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Tributary 8: Action

Now it is time to turn research findings into action. We ask you to take what you have learned and apply it to make this earth more beautiful and healthier than it is now. We ask you to consider the choices you make each and every moment. And the impacts those choices have on others.

Let's get real about ACTION!

Thinking about action should begin early in the inquiry process. Actions need to address an environmental problem or issue and the needs that surround it. A wonderful explanation of action and why to take it comes from the work of Tania M. Schusler, Marianne E. Krasny, Scott J. Peters and Daniel J. Decker, (2009). They write, "Environmental action is a process of co-creating environmental and social change while building individuals' capabilities for further participation contributing to personal and community transformation."

Action can take many forms, but the process should include certain steps. Once students identify a problem they wish to investigate, they should brainstorm a list of potential solutions. They will have opportunities to refine their solutions list as the research develops and unfolds. The research process is often iterative, and thinking about action throughout the process will refine it and result in a more effective solution. Keep in mind that the plan for action should be informed by the research findings and the needs of the stakeholders. Lastly, the decision to implement the action depends on learning goals, available time and funding.

When planning for action, please consider:

- Who will benefit from the action?
- What outcomes will result from the action?

- How much time will the action project take?
- What materials are needed?
- Who are the stakeholders? How will you engage them in the project?
- What are the expenses?
- What maintenance will be needed, and who will do it?
- What are possible negative outcomes that could result from this action?
- What are logical next steps?

The ultimate goal of an action project is student empowerment; therefore, it is essential that the action projects succeed. Successful action projects build a sense of efficacy and well-being in your students and inspire them to do even more.

Education/Outreach

Environmental issue investigations often reveal that the general public knows little about the issue and the key action is to educate. Examples include invasive species spread prevention – wader wash, litter prevention education, runoff/rain garden education, and nutrient prevention education. These can often be coupled with a physical action project to be used as a demonstration. For example, a rain garden installed at the library, school, town hall or other public space can become a valuable demonstration of what homeowners can do as long as the project has quality interpretive signs. Sometimes the education program might involve students presenting their findings to the public. Community libraries are great venues for this kind of work. Educating a particular segment of the population might be the chosen action. For example, aquatic invasive species are often spread on the waders and boats of fisherpeople. An education and awareness program aimed at this population might be the most effective action against their spread, depending on the biology of the invasive organism. Consider partnering with other organizations to effect these education actions. Local watershed associations, Departments of Public Works, local U.S. Fish and Wildlife Refuges, granges, service organizations like the Lions Club, may all be very interested in helping with educational action projects.

Physical Action

Often students determine that the best action to remedy an environmental issue is a physical restoration project. These may include things like tree planting, litter removal, wetland restoration/creation, and invasive plant removal. Regardless of project, it is imperative that students get buy in from all stakeholders. These may include municipalities, local U.S. Fish and Wildlife Refuges, private landowners, principals, superintendents, heads of maintenance, other teachers, neighbors and parents. This is part of the learning: communicating with a diverse group of stakeholders to win their approval for the project.

Physical restoration projects can become daunting and large in scope, so a key role in this for the teacher is to add in reality without squashing enthusiasm. Partnerships are key. There are a number of cases where schools partnered with other organizations to effect huge restoration projects. For example, stormwater management projects are design and installation intense and often require engineering and heavy equipment. But that does not make them unfeasible for schools to take on. One elementary school investigated runoff and the effect their school was having on the local stream. The students determined that runoff from the school was causing degradation and something needed to be done. Unfortunately, that requires an environmental engineer to do site assessment and design. The school partnered with the local Department of Public Works who did the site engineering and stormwater practice installation. Students assisted with planting the structures and the school was completely fitted with the latest in stormwater management technology, which has been incorporated into their curriculum.

Tree plantings can be logistically easier; however, be sure to have the area checked for underground utilities before digging. If any of the proposed projects involve private land, permission needs to be given by the landowner. We know of one class that conducted a

stream assessment and found that a section of stream needed a forested buffer. They researched tax records to find the landowner, wrote letters to the landowner stating the problem and received permission to plant trees on the property to improve the quality of the stream.

There are also opportunities to raise and release organisms in the classroom as part of a larger restoration project. *Schools in Schools* raises shad in the classroom for release into rivers as part of an effort to restore these migratory fish. *Trout Unlimited* raises trout in the classroom for the same reasons. There may be opportunities for students to pilot new species and technology. Students in Maryland piloted raising sturgeon and freshwater mussels in captivity. Permits may be required for these projects. Contact your state Department of Natural Resources to see what permits are required and if they have any kind of raise and release program already established for students, or if they would be willing to have students pilot a program.

Effective Action Takes Numerous Forms:

There is *Civic Action*, which involves presenting at town meetings or engaging with elected officials.

There are *Education and Outreach* activities: teaching community members about environmental issues and sharing student research findings and solutions.

There are *Restoration Projects*: litter cleanups, tree plantings, conservation plantings, installing stormwater projects, becoming a zero-waste school, etc.

