Green Schools National Network

From Inspiration to Action – Nature's Notebook: A Green Schools Citizen Science Ecology Project

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It starts with an idea; wanting to go just a little bit further. To inspire students just a little bit more. As a teacher you know the best experiences you can give your students are those that they can explore with their own senses, and, even better, outside in the natural world. You do not even need to teach science to know that opportunities to repeatedly work on projects outside of the normal classroom experience are those which will be most remembered for years to come – the *"remember the time when we…"* These are the opportunities that inspire students to set goals and choose careers that are engaging to them, and meaningful for us all.

Manzo Elementary School in Tucson, Arizona is an award-winning green school on the city's south side. As a bilingual, experiential learning school, they pride themselves on math and science initiatives as well as project-based learning. Through the visionary leadership of a few project coordinators and support from the administration, the school has created a learning oasis outside its doors that includes a hands-on ecology project in its courtyard and a desert biome project located at an adjacent property outside of the school's campus. These outdoor learning opportunities are one of many things that established the school as a green school leader. Much work went into the creation and maintenance of these spaces and the benefits to the students are astounding. The school has developed a programmatic plan for staffing, maintaining, and utilizing these spaces for years to come.

The ecology and biome projects offer places where teachers are able to bring students as often as they are able. There are a few paid and volunteer staff, consisting of professional educators and student mentees, who assist teaching staff with activities or provide educational content during and after school. These staff provide the vision and guidance for implementing experiential lessons throughout the day. When developing activities to do in the outdoor spaces, they seek ideas from local organizations and science-based programs to provide project-based activities for students to engage in. Ranging from tending the garden and chickens to harvesting rainwater, maintaining the desert tortoise habitat, and doing citizen science, activities are designed to be age-appropriate explorations.

Collaboration with other local non-profits, governmental organizations, and departments within the nearby University of Arizona are also elements of success for programs at Manzo. Programs developed in consultation with a host of groups make the experiences on campus even more real. Current Ecology Program Coordinator Blue Baldwin recognizes the value of working collaboratively and creating partnerships within the community. Under her guidance, students and teachers are able to connect with the vast array of resources Tucson has to offer. Teachers who are looking for ways to make connections to the real-world can do so by participating in these programs. These experiences enhance standards of learning, and such projects allow students to explore the world on their own while participating in the scientific process.

Over the summer of 2016, Lisa Parce, an Adjunct Lecturer in the Department of Agriculture Education at the University of Arizona connected with Blue at Manzo about having her college students create a "citizen science based phenology walk" on campus. Lisa teaches a course entitled, "Learning to Teach to Learn" which uses true service learning projects to help 100 and 200 level students learn how to master a skill, often in a subject area outside of their major, and then learn to teach others about the topic. She has been using the citizen science project called *Nature's Notebook*, sponsored by the USA National Phenology Network (USA-NPN, a U.S. Geological Survey Program), for several semesters in her course as the skill students are expected to master.

The *Nature's Notebook* citizen science program is designed to help researchers and land managers collect phenology observations on select plant and animal species across the United States. Phenology, or the study of recurring life cycle events in plants and animals and their response to the environment, is one of

the key indicators of climate change. As the planet warms, species will need to adjust and adapt, so understanding the timing of these life cycles is critical to understanding what can be done to minimize risk. Phenology information is not only used by researchers interested in studying the effects of climate change, but by others at a local scale – gardeners interested in bloom times; farmers and growers harvesting food; foresters managing for invasive species; wildlife biologists studying animals; and even teachers educating about life cycles in science class. The organization regularly provides feedback and information on how data collected are being used and shares research-based details in an understandable way for those lacking scientific backgrounds.

People interested in phenology data for research, management, and education cannot collect enough observations on their own to determine meaningful trends; thus, they turn to many citizen volunteers to help them gather observations in their yards, at their schools, and in their communities. The data is collected in a standardized way and, if the *Nature's Notebook* program is utilized, it becomes part of the National Phenology Database (NPDb), a repository of data curated by USA-NPN, and is available to anyone interested in learning about seasonal and long-term change.

The National Coordinating Office (NCO) of USA-NPN designed many training and standards-aligned educational materials to assist citizens, teachers, and others interested in contributing to the phenology database via *Nature's Notebook*. The staff also offer free consultations on how to get started. By following protocols designed to ensure high quality data, participants can contribute as much or as little information to the NPDb as is comfortable for their experience and age level. Everyone who contributes observations to the *Nature's Notebook* program receives regular information about what their data are being used for and how researchers are applying it.

The NCO also offers online courses, for a $50 fee, designed to teach leaders (referred to by USA-NPN as Local Phenology Leaders) interested in establishing observation sites open to many people, like classroom teachers, as well as how to create a monitoring program designed to last for multiple years. Having a long-term monitoring program at a site like a school enables Local Phenology Leaders to engage students in the real-world scientific process of making and recording observations, and provides an opportunity for the Leaders to create and use a place-based data set of their own with future students. For information on how to enroll in the course visit www.usanpn.org/nn/LPLCertification. Educators can earn up to 30 hours of Continuing Education Units for participating.

