COLLEGE OF SOCIAL & BEHAVIORAL SCIENCES
Women in Science & Engineering

Bio/Diversity Project
Lesson Title: Researching Pollinator Gardens

Teacher: Kelly McHugh and Skylar Batty
Grade Level: *9th*
Time: Two *50 minute class periods*

AZ State Science Standard:	*Essential HS.L2U3.18* ● *Obtain, evaluate, and communicate about the positive and negative ethical, social, economic, and political implications of human activity on the biodiversity of an ecosystem.*
Content Objective: Math, Reading, Science, Writing, Other:	● *Students will be able to utilize researching skills in order to find information about specific plants that would attract their assigned pollinator* ● *Students will be able to determine through their research which plant they propose to plant in the school garden at the conclusion of the project* ● *Students will work collaboratively to research and propose a specific plant for the pollinator garden*
Language Objective: (Optional)	"N/A"
Scientist of the Week:	● *Bashiru Ademola Raji* ● *Soil Scientist* ● *Nigeria* ● *Nigerian professor of soil science, Pedologist, geologist, an environmental impact assessment expert and incumbent Vice-chancellor of Fountain University, Osogbo. He is the second substantive Vice-chancellor of the University.*

Vocabulary	**Materials**
● Symbiosis ● Invasive species ● Soil formation	● Set of computers for the class ● Blank paper for script writing ● Guided research worksheet ● Presentation overview document ● Rubric for grading

Seasonality: (If more specificity is required, please note date/time range under the season)

Highlight which season(s) your lesson would be most suited to. When working with the natural world, it is important to keep this in mind for your planning! Some activities are possible for a brief window of time while others may be appropriate during any time of year.

Monsoons	*Autumn*	*Winter*	*Spring*	*Dry Summer*
July-Sept.	Oct.-Nov.	Dec.- Feb.	Mar.-Apr.	May-June

Guiding Questions:

- What makes a presentation interesting and engaging to the audience?
- What are sound research methods?

Engagement/Introductory Activity:

- Introduce the Scientist of the week
- Give students a more detailed overview of the final project they will be completing
- Briefly touch on the research topics they will need to consider when trying to choose which plant they will propose to plant in the pollinator garden
    - plant anatomy
    - soil formation
    - symbiotic interactions
    - invasive species
    - growing conditions
    - expense
- Tell students about the presentation that they will be completing for the final project
- This will be persuasive presentation that is proposing to the class which type of flower should be planted in the school garden in order to attract their assigned pollinator

Exploratory Activity:

- Have students use the laptops to complete their plant research. Hand out the guiding questions worksheet to aid them in the research process.

- Have students determine their role in this project (which can be rotated through)
    - Groups of 3 each have specific job (can rotate jobs)
        - **ALL** are researchers
            - Look up facts/evidence for claim
        - Scribe
            - Writing actual script for video
        - Video taker
            - In charge of uploading/recording/effects
            - Make sure they can email it from phone to themselves to access from school computer/our email
        - Fact checker
            - Determine most important facts to include from research

Explain:

- Before moving on to the script writing, students must check with the teacher to see if their proposed flower is acceptable
    - Sonoran desert plants must be available for purchase by teacher to plant in the garden on the last day of class

Extension Activity/Questions:

- Once students have their approved plant from their research, they will start writing their script
    - Script must include all group members to talk/present
- Have a theme!
    - Try to pick a theme to make your commercial stand out and persuade the audience
        - Ex. superheros, super bowl/funny styled

Evaluation Activity:

- Last 5 min of class have group discussion about where they are with their script
    - ½ way done, ¾ done etc.
    - Complete the research and scripts to present in class the following week

Presentation Overview

Pollinator Garden: A pollinator garden is a garden that is planted predominately with flowers that provide nectar or pollen for a wide range of pollinating insects. A pollinator garden can be any size. You might only have a balcony or a small yard but you can still plant pollinator-friendly flowers there. You don't have to be exclusive about this planting policy – there may be other flowers that you like to grow in your garden for various reasons – but the majority of flowers in a pollinator garden should be specifically chosen because they support pollinators. Many pollinating insects can only exploit particular shapes or sizes of flowers. To support pollinator diversity you must cater for all shapes and sizes of insect mouthparts. Do this by planting a diversity of flower types.