Lastly, there are the small, but cumulative, *Daily Choices* people make regarding transportation, energy use, food procurement, household and personal purchases. Educated consumers can reduce their environmental footprints considerably by learning the life-cycle of their purchases—knowing where the product comes from; what it is

made from; who made it; who transported it and in what way; how it is packaged; what will happen to it when the consumer is finished with it, etc.

Invasive Species

People have been purposefully and accidentally transporting plants and animals for centuries, and many of the organisms we consider to be native to a place were actually brought there by people. Invasive species have the potential to change the dynamics of a finely tuned ecosystem and can result in the extinction of native species and have negative effects on human communities.

There are a few terms that define native and non-native species.

Native –refers to an organism living in its natural range, the place where an organism is originally from.

Non-native refers to an organism not originally from a place where it is located now.

Introduced and exotic – synonymous with non-native. An introduced or exotic species is an organism that is non-native and brought to a place.

Invasive – a non-native organism that has established a large population so that it dominates the ecosystem, outcompeting the native species.

Naturalized – a non-native species that is now living in balance as part of an ecosystem.

There are plenty of examples of aquatic invasive and introduced species, and each one tells a fascinating story of human ecological interaction, highlighting differing values and beliefs people hold as they relate to solving these environmental issues. Well known invasive species include: zebra mussels in the east, silver carp in the midwest, multiple introduced crayfish species, and snakehead fish. Aquatic invasive species are great topics for an investigation. Introduced species such as Asian Clams and the baygrass Hydrilla might be filling a water filtering niche in the Chesapeake Bay, even though they are non native. There is much to be learned by studying non native and invasive species. Many teachers and environmental organizations create action projects around removing invasive species. If you and your students decide to tackle an issue involving a non native species, please remember that non native does not always equal invasive.

Assignment 8a. What is Your Action?

Please take some time to develop an action plan that is informed by your inquiry findings. Then, please complete the action, and share it using any media that will serve your purpose well. When you are finished, we recommend you go stream snorkeling! Yes, you heard us correctly. Freshwater snorkeling. You've earned it!

Stream Visit: Snorkeling

Estimated time for this stream visit: 1.5 hours

What you'll need: a friend, journal, regular and color pencils, something to sit on, mask and snorkel, footwear to wear in the creek, clothing to protect your skin from stream rocks and sun.

Freshwater snorkeling is an amazing way to observe stream life and better understand the role of biodiversity in aquatic ecosystems. When you snorkel, be sure to follow basic safety precautions. Never snorkel alone. Go in water shallow enough for you to stand, with slower velocities, make sure the water is not polluted and is safe for swimming contact. (Most state health departments have this information)

You will likely get into the river twice. The first time is to make observations of the patterns, abundance, diversity and distribution of life in the stream. The second time is to just experience, to become connected with the stream in an experiential way.

Snorkeling 1 Scientific Stream Exploration

Once you are in the stream, identify the different habitat features you learned about in this course. Look to see if you can notice any patterns of where different fish species are located. While you are snorkeling, look for benthic macroinvertebrates, in addition to fish. See if you can notice any patterns to where different benthic macroinvertebrates are located.

Snorkeling 2 Contemplative Stream Exploration

Snorkeling a stream can be inherently contemplative. What we mean by this is when you go into a stream and look underwater, you can settle into the movement of the stream and just watch the life of the stream unfold around you in its environment, on its own terms. As a way to help you get into this contemplative way of observing stream life, be intentional in how you approach the creek. Walk silently to the stream. Before entering the water, take a long slow look at the stream. Pay careful attention to what it does, and how. When finished looking, enter the stream slowly, quietly. Settle down into it as gently as possible and proceed through the following guided observations, which you'll need to review before going in—or have your friend read them to you.

Becoming the Stream

Relax into the water to become the stream. Not part of it, rather, as best as you can make yourself into the stream itself. Merge with it to become a single flowing entity.

Sensory Observations

Next, feel the current moving you, the water surrounding you with light pressure on your skin. Notice the light changing, the colors, the cobbles tumbling, the debris swirling by, fish nibbling on your mask/toes.

Touch a leaf, a cobble, a turtle, a fish.

Listen to underwater sounds. What do you notice?

From Another Animal's Perspective

Find an animal to observe. Moving with intention, observe and try to understand life from the animal's perspective, the perspective of an animal living in the stream environment.

Reflect: Stream Snorkeling

When you leave the water, take a few moments to journal about your experiences.

Interlude 8

While snorkeling, I become a member of the world I witness,
flowing into and along with the aquatic landscape.

The mesmerizing light reflecting off the surface obscures the richness below.
What richness exists! Once I sink below the surface, I see blunt-edged, dark green
grasses softly swaying; light rippling across a white sandy bottom; fish wearing
rainbows. Light skips across the textured surfaces, illuminating for brief moments before
moving to the next subjects: a curve, a subtle movement, a sparkle, a bright color, a
glimmering eye looking back at me.

— K. Chambliss



Photo Credit - *Freshwater Journeys*