PURPLE PLOW
Uncovering STEM Solutions

PUZZLERS

#7 Miniature Greenhouse

1 HOUR

PUZZLE: CREATE A MINIATURE GREENHOUSE

STANDARDS & CONNECTIONS: NGSS.3-5-ETSI, NGSS.MS-ETSI, NGSS.MS-PS3-3

SUGGESTED MATERIALS: Plastic wrap, plastic water/soda bottle, plastic pipe, wire, wood pallet, cardboard

BACKGROUND: Greenhouses are used in agriculture because they stay warm inside, even during the cold months. They are typically made of glass or some type of translucent material. As the sun shines on the greenhouse, the temperature inside increases, but the heat is trapped so it can't escape.[i] As a result, greenhouses can prolong the growing season, making it possible to grow plants during the times of the year where the plant would otherwise freeze or die. Greenhouses are also used to grow young plants called seedlings because of the preferable environment.

1. IDENTIFY: Share the background information with the students, then share the puzzle to be solved. Determine constraints (e.g., time alotted, space, materials provided, etc.) and divide students into small groups.[ii]

2. IMAGINE: Ask a series of questions to help students brainstorm solutions to the puzzle. Encourage students to list all ideas – don't hold back! Before moving on, make sure each group selects a solution that fits within the contraints.

- Ask: *How can you can solve this puzzle? Which of your ideas can you build a prototype for given the constraints?*

3. DESIGN: Students diagram the prototype, identify the materials needed to build the prototype, and write out the steps to take. Students describe the expected outcomes.

- Ask: *What steps will you take to create your solution? What do you expect your solution to look like and be able to do?*

4. CREATE: Students follow their design plan and build their prototypes. Monitor their progress and remind them about how much time they have.

5. TEST & IMPROVE: Students evaluate their creation and compare it with the expected outcomes. Students seek areas of improvement and make changes where needed.

6. SHARE: Students share their solution to the puzzle and communicate lessons learned.

- Ask: *What was your biggest takeaway? What would you do differently?*

ADDITIONAL RESOURCES: For more background information on this topic, please visit www.purpleplow.org.

Put a temperature gauge inside the greenhouse and place one outside. See if the temperature inside stays warmer than outside. Visit your local nursery to see what they use to maintain their greenhouses.

[i] NASA. (2018, April 23). *What is the greenhouse effect?* Retrieved from: https://climatekids.nasa.gov/greenhouse-effect/

[ii] University of Massachusetts Amherst. (2015). *Starting a greenhouse business.* Retrieved from: https://ag.umass.edu/greenhouse-floriculture/fact-sheets/starting-seeds-in-greenhouses