PROMPT:

Students will create a group presentation in which they research one specific desert pollinator to determine what pollinator garden characteristics would be the most suitable to attract that specific pollinator. Students should convey the importance of creating a pollinator garden in an urban environment (such as your school garden) within their presentation. Students will give scientific background as to why their pollinator is important (to the Sonoran desert) and what conditions to consider for their proposed ideal plant (color, smell, soil conditions, symbiotic relationships, etc.) Students will propose an ideal plant/flower for the garden given their research and suggest why it would be beneficial to the school (why pollinators are important to us -- humans).

QUESTIONS TO CONSIDER:

- What flower characteristics attract your pollinator? (flower color/shape/size/smell/etc.)
- Why is it important to create a garden that will attract your pollinator?
- Does your pollinator live in symbiosis with other Sonoran Desert organisms?
- Which Sonoran Desert plants would attract your pollinator?
- Which Sonoran Desert plants would be feasible to plant in a pollinator garden? (cost/size/growing time/etc.)

Pollinator/Plant Research

Name:_____ Assigned Pollinator:_____

1. What plant characteristics attract your pollinator? (Think about flower color/smell/shape/size)

2. What specific **Sonoran Desert** plants attract your pollinator?

3. Are there Sonoran Desert invasive species that affect the growth of plants that attract your pollinator?

4. How does soil formation play a role in the development of your plant? (Look into how soil bacteria help/hinder the growth of plants)

5. Does your pollinator live in symbiosis (parasitism/commensalism/mutualism) with any of the plants you have found? Do any of the plants that you have found live in symbiosis with other organisms besides your pollinator?

6. List 3 possible plants that would attract your pollinator if they were planted in the garden.

7. For the 3 plants listed above, explain how each one specifically attracts your pollinator and 2 factors that affect the growth of each plant (invasive species threats/soil formation/symbiosis/etc.)

8. Of the 3 plants you have chosen, which one would be the best to plant in the pollinator garden? (consider cost, growing time, growing conditions)

GRADING RUBRIC:

	5-Excellent	4-Proficient	3-Good	2-Okay	1-Poor	0-Insufficient
Flower Characteristics	Includes multiple characteristics for ideal pollinator plant for Sonoran desert	Provides a couple characteristics for ideal pollinator plant for Sonoran Desert	Provides some characteristics for ideal pollinator plant for Sonoran Desert	Provides few characteristics for ideal pollinator plant for Sonoran Desert	Provides only one characteristics for ideal pollinator plant for Sonoran Desert	Provides no characteristics for ideal pollinator plant for Sonoran Desert
Pollinator Garden importance	Students recognize the importance of pollinator gardens by connecting it to humans, providing strong details and facts, and giving examples.	Students recognize the importance of pollinator gardens and provide details and connection to humans.	Students recognize the importance of pollinator gardens and relate it back to humans.	Students recognize the importance of pollinator gardens, but explanation is not detailed or complex.	Students address the importance of pollinator gardens briefly.	Students do not consider the importance of a pollinator garden.
Symbiosis/external factors	Included specific symbiosis relationships of pollinator, plant, and other organisms.	Included one symbiotic interaction between pollinator, plant, and other organism.	Discussed why symbiosis is important for their pollinator and plant.	Mentioned symbiosis but only gave example with pollinator OR plant, not both.	Mentioned symbiosis but gave no example.	Did not mention symbiosis at all
Sonoran Desert Plants	Students Identify various Sonoran Desert plants that attract their pollinator (including strong/detailed explanation of why).	Students Identify various Sonoran desert plants that attract their pollinator (including brief description of how and why)	Students Identify 1 or 2 Sonoran desert plants that attract their pollinator (lacking explanation of how and why)	Students identify only one Sonoran desert plant that attracts their pollinator (lack explanation of how and why)	Students identify plants that attract their pollinator (non- Sonoran desert plants were identified/mentioned)	Students do not identify any plants that attract their pollinator.
Proposed Plant	Plant is a Sonoran Desert plant, cost effective, seasonality/feasibility is considered, and attracts pollinator.	Plant is a Sonoran Desert plant, attracts pollinator, feasible, not most cost effective.	Plant is Sonoran Desert, attracts pollinator, not very feasible, not very cost effective.	Plant attracts pollinators and is Sonoran Desert plant, but is not feasible, and not cost effective.	Plant attracts pollinator but is not Sonoran Desert plant, not feasible, not cost effective.	Plant doesn't attract pollinator, is not Sonoran Desert plant, not feasible, not cost effective.
Organization	Presentation clearly addresses all aspects of the prompt and easy to follow. Students have well written script used during the presentation.	Presentation addresses most aspects of prompt and easy to follow. Students have script and use it during presentation.	Presentation addresses most of the prompt in but not easy to follow. Most students use their scripts, but some rely on the screen/poster.	Presentation addresses some of the prompt but is hard to follow. Many of the students rely on their screen/poster too much.	Presentation barely addresses prompt and is hard to follow. All students rely too heavily on the poster/screen	Presentation does not address prompt and hard to follow.

