Makey Makey conductivity tester on the laptops and plug in the Makey Makey board
    - Tape two parallel strips of aluminum foil to a piece of cardboard
    - Connect the two strips of aluminum foil to the Makey Makey board
      - One should be connected to the ground, or “earth” and the other should be connected to the space bar
    - Set out a bucket with a mix of conductive and insulating objects at each station
- During the lesson:
  - Begin by splitting your learners into groups of about five
  - Call one group up to play a game of Hi-Five Tetris (depending on your time, space and group, you may want to have each group get a turn to play or have them all play at their stations instead of having one group demonstrate for the whole class)
    - One person holds each cardboard piece
    - Whoever is holding the “Ground” is one half of the circuit and all of the other pieces are the other half of the circuit
    - Whenever the “Ground” holder hi-fives someone, they will complete that circuit. (if they hi-five the “R” holder, the piece will move right, etc.)

Recommended Procedure (Cont.):

- During the Lesson (Cont.):
  - Lead a discussion about conductivity and circuitry
    - Ask your learners why Hi-Fives were able to control the Tetris game
    - What are the properties of our skin that we could replicate with other materials to complete a circuit?
      - It's important, in this context, to understand that skin itself is not a strong conductor. It actually is slightly insulating to protect us from electricity. It's because of the oils, water, and salt on our hands that we're able to conduct.
  - Have learners work together in their groups to test the conductivity of different objects
    - Show each group how to use an object to bridge the two parallel strips of aluminum foil to complete the circuit
    - Have them record the results of each object's conductivity on the worksheet
      - If you don't have the ability or desire to have a Makey Makey setup for every group, you can instead give each group a conductivity tester to test their materials. You can buy one like this, or make one like this.
      - Because these conductivity testers can tells us not only whether something is conductive, but also how conductive it is, this is also a good option if you have older learners who may benefit from more in-depth data gathering.
      - If using this option, use "Conductivity Worksheet 2"
    - Help groups draw connections and notice the common characteristics between different conductive materials and different insulating materials
    - Have learners make predictions about the conductivity of other objects and materials based on the patterns they've noticed

Recommended Procedure (Cont.):

- During the Lesson (Cont.):
  - Design and build a new controller
    - Have each group work together to brainstorm some different materials that could work as game controllers
    - Groups can draw or make a model showing how their controller would work, then build and test their controllers
    - With older learners, you can ask them to iterate and change variables to test how small changes affect their controllers conductivity
  - Controller Showcase
    - Once each group has a tested, working controller, have them demonstrate their invention with a game of Tetris

Questions for Reflection:

- How did your final controller design compare to the original hi-five controller?
- What did you learn from the conductive properties of skin that helped you designing your controller?
- What patterns did you notice in conductive materials? What about in insulating materials?
- Is more conductive always better? What are some situations when insulating material would be beneficial?