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Green Teacher

Issue 109, Spring 2016



Page 8



Page 28



Page 35

FEATURES

- The Importance of Children's Risky Play**
By Morgan Yates and Mariana Brussoni /3
- Learning to be Gentle Giants**
by Jane Powell /8
- Undercover Litter Picker**
by Ann Palmer /12
- Discoveries in Nature Boxes**
by Megan Woolard Arredondo /17
- Citizen Science: Collecting Real-Life Data**
by Cathy Scott /20
- Uncaging Imagination with Guerilla Geography**
by Thomas Larsen and Lisa Tabor /24
- Best Practices for School Gardens**
by Mary Dudley /28
- Integrated, Social Justice Learning for Those At-Risk**
by Natalie Zayas Delgado /32
- How-To Float a Classroom**
by Dayna McRoberts and Jen Guimaraes /35
- Natural Chemistry – Outdoors!**
by Alexander Engl and Björn Risch /39

DEPARTMENTS

- Resources** /43

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EDITORIAL

EARLIER THIS SPRING I participated in a campaign to save the position of the lone environmental education coordinator in the biggest school district in Quebec, Canada's second largest province. Although the coordinator was a well-regarded champion of many successful district-wide programs over a 17-year period, the cruel hand of fate had determined that her position would soon be eliminated. What made this cost-cutting decision all the more painful, was that hers was the only such position in the province. Educators in many other school districts had benefitted from her innovations.

Once the shock wore off, environmental educators across the province began to organize. A private Facebook group was established and petitions were launched that eventually gained thousands of signatures. Non-profits across the province mobilized their members, and teachers

garnered the support of their union. (My own small role was to recruit educators in other provinces to write letters of concern to district officials.) Before long, the efforts of many attracted considerable attention from Quebec media. Once that happened, parents joined the fray and the pressure grew steadily on the school district to reverse its decision.

To many observers, it seemed particularly odd to eliminate the position of someone who led conservation programs that saved millions of dollars in energy, water and waste costs.



More than a few observers noted that those annual savings far surpassed the coordinator's salary. At a time when governments at all levels are under pressure to reduce carbon emissions, it seemed particularly perverse that her position was going to be eliminated. Not surprisingly, much of the media coverage framed the decision as "penny-wise and pound foolish".

Green Teacher readers will appreciate that the value of environmental education coordinators at all levels of government goes far beyond dollars and cents. In school districts, such positions confirm to all that learning about – and for – the environment is essential. They lend legitimacy to every teacher, school and parent group that want to undertake environmental projects. Most often, those projects involve partnerships with the local community and generate positive media attention for schools.

Most importantly, the coordinators become a conduit through which innovative new ideas and learning strategies funnel down to the teachers and students willing to test them. The coordinators alert schools about funding opportunities. They organize trainings and other professional development sessions that provide educators with the confidence to adopt new curriculum. At this moment in history, it seems incongruous to be fighting to save the few environmental education positions that currently exist. Shouldn't we be expanding the number of positions instead?

I am happy to report that the collective efforts of many finally won the day at Quebec's largest school board. I would like to think that when the officials announced their reversal, they did so with a greater appreciation of how critically-important environmental education has become in this millennium. If true, that appreciation will not have come a moment too soon.

–Tim Grant



The Importance of Children's Risky Play

"As safe as necessary" versus "as safe as possible": what the research tells us

By **Morgan Yates** and **Mariana Brussoni**

IT IS A COMMON STORY. A gaggle of children are outside laughing, jumping, and generally running around. Then someone starts a new game or activity that just seems a bit too dangerous . . . or is it? The children seem to be having such a good time. So should you let them continue or should you stop the new activity for being too risky? How do you determine if it is too risky?

Risky play is defined as exhilarating or exciting play where there is a possibility of physical injury. Sandseter¹ outlines six different kinds of risky play: speed (e.g., running fast), height (e.g., climbing a tree), with tools (e.g., knives, ropes), elements (e.g., water, fire), rough-and-tumble (e.g., play fighting), and disappearing or getting lost (e.g., independent exploration). Risky play can sound like scary

and dangerous play and, as with any type of physical activity, there is the possibility of injury. However, serious injuries are rare and risky play is typically a safe activity.²

Injuries are one of the leading causes of death for children in developed nations so there is good reason for concern. However, injury-related deaths typically do not result from children's risky play, but rather motor vehicle crashes, suicides, and poisoning. Furthermore, several researchers, teachers and public health practitioners suggest that efforts to keep children *as safe as possible* have resulted in constraining children's play and limiting opportunities to be challenged to such an extent that it could be having negative impacts on their health and development. Increasingly, recommendations are being made to shift from keeping children as safe as possible, to *as safe as necessary*.

We have a tendency to consider *risk* as synonymous with *hazard*, but these words have very different meanings. The



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difference can be useful to note when trying to find a balance between the possible negative outcomes and the benefits of risky play. Risk can be thought of as situations where children recognize the challenge and decide on a course of action, such as climbing a tree. Hazards are either things that children may not recognize as potentially dangerous, such as play equipment with loose bolts; or situations where children may not have the capacity to manage the dangers, such as a strong current in a fast-moving river. While taking an *as safe as necessary* approach, which embraces risky play, can be challenging, we provide examples in this article of existing tools and resources to help find balance and to support risky play in education and recreation environments.

Why is Risky Play Important?