Group work	While creating the presentation, all group members contributed equally, and all group members were considerate/respectful	Students divided the work of the presentation roughly equally, and worked collaboratively.	Students were considerate and respectful to one another, but the workload was divided unevenly	Students faced some issues with collaboration, and the workload of the presentation was divided unevenly.	Students were mostly uncooperative with one another, and the workload of the presentation fell onto 1 or 2 people.	Students relied on one group member to create the presentation, and students did not work together collaboratively.
Sufficient Research	Student clearly did research on pollinator and can answer variety of questions about them concerning prompt.	Student did research and can answer most questions about pollinator concerning the prompt.	Student did some research and can answer some questions about pollinator concerning the prompt.	Student barely did research and struggles to answer questions about pollinator concerning the prompt.	Student did minimum research and struggles to answer questions.	Student did not do research and cannot answer any questions about pollinator background.
Presentation	Students present to their classmates in a clear/concise manner. Each group member presents an equal amount of the presentation. All group members speak loudly, clearly, and make eye contact with the audience, students do not rely on text on the screen/poster.	Students present to their classmates in a clear manner. Each group member presents an equal amount of the presentation. Most group members speak loudly, clearly, and make eye contact, most students do not rely on the text on the screen/poster.	Each group member presents an equal amount of the presentation. Most group members speak clearly, little eye contact is made with the audience. Students slightly rely on the text on the screen/poster.	Each group member does not present and equal amount of the presentation. Some group members are not able to be heard, little eye contact made with the audience. Most students rely on the text on the screen/poster.	Each group member does not present an equal amount of the presentation. Many of the group members lack presentation skills (clear voice/eye contact). All students rely on the text on the screen/poster.	Each group member does not present equal amount of the presentation. All group members struggle with speaking loudly, clearly, and avoid eye contact/poster.
Participation/Questions	Asks/comments a meaningful or well thought out question.	Asks/comments at least one question to another group (not a yes or no question).	Asks/comments one simple question to another group's presentation.	Comments on 1 groups pollinator/proposed plant (not detailed or sufficient)	Only comments on presentation, doesn't ask any questions.	Does not participate.
Point Total (out of 50 points)						

Name: _____ Assigned Pollinator: _____

Questions for presenters:

1. Flies
    a. What did you finding interesting?

    b. What caught your attention?

    c. Questions for presenters:

2. Bats
    a. What did you finding interesting?

    b. What caught your attention?

    c. Questions for presenters:

3. Bees
    a. What did you finding interesting?

    b. What caught your attention?

    c. Questions for presenters:

4. Wasps
    a. What did you finding interesting?

    b. What caught your attention?

    c. Questions for presenters:

5. Butterflies
    a. What did you finding interesting?

    b. What caught your attention?

    c. Questions for presenters:

6. Moths
    a. What did you finding interesting?

    b. What caught your attention?

    c. Questions for presenters:

7. Hummingbirds
    a. What did you finding interesting?

    b. What caught your attention?

    c. Questions for presenters:

8. Beetles
    a. What did you finding interesting?

    b. What caught your attention?

    c. Questions for presenters: