Fermilab Education and Public Engagement Activity Template

Developers Ecology Group, Walter Leverneir	
Activity Name Native Plant Ecological Diversity	
Grade Level 6 - 12	**Unit Topic Connection** Ecology

The Hook

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

What's living in your garden/greenspace and how can what you plant change what's drawn to the area? (What things attract)

1 sq meter observation/Students observe a "spot" over a period of time
Record observations in a log (digital or paper)
Observations can include:
-Pictures
-Drawings
-Species interactions
-Species logs
-Recent Atmospheric conditions

- Example

Scenario/Background Information

(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.)

How does an ecosystem change over time? (1sq meter)
Native Plants are key for maintaining ecological diversity and health.
Many areas have had native plants removed.

Safety

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

Safety when choosing their 1 sq meter/"spot" location. Area they are allowed in. Safe area to conduct research, etc.
Proper weather based wear- Sunscreen, hat, etc.
Basic growing safety considerations (Washing hands, etc.)
Identification and disposal of mold contamination

Student Question/Problem/Challenge

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

-Monitor a location's ecological diversity
-Find ideal methods for germinating and growing Native Plants at home
-Organize a Native Plant Sale

Learning Goals/NGSS Performance Expectations

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

Students will be able to explain how ecological relationships affect organisms.
Students will be able to evaluate competing design solutions for maintaining biodiversity and ecosystem services.
Students will construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.

What will you need?

Supplies

Petri dishes
Seeds
Filter paper
Growing medium
Seedling trays
Pots

Seeds Might Include:
Echinacea purpurea
Dalea purpurea
Echinacea pallida
Eryngium yuccifolium
Monarda fistulosa
Penstemon digitalis
Tradescantia virginiana
Zizia aurea
Sporobolus heterolepis
Schizachyrium scoparium

Setup

Seed Germination tips and steps
For 1 square meter observation setup:

- If students are in school teacher can set up an area with pvc pipe to measure out area
- If students are doing on their own at home, have students pick one nature spot that they can get to everyday on their own(could be their family's garden, or even just a little spot of grass near their home) They will see life change and grow no matter where they choose.
- Record what critters visit the area as well and why they might be there(birds, bugs, ect)

Tips

Use seeds that require little to no pretreatment

Activities are Season dependent. Make sure you start at a time where activities can be completed successfully.

	Native Plants can take some time to germinate. Be patient and start early.

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.)

1 square meter observations

- Example
  Bird Identifier
  Insect Identifier
  Illinois Wildflowers
  Seek App

Seed germination - germination rates, native vs crop (germination code)

- Data collection activities comparing germination rates
  - Native prairie plants; vegetables
- Data collection activities comparing growth rates

Seed starting/germination

- Intermediate Scientific Investigation Planning Template

Build your own greenhouse

- Cup example
- Repurposed material

Plant sale

- Fundraising opportunity for school, class, or club

Energy and Ecosystems: Prairie, Water and Woods Field Trip to cap off

- Energy and Ecosystems Field trip Grades 6-9

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.)

Connect to Gardening of Vegetables/Herbs. Same concepts can be used for students to grow their own food.

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.)

1 sq meter logbooks (Digital or paper)
Seed starting- Intermediate Scientific Investigation Planning Template
Greenhouse log
Fermilab rotation log

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

NGSS Disciplinary Core Ideas	**NGSS Science and Engineering Practices**	**NGSS Crosscutting Concepts**
MS-LS1-4 MS-LS1-5 HS-LS2-2 HS-LS2-7	Analyzing and Interpreting Data MS-LS2-1 Engaging in Argument from Evidence HS-LS2-6	Patterns MS-LS2-2 Systems and System Models HS-LS2-5

CCSS Math	**CCSS ELA**

SEL	**CTE**
1C Demonstrate skills related to achieving personal and academic goals.	

2C Use communication and social skills to interact effectively with others. **3A Consider ethical, safety, and societal factors in making decisions.** **3B Apply decision-making skills to deal responsibly with daily academic and social situations.** **3C Contribute to the well-being of one's school and community.**	
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.thinksrsd.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