**Lesson #6 – Showing What you Learned and Reflection**

**Problem Statement:** How can we reduce the amount of pollutants distributed by storm water in our community from entering our region’s waterways so that marine animals are not contaminated?

This lesson connects to the problem of designing a rain garden for a school by applying what students have learned in previous lessons to completing either a real rain garden grant application, or by designing an educational brochure that educates others on the value of rain gardens to redistribute storm water.

**Learning Objectives:** Students will be able to:

* clearly articulate how pollutants in rainwater are harmful to marine animals
* explain the value of a rain garden at school, home, and/or community
* connect potential marine science careers with lesson completion
* apply knowledge learned in previous lessons to successfully apply for a rain garden grant or create a rain garden informational brochure.

**Science Lesson Standards (**Source: [Next Generation Science Standards](https://www.nextgenscience.org/search-standards)**)**

|  |  |
| --- | --- |
| **Standard**: | **How Will it Be Assessed:** |
| [**Performance Expectation 3-5-ETS1-1: Engineering Design**](https://www.nextgenscience.org/pe/3-5-ets1-1-engineering-design) **-**  Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost. | Student design groups will successfully complete either a rain garden grant application, or design a rain garden educational brochure (see rubric for criteria) |
| [**Performance Expectation 3-5-ETS1-2: Engineering Design**](https://www.nextgenscience.org/pe/3-5-ets1-2-engineering-design) **-**  Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem. | Student design group will come up with multiple solutions to decide whether to complete either a rain garden grant application, or design a rain garden educational brochure |

#### 

**Soft skills: (**[Source: Social Emotional Learning Standards, Benchmarks, and Indicators](https://www.k12.wa.us/sites/default/files/public/studentsupport/sel/pubdocs/Appendix%20D%20Standards%2C%20Benchmarks%20Indicators.pdf)**)**

|  |  |
| --- | --- |
| **Soft Skill** | **Standard** |
| Communication | STANDARD 5: SOCIAL MANAGEMENT – Individuals have the ability to make safe and constructive choices about personal behavior and social interactions. |
| Collaboration | STANDARD 3: SELF-EFFICACY – Individuals have the ability to motivate themselves, persevere, and see themselves as capable. |

* ***Communicate clearly:***
  + Articulate thoughts and ideas effectively using oral, written and nonverbal communication skills in a variety of forms and contexts.
  + Use communication for a range of purposes (e.g. to inform, instruct, motivate and persuade.)
* ***Collaboration:***
* Demonstrate the ability to work effectively and respectfully with diverse teams.
* Exercise flexibility and willingness to be helpful in making necessary compromises to accomplish a common goal.

**Locally and/or personally relevant for students:**

Relevancy is built through application of understanding of the effect of stormwater run-off and retention within specific school communities, including filtration of pollutants, and value of native plants. Demonstrate understanding of unit learning objectives through real-life application; either completing a real rain garden application for their school, or creating an educational rain garden brochure.

**Connections to career and educational pathways:**

Students learn connections to career and educational pathways through the application of previous knowledge to a real-life scenario. A few examples of potential career links include civil engineering, environmental engineering, landscape architecture, environmental law, marine biologist, biologist, botanist, and fish and wildlife management.

**Prerequisite Skills:**

* Understand the role of rain gardens in filtering pollutants, reducing stormwater flooding, and creating native habitats for plants and animals.
* Knowhow to measure or area of irregular shapes with graph paper. (rain garden grant)
* Know multiplication and addition of whole numbers and decimals. (rain garden grant)
* Understand how to plan within a budget (rain garden grant)
* Understand basics of how to use Microsoft Word (rain garden brochure)

**Materials:**

* [Stormwater Rain Garden Grant Application](https://docs.google.com/document/d/1Y5HsH29uXQip1Eo58SIp4D8gHKIPu8nuaw6bmUvG2Bs/edit)
* Rain Garden 3-4 Brochure Template (Word)
* Rain Garden 5-6 Brochure Template (Word)
* [Student Roles and Behavior Norms](https://docs.google.com/document/d/1KEmLjFzjpA0Mk2XirXofJ7qSmQ5PzsLI3HBayFq3H0w/edit)
* [Unit Reflection Questions](https://docs.google.com/document/d/1_TKyFfmeGPAn5cW9eyXl0w_pmi6wPGNs9y4Qu1W_2BM/edit)

**Lesson preparation:**

* Prior to teaching day the teacher will need to print a copy of the following documents for each design group:
* The rain garden grant application (one per group)
* Rain garden brochure templates. (one per group)
* Rain garden grant rubric (one per group)
* Rain garden brochure rubric (one per group)
* Student Roles and Behavior Norms (one per group)
* Unit Reflection (one per student)
* Provide large sheet of white paper w/ color pens (one for each table group)
* Also make sure all groups have access to technology, either a laptop or desktop computer. If student groups will be creating a rain garden brochure, computers will need to have Microsoft Word installed.

