**Introduction**

Our world is full of wonder, mystery, and in a constant state of change. There are so many phenomena to explore, examine, and explain. One problem of great concern here in Arizona is that scientists project that the southwestern United States will become a “climate change hotspot” in the future.1 Models used by the US Global Change Research program predict the average annual temperature in the Southwest may increase by 4 to 10 degrees Fahrenheit.2

To lessen the impact of a warming climate on our communities, the *Design Your Own Basin* lesson provides students with a tangible way to cool outdoor spaces. Students learn to direct rainwater to created basins; optimal places to grow native plants. By planting a tree they increase shade and evapotranspiration in that area. This lesson can lead to students taking action in their own community by creating a passive rainwater harvesting system that helps mitigate increased heat.

***Student Driving Question: What features and plants are optimum to help cool your community?***

**Resources**

* Constructing Explanations Worksheet.docx
* DYOB Student Presentation Template.ppt
* Design Your Own Basin Video: <https://arizona.box.com/s/fnasf4cmgg1z7o9tzch5foyrgj347bip>
* Soil Texture Triangle-Permeability Table.docx
* Plant Guide: <https://www.amwua.org/plants>
* Engineering Design Process Diagram.pdf

**Lesson Sections**

Walk your students through each of these steps and have them answer the *Construct an Explanation*… questions on the *Constructing Explanations Worksheet.docx*. Have students use the *DYOB Student Presentation Template.ppt* to work through the design process and to present their final design.

1. What are the relationships between low areas and high areas? Watch these videos:

* **Design Your Own Basin Video:** <https://arizona.box.com/s/fnasf4cmgg1z7o9tzch5foyrgj347bip>

Examine your outdoor area.

* How does water flow?
* Can you see where soil erosion is happening?
* Where is the best place to build a basin?
* Can water from a roof or sidewalk (impermeable surface) be diverted there?

**Construct an explanation based on evidence using the Constructing Explanations Worksheet**

1. Back in the classroom answer these questions:

Collection area

Where is your rain coming from?

Conveyance Area

How will you direct water to your basin?

Basin Area

Where will you build your basin?

1. What’s the soil like in your outdoor area? What will happen when it rains there?

Conduct a jar test:

1. Use the Soil Texture Triangle (make live link) to figure out what kind of soil you have.
2. Based upon the results of the jar test for your school, ask the students how fast or slow they think the water will enter the ground? Use the Texture and Permeability Table (live link) to figure out how fast water will move through the soil.

**Construct an explanation based on evidence using the Constructing Explanations Worksheet**

1. What plants should you plant? <https://www.amwua.org/plants>

We’re going to keep it simple. Choose 1 native tree for optimal shade, 2 native shrubs for added dimension and color, and 1 native grass plant. Why grass? Because grass roots help break up the soil making the soil more permeable! Plants provide shade and transpiration from the plants cools the air around them.

1. Did you know that we lose 6 times the water that we get in a year in the Phoenix Metropolitan area? That means that our evaporation and transpiration from plants are 6 times higher than our precipitation. What is mulch? Why do we mulch?

**Construct an explanation based on evidence using the Constructing Explanations Worksheet**

1. Above we’ve talked about the parts of a rainwater harvesting system: a collection area, a low area for a basin, the soil, the plants and the mulch. Students can use the engineering design process to develop a design for rainwater basin project. The problem is to design a system that helps cool the environment and uses water wisely. What criteria do they have? What constraints are there? Work through the engineering design process (live link to process diagram) to design a solution to increased heat and wise water use.
2. The *DYOB Student Presentation Template* can be used by the students for the presentation of their rainwater harvesting system.

Reference:

1. Diffenbaugh, N. S., J. S. Pal, R. J. Trapp, F. Giorgi, and S. H. Schneider. 2005. Fine-scale processes regulate the response of extreme events to global climate change. Proceedings of the National Academy of the United States of America 102(44): 15774-15778.
2. Karl, T .R., J. M. Melillo, and T. C. Peterson, editors. 2009. Global change impacts in the United States. United States Global Change Research Program. Cambridge University Press, New York, NY, USA.