Recognizing the value of using *Nature's Notebook* for teaching and learning at a site like Manzo, for both the students and community, Lisa and Blue partnered to create the "phenology walk" in the ecology and desert biome projects. Lisa's college students were able to study the local ecology and select plants to observe found on the *Nature's Notebook* species list. They followed guidelines established by the NCO's *Phenology Walk and Trails Guide*, and marked plants for students at Manzo to observe. The college students also learned how to use *Nature's Notebook* for making observations throughout the semester by collecting observations of their own at Manzo and at a site established on the University of Arizona campus. By

participating in the full process of site establishment and data collection, the class was able to put together creative lessons on teaching others about ecology and making observations.

(source: LoriAnne Barnett)

Manzo gained a phenology walk that Blue could use in her programming. With the help of several volunteers, students can participate in the citizen science program at least once a week, where they make and contribute observations on plants like the candy barrel cactus, ocotillo, and Santa Rita Prickly Pear. Their observations become part of the research database used by local researchers, like U.S. Fish and Wildlife biologists, who seek details about what these species of plants are doing across the Tucson basin. The site is also poised to become a long-term observation location so that data collected by students this year can be utilized by students in years to come. That provides relevant information for incoming students to learn about what others saw in previous years, hypothesize about what they can expect to see and when, and anticipate with excitement what will happen next. Lisa's future classes will be returning to the Manzo garden as a space where they can learn about *Nature's Notebook* and engage in teaching their own assignments.

Lesson plans for using *Nature's Notebook* are available on the USA-NPN website, including a 6-week Jr. Phenologist Certification Program where student groups who collect at least 6 weeks worth of data can be recognized nationally on the USA-NPN website for their efforts. This lesson plan also contains other phenology-related activities and explorations for students to experience. One of the USA-NPN volunteers working at Manzo has supplemented the data collection activities with several others of his own design, including studies of life cycles, desert adaptations, and botany, to engage the students in the full process of science observation.

Teachers who utilize the Manzo ecology space can participate in the *Nature's Notebook* program, which can be paired with subjects other than science. English and Language Arts classes may already be going outside to write stories or do journaling activities, and when they do they can also collect observations from the garden. Social Studies classes learning about traditional foods that have been locally planted can submit observations. Math classes can use *Nature's Notebook*-selected plants to collect measurements and observations at the same time.

They, too, will be contributing to the site-based data set which will be used over multiple years. With the benefit of the classroom space, teachers can utilize USA-NPN's phenology calendars, showing visual representations of the observations entered into the NPDb. Regardless of whether *Nature's Notebook* is used during or after the school day, it connects students and teachers to the outside world as well as science and research. Thus, once an observation location is established, the most difficult part of the project is finding time to bring students outside once a week.

While the project at Manzo had the assistance of many people to get it off the ground, it is not impossible to start a simple *Nature's Notebook* project on your own, with zero funding. The three most important things you need to begin include: 1) a willingness to spend some time learning how to submit observations into *Nature's Notebook*; 2) a willingness to develop a long-term plan for using *Nature's Notebook* at your school; and 3) a commitment to taking your students outside once a week for at least 15 minutes throughout the school year – long enough for them to experience changes in the natural world. If you can make those three things happen, then you can help to establish a valuable long-term phenology monitoring project at your school which engages students of all ages in the process of research in your schoolyard.

Adding a *Nature's Notebook* project enhances any green space at a school. As in the example of Manzo Elementary, it offers opportunities for the school to collaborate with community organizations, engages students in real-world investigation, connects the classroom to researchers, and provides opportunities for multi-year observations. For information on how to begin, visit the *Nature's Notebook* website or contact education@usanpn.org. Your contributions to the database are invaluable and the benefits to teachers and students inspire for years to come.

About the Author

LoriAnne Barnett coordinates USA-NPN's education activities, focused on engaging a variety of formal and non-formal audiences in experiential education and phenology via the Nature's Notebook program. She has worked in a number of educational settings over the last two decades, teaching both youth and adults the importance of place and connections to the natural world, and serves as an advocate for citizen science, education, and stewardship of the land.

LoriAnne holds a B.A. in Environmental Studies from Shippensburg University in Pennsylvania and a M.A. in Environmental Science and Environmental Education from Prescott College in Arizona. She has led workshops on leadership development, Wilderness First Aid, outdoor adventure safety, and risk management. Her areas of expertise include youth development, curriculum development, and environmental education. Current Board service includes President of the Arizona Association for Environmental Education and founding board member of the Arizona Master Naturalist Association.

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