**We All Live Downstream Group Names: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Situation:** High in the Valley and Ridge region of Virginia, a poultry farm located beside the James River dumps food waste into a large pile beside the river. As the pile grows larger, more and more food waste tumbles down and into the river. Further downstream, in the Blue Ridge region, a farmer is spaying his apple trees with pesticides, to protect the trees from fruit worms, when suddenly it begins to rain. The pesticide slowly washes off of the trees and along with the rain and soil, washes into the James River. In the capitol city of Richmond, standing in the same rainstorm, a man is at a gas station. While fueling his car, he tosses his empty soda bottle and chip bag into the trashcan, but he misses. The trash rolls around on the ground as the wind and rainwater push it down the sewer drain. The trash is gone and forgotten! While it continues to rain in the Piedmont and Blue Ridge region, it is sunny on the Coastal Plain. A fisherman is at a marina in the James River fueling his boat before setting out to check his crab pots. Distracted by talking with the marina owner, the fisherman continues to fuel his boat and does not notice that his gas tank is full; gas begins to spill into the river. Over the next few days the food waste from the poultry farm, the pesticides, soil, trash, and gas flow downstream through the watershed and eventually into the Chesapeake Bay and impact the water quality.

**Problem & Career Focus:**You are an environmental engineer for the Virginia Department of Environmental Quality. You have been asked to engineer a solution to improve the water quality of the Chesapeake Bay.

**Things to consider*:***

* What is causing the poor water quality?
* What are the effects of poor water quality on the environment?
* What can you build to help improve the water quality?

|  |  |  |  |
| --- | --- | --- | --- |
| **Criteria**   * Analyze the water, then design, build, and test a system to improve the water quality. * Select from available resources/materials to construct your system. Measure and record the effectiveness of your solution on cleaning the water. * Create an awarness campagin to advise the public on preventative measures to improve and protect the watersheds of Virginia. | | **Constraints**   * Must use only the materials provided * Must collborate with your engineering partner * Must be completed by the end of this unit | |
| **Materials:**  **Use any of the following...** | | **Tools:**  **Use any of the following...** | |
| * Recycled Materials * Craft Supplies * Tape (no more than 12 inches) | * String * Cups * Paperclips * Fasteners | * Scissors * Ruler * Crayons | * Pencils * Paper * Computer |

****

**Assessment**

* iSTEM Rubric

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Students: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | | Assignment: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | | Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_ | |
| Integrated STEM Disciplines  (**check all that apply**) |  | **4** | **3** | **2** | **1** |
| **X** | **Integrated Literacy** | **Effective communication** to explain learning. **Writing** is **organized** and **on topic**. Writing includes **capitalization, ending punctuation, complete sentences,** and **descriptive details.** | **Effective communication** to explain learning. **Majority** of the **writing** is **organized** and **on topic**. Writing includes **capitalization, ending punctuation, complete sentences,** and **descriptive details**. Minor **errors** **do not** **interfere** with meaning. | **Attempt to communicate** learning. Writing is **not fully organized** around topic. **Capitalization, ending punctuation, complete sentences**, and **descriptive details** were i**nconsistent**. **Errors** in writing **interfere** with meaning. | **Little attempt to communicate** learning. Writing is **not organized** around topic. **Capitalization, ending punctuation, complete sentences**, and **descriptive details** are **missing**. **Numerous errors** in writing **interfere** with meaning. |
| **X** | **Science** | **Accurate** knowledge of **watersheds** and **scientific investigation** are **clearly applied** in diagrams, models, and throughout group discussions. | **Basic** knowledge of **watersheds** and **scientific investigation** are **evident** in diagrams, models, and throughout group discussions; with minimal misconceptions. | **Numerous misconceptions** on **watersheds** and **scientific investigation** are **evident** in diagrams, models, and group discussions. | Understandingof **watersheds** and **scientific investigation** are **not applied**. Diagrams and models are missing. Group discussions lack scientific understanding. |
| **X** | **Technology** | Prototype/Process depicts evidence of **advanced innovative research** and **meets all criteria** and **constraints**. | Prototype/Process depicts evidence of **research** and **meets most** of the **criteria** and **constraints**. | Prototype/Process **lacks evidence** of **research** and **many** of the **criteria and constraints** are **not met**. | Prototype/Process **lacks evidence** of **research** and **most** of the **criteria** and **constraints** are **not met**. |
| **X** | **Engineering** | **All** components of the **engineering design process** were **followed**. | **Most** components of the e**ngineering design process** were **followed**. | **Few** components of the **engineering design process** were **followed**. | The **engineering design process** was **not followed**. |
| **N/A** | **Mathematics** | **Accurate knowledge** of mathematical processes are evident and applied to **quantify** the **success** of the prototype. | **Basic knowledge** of mathematical processes are evident and applied to **quantify** the **success** of the prototype. | **Limited knowledge** of mathematical processes are evident and applied to **quantify** the **success** of the prototype. | **Mathematical processes** are **not evident** **or applied**. |
| **X** | **21st Century**  **STEM Skills** | **All** 21st century STEM skills were applied during the learning process. | **Most** 21st century STEM skills were applied during the learning process. | **Half** of the 21st century STEM skills were applied during the learning process. | **Few** of the 21st century STEM skills were applied during the learning process. |
| **/ 20 Total Points** | | | | | |