Watershed Experience Lesson 4:

Build a City on a River

ACTIVITY TYPE: *Stream Table Day 3 of 3*

AUDIENCE: *High School*

TIME FRAME: *1 hour 15 minutes*

SUMMARY:

After two lessons where students collected information, they will analyze and use this information to design a city that can live in harmony with the river. They'll use lab sheets to brainstorm and collaborate on their designs before building them in the stream tables.

MATERIALS:

General Materials:

- *2-3 Stream Tables*
- *Design Lab Sheets*
- *Big paper for designing: Post-It Poster sheets, butcher paper, etc. (optional)*

City Building Materials (these are flexible & you can get as creative as you'd like with them):

- *Monopoly houses*
- *Infrastructure from Lesson 3*
- *Wooden blocks*
- *Legos*
- *Sponges*
- *Popsicle sticks*

- *Hot glue*
- *Foam sheets*
- *Pipe cleaners*
- *Straws*

PREPARE AHEAD:

This student-driven lesson takes a lot of material preparation and clean-up. The more you prepare the materials, the easier it is for the students to take control of designing and building.

ENGAGE:

Have students review their lab sheets from the prior two lessons so the key concepts are fresh on their minds. What are some changes humans make to streams, and what are some impacts that stream behavior has on humans? Make a list of student ideas on the board.

Make another list, asking students: What are some things about rivers that we haven't talked about, but might be important to consider? These might include pollution, biodiversity/habitat, recreation, water access for drinking/farming, etc.

PROCEDURE:

Student Challenge

Make groups of 4-5 students and give them the challenge papers and big design paper. Introduce the challenge, as theatrically as you'd like. Tell students that they were hired by a cutting-edge architecture firm to design an entirely new city. The city will be along a river, and they need to take into consideration how to keep both the river community and human community safe and thriving for the future.
Review the two lists and remind them that they need to consider these issues.

Present the goals, criteria and constraints.

***Goals**: The design must:*

- *Prevent flooding during storm events*
- *Prevent erosion around homes and development*
- *Minimize negative impacts of humans on the stream, and the stream on humans*
- *Maximize the stream's benefits to people, such as:*
  - ❖ *Drinking water*
  - ❖ *Watering crops*
  - ❖ *Recreation*
  - ❖ *Transportation*

***Criteria:** The city must include:*

- *A nearby farm*
- *A stream crossing*
- *A riverfront housing development*
- *A downtown area*

***Constraints:** Introduce the materials and go through the options (what they can/can't glue/cut etc.)*

- *You may not change the shape of the river*
- *You may not glue things directly to the stream table*
- *You may use only the materials we have provided*

Ask students to sketch their group design. They can all draw ideas (that's why the big paper is great) but in the end they need to agree on one version of their plan. Review the final plans and make sure they're meeting the criteria and constraints. Once approved, they can build.

Assign two groups to each stream table. Give the first groups 5-7 minutes for building. Have all students at each stream table make predictions. Then, run the water. Make observations. Then, reset and do the same with the next groups. If there's time, it is ideal to let both groups make changes and then get to do a second trial.

Wrap Up

Once all student trials conclude, gather as a class to wrap up. Have a group conversation and guide students with the following questions:

-Did you realize anything about how rivers and humans interact? Specifically, in your town?

-How could people who make decisions about our open space in cities in real life use this information?

-How could we make a difference in our communities along our rivers?

BACKGROUND:

Cities have been built along rivers for thousands of years because they provide transportation, drinking water, fertile soils, irrigation, and defense. Since streams are not static ecosystems, sometimes these human communities are in danger of flooding, erosion, and pollution. People are trying to overcome these issues with different solutions. For example, if they are concerned with erosion, they might install a concrete wall along the riverbank. This solves their erosion problem but causes trouble downstream.

Emphasize that they will need to wrestle with pros and cons, and consider the entire river and those living along it. This lesson builds on what they learned in the previous lessons and challenges them. Be sure to ask questions as they work to bring up these two main takeaways but let them try and fail as they go through the trials to experience hands-on what ideas work best.