**Time required:** 5 days. About 210 minutes.

1. Day One (35 minutes)
2. Day Two (60 minutes)
3. Day Three:(60 minutes)
4. Day Four: (45 minutes)
5. Day Five: (30 minutes)

**Grouping of students for instruction:**

* Students will be divided into groups, based on if applicable (random, ability, interest, social purposes, etc.) Roles will be decided within each group under the supervision of the teacher.
* Students will need to be in groups of 3-4. Roles will include:
  + ***Project Manager:*** This student will oversee the work of the group, and completing writing for a grant application, or creating a brochure.
  + ***Communication Specialist:*** Maintains written journal of what group is doing, including struggles and successes. Also responsible for sharing out results of work to the rest of the group.
  + ***Copy Writer:*** Student(s) write text for either the grant application or educational brochure
  + ***Landscape Architect:*** Responsible for drawing rain garden design.
  + ***Graphic Designer:*** Responsible for creating brochure using all the information collected from the rest of the group.

**Understanding the Problem**

|  |  |
| --- | --- |
| **Day One (30 minutes):** | |
| **Teacher** | **Student** |
| 1. Introduce video to get students thinking about why rain gardens are important.   Show the first 5 minutes of video.  <https://www.youtube.com/watch?v=9Kti4HJ45BM> | 1. Students listen to teacher introduction |
| 1. Ask students to watch and list as many positive benefits of creating a rain garden. | 1. Students watch video, making list of benefits of rain gardens   • run-off contains pollutants; rain gardens help filter pollutants before water goes into storm drain.  • reduce amount of rain water running off into storm drain.  • helps “recharge” groundwater before going into storm drains  • diverts rainwater from non-draining surfaces, like roads, parking lots, and other low-lying surfaces  • helps ecosystem by creating new habitats for both plants and animals. |
| 1. Teacher asks students to work in table groups to create a poster that shows the benefits of rain gardens.(15 minutes) | 1. Students table groups create poster labeling all the benefits of rain gardens |
| 1. Teacher asks students to work in table groups to create a poster that shows the benefits of rain gardens.(15 minutes) | 1. Students will T & T with table partner and share what the problem statement/ learning objectives are. |
| 1. Review Problem Statement and how previous lessons relate to this sequence of learning. (10 minutes)    * How can we reduce the amount of pollutants distributed by storm water in our community from entering our region’s waterways so that marine animals are not contaminated? | 1. Students will T & T with table partner and share what the problem statement/ learning objectives are. |
| 1. Teacher leads sharing out of day’s thinking in whole group discussion | 1. Students share w/ small group benefits of rain gardens learned from previous lessons. Check each other’s understanding of how rain gardens work. |

**Instructional Plan**

|  |  |
| --- | --- |
| **Teacher** | **Students** |
| ***Day Two (60 minutes):***   1. Remind STEM applications of what was learned in previous lessons.   Students will be able to:  • clearly articulate how pollutants in rainwater are harmful to marine animals  • explain the value of a rain garden at school, home, and/or community  • apply knowledge learned in previous lessons to successfully apply for a rain garden grant, or complete rainwater brochure   1. Teacher will ask students to think about potential jobs/careers that might support problem statement 2. Assign collaborative groups of 4 members per group. (show roles handout) 3. Establish group norms and responsibilities. (see handout) 4. Teacher will explain objectives of the lesson, including applying skills and knowledge learned from previous lessons to either complete a rain garden grant, or informational brochure. 5. Teacher passes out materials for either apply for a rain garden grant, or create an educational brochure about the values of rain gardens. 6. Begin work on completing rain garden grant, or designing rain garden brochure using template.   ( lower grades use Word template with pre-existing subtopics and organization, while older groups use template without pre-existing subtopics and organization)   1. Last ten minutes of work period, teacher brings the class back together and asks groups to share out progress made, including struggles. | 1. Students will T & T with table partner about how pollutants in rainwater can be harmful to marine animals. 2. Students will T & T with table partners to brainstorm a list of potential jobs/careers that would support protecting marine animals from pollutants in run-off water. 3. Students will assign student roles within each group. 4. Design groups will T&T to eview with group norms 5. Design teams will decide which activity; rain garden grant or informational brochure to design, as a group. 6. Following previously determined individual jobs, teams will first review what each activity requires, then begin planning on what to include either activity. 7. Student groups begin working on group activity.   Groups given technology to use to research and record work. (brochure groups need computer with Word installed)   1. Design teams will share out to the whole group what project they have chosen and why. |
| ***Day Three:(60 minutes):***   1. Teacher will review project expectations with class 2. Continue working on completing grant application or creating brochure. 3. Last ten minutes of work period, teacher brings class back together and asks groups to share out progress made, including struggles. 4. Teacher reminds class they will have about 15 minutes to finish up either rain garden grant or brochure next day, before making presentations to rest of class. | 1. Students will T & T with group partners to check understanding of project expectations. 2. Students continue to work on design projects, following student roles, and group norms. 3. New communication specialist from each group share with the class on how the project is progressing. |

|  |  |
| --- | --- |
| ***Day Four: (45 minutes):***   1. Teacher reminds students that they have 15 minutes to finish projects before communication specialist will present to whole group. 2. Each group shares process to completing design to whole group 3. At end, audience can ask questions of student groups to better understand design process. | 1. Student work groups make last minute edits to grant or brochure before sharing. 2. Student design teams share completed stormwater grant application, or brochure and explain how it solves initial storm water problem. 3. Student teams answer student questions about learning/design process. |

