

Fermilab Education and Public Engagement Activity Template

Developers Nancy Gadzala, Jen Smith, Heather Whitney	
Activity Name Greenhouse Engineering: Build the Greenhouse Around Your Plant	
Grade Level 6-8	Unit Topic Connection Various; renewable energy and greenhouse effect, solar energy, climate, human impact on climate, photosynthesis, genetics (if using a plant like Wisconsin Fast Plants), germination

The Hook

(Write a two- to three-sentence introduction, including thought-provoking questions related to the activity.)

Goal Option 1

How does the greenhouse effect play a role in plant growth? How does the greenhouse process cause a plant to grow? (radiation/ conduction vs. convection)

Goal Option 2

How do greenhouses work? Grow a healthy plant and explain how the plant grows (photosynthesis) and the process. Also, explain how greenhouse plays a role

Scenario/Background Information/Pictures

(Write a few paragraphs with further information about the activity. What is the problem that is to be investigated? Explain the problem/challenge in terms of a real-world situation that is to be solved.)

Students are tasked with building a greenhouse that can successfully trap the heat of the Sun to grow their plant. Students must create a greenhouse design and experiment with different ways of insulating their plant with materials from home.



Safety/ Materials

(Explain what cautions students should take during the activity.)

There are not really any cautions or safety precautions that need to be taken

Materials given to students:

A cup with dirt and a lima bean seed in it along with a straw for watering (note: pipette can be given)

Students would need to gather their own materials for constructing the greenhouse.

Student Question/Problem/Challenge

(Explain what the student teams will do in their activity.)

- What materials make good conduction of heat for a greenhouse?
- How does temperature or humidity affect the growth?
- Does color of the ground affect the absorption of color?
- Does the color of the light (cellophane) have an impact on growth height?

Learning Goals/NGSS Performance Expectations

(Explain what students will learn during the activity, including practices and content.)

Goal Option 1

How does the greenhouse effect play a role in plant growth? How does the greenhouse process cause a plant to grow? (radiation/ conduction vs. convection)

Goal Option 2

How do greenhouses work? Grow a healthy plant and explain how the plant grows (photosynthesis) and the process. Also, explain how greenhouse plays a role

What will you need?

Supplies

- Colored construction Paper
- Box or tupperware type container

Setup

Tips

- Rulers or chopsticks or pencils or straws
- straw
- pipette
- lima beans
- soil
- cup
- insulators (paper, airbags, foam from a cooler or similar, etc)

- Research insulators
- Team up with people at home and school or even have a teacher example that is video recorded.
- Flipgrid recordings can also work for data collection

Process

(Write a process that will **guide the facilitation** of the activity. Remember that the point of the activity is for the students to think about what **they** need to do to achieve their goals.)

Wrapping it up

(Provide suggestions for classroom discussion and pacing from lesson to lesson as well as connecting to the curriculum unit topic and learning goal.)

Assessment

(This activity may serve as a performance assessment for a unit. How can the students apply their content knowledge and be aware of the many practices they utilized during the challenge activity? Provide suggestions on how to assess student success. Suggestions may include student logbooks, including notes, data and reflection on their thinking.)

Standards Connections (Connect to learning goals/performance expectations.)

NGSS Disciplinary Core Ideas	NGSS Science and Engineering Practices	NGSS Crosscutting Concepts

CCSS Math		CCSS ELA
SEL	CTE	
Other		

Resources and References

(List any useful links for teacher background information. List student resources that may be needed.)

We are one Fermilab

<https://news.fnal.gov/wp-content/uploads/2018/10/we-are-one-fermilab.jpg>

How Particle Physics Discovery Works

<https://www.fnal.gov/pub/science/particle-physics-101/how-works.html>

Fermilab Ecology

<https://ecology.fnal.gov/>

NGSS - Science and Engineering

Practices <https://www.nextgenscience.org/sites/default/files/Appendix%20F%20%20Science%20and%20Engineering%20Practices%20in%20the%20NGSS%20-%20FINAL%20060513.pdf>

Science, Technology, Engineering and Mathematics Career Cluster Knowledge and Skill Statements (2008)

<https://cte.careertech.org/sites/default/files/K%26S-CareerCluster-ST-2008.pdf>

CCTC - Career Ready Practices

<https://cte.careertech.org/sites/default/files/CareerReadyPractices-FINAL.pdf>

Project Lead the Way, Engineering

Design <https://www.pltw.org/our-programs/pltw-engineering-curriculum>

5Es

<https://ngss.sdcoe.net/Evidence-Based-Practices/5E-Model-of-Instruction>

Claim, Evidence, and Reasoning

- **BSCS Scientific Explanation Tool -**
https://www.amnh.org/content/download/146458/2328830/file/Explanation_Tool_MASTER.pdf
 - **Rubric**
https://www.amnh.org/content/download/146460/2328840/file/Explanation_Tool%20RUBRIC.pdf
- **Scientific Argument Tool -**
http://sepuplhs.org/pdfs/Argument_Tool_MARCH2016.pdf
 - **Rubric -**
http://www.argumentationtoolkit.org/uploads/2/1/4/1/21417276/evidence_rubric.pdf
- **Sentence Starters for CER -**
<http://www.thinkerssd.com/wp-content/uploads/2014/02/CER-Sentence-Starters-CER.pdf>
- **NSTA Resources on CER -**
https://learningcenter.nsta.org/mylibrary/collection.aspx?id=GBdqFKABr0U_E