**Reflection:**

|  |  |
| --- | --- |
| **Teacher** | **Students** |
| **Day Five: (30 minutes):**   1. Students complete reflection activity as either small group or individual. 2. Completion of Pre-Post Assessment | 1. Students complete the reflection sheet. 2. Students complete individually Pre-Post Assessment of Unit |

**Accommodations:**

Accommodations for this lesson will be differentiated within the design and assignment of different roles of the grant teams. ELL, SPED, and Highly capable would be spread out through the different teams. Group roles can either be rotated or assigned to specific students depending on student needs.

**Accommodations:**

* **English Language Learners**: *ELL students are intentionally grouped to receive support from other students.*
  + Within groups, ELL students can partner up with Non-ELL students to complete tasks.
  + Students may work in partners and have one person write while the other helps with what will be written.
* **Special Education**:
  + Student groups would reflect teacher consideration of placement, including
  + Students may work in partners and have one person write while the other helps with what will be written.
  + Mentor text (example of completed rain garden grant or rain garden brochure can be given to groups for reference.
* **Highly Capable**:
  + 3-4 highly capable students can complete 5-6 rain garden brochure
  + 5-6 highly capable students create own template for organizing rain garden brochure
  + Multiple rain garden grants could be created for more than a single location on school groups.

**Extensions:**

* Students can consider writing rain garden grant for home.
* Students can actually apply for home or school Green Stormwater Infrastructure Mini Grants [Green Stormwater Infrastructure Mini Grants](http://www.12000raingardens.org/gsi-mini-grants/)
* Students can present, with either Google slide show or poster board, what they learned about how to reduce the amount of pollutants distributed by storm water in our community from entering our region’s waterways so that marine animals are not contaminated.
* Student teams could research and present, using Google slides or poster board, potential marine careers students could think about.

**Assessment:**

* Final stormwater rain garden grant application
* [Stormwater rain garden grant rubric](https://docs.google.com/spreadsheets/d/1AXwXi7NkKoD6s9PPnwtqJWY07eNvEetNbjY7_8gZLR8/edit#gid=0)
* Completed rain garden brochure
* [Rain garden brochure rubric](https://docs.google.com/spreadsheets/d/1JOZVs24c1nqYeiiFAhFi_EKy819j5yc43XU-9ax5TVU/edit#gid=0)

**References:**

* Instructional Plan Created during the 2019-2020 school year by Verónica West, Jenn McNease, Erin Wells, and Tim Rhoades of the Northshore School District in Washington State as part of their work with the Washington Alliance for Better Schools (WABS) ACCESS STEM program.
* Instructional Plan Consultants (not responsible for the content of this instructional plan):
  + Steve Harvey, teacher, Everett School District in Washington State
  + Linda Richard, Associate Director of Instructional Leadership, Washington Alliance for Better Schools (WABS)
  + Mick Shultz (Port of Seattle), Lisa Hiruki-Raring (NOAA-Alaska Fisheries Science Center)

**Resources:**

* Tutorial - How to calculate the Area of a given Irregular Figure using a Square Grip Paper? <https://www.youtube.com/watch?v=x0NHC0cmKfU>
* Creating a brochure from Microsoft Word

<https://learn.g2.com/how-to-make-a-brochure>

* Creating brochure from Google docs

<https://www.techwalla.com/articles/how-to-make-a-brochure-using-google-docs>

* Brochure Template - either Microsoft Word template, or teacher created Google Docs template
* Rain Garden Handbook

<https://drive.google.com/drive/folders/17ABYXCxuNzv2MbneFFJUkAVj89u0nn4o>

* Stormwater grant link and application to the King County <http://www.12000raingardens.org/wp-content/uploads/2019/03/GSI-Mini-Grant-Application.pdf>
* <https://snohomishcd.org/rain-gardens>
* [Green Stormwater Infrastructure Mini Grants](http://www.12000raingardens.org/gsi-mini-grants/) (12,000 Rain Gardens in Puget Sound)
* <https://register.greenschoolsconference.org/uploads/GSCE2017/HANDOUTS/KEY_14036551/RainGardenManualForSchools.compressed.pdf>
* <https://www.kidsdiscover.com/teacherresources/apply-grant-writing-guide-teachers/>
* <https://www.scholastic.com/teachers/articles/teaching-content/teachers-get-grant/>
* <https://kitsapcd.org/programs/raingarden-lid>