The positive benefits of risky play are far reaching, touching many aspects of children's health and development. Brussoni et al. conducted a systematic review of the evidence regarding the health benefits of risky play. The review included 21 publications that examined play at height, where there's a chance of getting lost, rough-and-tumble play, and risky play supportive environments. The evidence indicated that risky play was associated with less sedentary behavior, higher levels of physical activity, and more social behaviors. Furthermore, no negative health impacts were reported, including injury. It was also found that physical activity has positive effects on obesity levels, musculoskeletal health, cardiovascular health and bone density. There are also indications that physical activity has positive benefits on mental health including self-concept, anxiety and depression, as well as school performance, concentration and memory. Thus, increasing physical activity generally has significant and far-reaching health implications for children and risky play is one way to increase children's overall physical activity and realize the health benefits.

Risky play can also be associated with increased time spent playing with peers, increased interpersonal cognitive problem solving, increased motor skills, social behaviors, and conflict resolution. Generally, risky play allows children to challenge their own limits and learn skills by doing so.³ The success or failure of these challenges can provide motivation to try other activities or to try the same activity different ways, with feelings of exhilaration when the challenge is met. Finally, learning how to manage risk in childhood may help develop risk management strategies for later life and increase children's abilities to navigate substance use and sexual behaviors during adolescence.

While there are potentially negative outcomes associated with risky play, minor injuries are an expected side effect of play and physical activity. For example, play, especially in the outdoors, may involve running, jumping, swinging and climbing. A systematic review of physical activity in school aged children by Janssen & Leblanc⁴ showed that physically active children had higher rates of injuries than did inactive children, and that as physical activity levels increased, so too did the risk of injuries. Nauta et al.⁵ undertook a review looking at the number of injuries per 1,000 hours of physical activity by children. They found 0.15 to 0.17 medically treated injuries per 1,000 hours of leisure time physical activity, which was mainly playground time. Using this rate, Tremblay et al.⁶ calculated that to engage in the necessary number of hours to log one medically-treated injury, a child would have to play outside for three hours every day for approximately 10 years. Even this injury would likely be minor with only short-term impact. Finally, while tragedies can happen anytime, including during risky play, they are extremely rare.⁷ For example, in Canada in the period between 2000 and 2012 there was one death resulting from a fall from play equipment (and none resulting from climbing trees).⁸

What is Limiting Risky Play?

Despite the positive benefits of risky play, the *as safe as possible* approach is pervasive, prioritizing the minimizing of risk over the benefits of risk in play.⁹ Ball & Ball-King suggested this could result from applying workplace risk management theories to play and play spaces. While risk minimization makes sense in a workplace, the same principles do not apply to a recreation and leisure environment. The workplace mentality does not take into account the social utility or positive value of the activity when trying to eliminate all risks. It also leaves risk assessment to risk assessors with backgrounds in industry, rather than in children's health and development.

Herrington & Nicholls¹⁰ discuss how US injury data was used to justify the Canadian Standards Association's safety standards for children's play spaces and equipment. Using US data gave the appearance of a substantial number of injuries resulting from the much larger population base in the US compared to Canada. UK research also suggests that some of the safety efforts undertaken in children's play spaces may not be justified. A risk-benefit study on impact absorbing surfaces in UK playgrounds found that the risk of death on play equipment was about 1 in 30 million per year, which is much lower than the risk of injury while playing many sports. The risk-benefit analysis concluded that the high cost of impact absorbing surfaces might not be warranted based on this level of risk. Furthermore, where impact absorbing surfaces were installed, there was not a notable decrease in the rate of injuries.

The perception of a frivolous litigation culture in the US with large damages awarded may have increased sensitivity to, and fear of, litigation in both countries, to such an extent that the *as safe as possible* route can appear to be the most sensible.¹¹ In reality, there is little evidence that Americans are any more litigious than other countries, nor that allowing more risk actually increases litigation. A UK government report found no data to indicate that litigations have increased in the UK, and cautioned that risk assessment approaches based on the "Precautionary Principle" or "As Low as Reasonably Practicable" policy guidelines could lead to excessive caution.¹²

In Canada, there is some indication that the public and the courts may be increasing acceptance of risk and rejecting excessive safety rules. For example, in Calgary in 2013 a recreation center was advised to no longer allow children to climb on the rocks in their lobby due to safety and litigation concerns. In a petition against the ruling, parents overwhelmingly said they accepted the risk and children were eventually allowed to climb again¹³. A recent court case in British Columbia provided support for children's risk taking in play, dismissing a claim filed against a district by a mother whose daughter was injured playing grounders (a variation of tag). In that case, Mr. Justice Baird referenced

the ParticipACTION Report Card on Physical Activity For Children and Youth, which was submitted to the court as "social fact" to indicate the approach to risk taken by the district, and noted that grounders was exciting and fun and that "*in the overwhelming majority of cases, no mischief comes to anyone from such innocent pleasures*".¹⁴

Parents' attitudes and safety concerns can also be a barrier to children's risky play. Two major safety concerns reported by parents include pedestrian safety and child abduction,¹⁵ but these do not reflect the data and efforts to address them can often be misguided. To deal with concerns around traffic, parents often resort to chauffeuring children to and from activities, despite the fact that children are more likely to die while riding in a car, than as a pedestrian.¹⁶ The risk of child abduction by a true stranger in Canada is approximately 1 in 14 million.¹⁷ Despite the rarity of this event, parents may limit children's outdoor play, or engage in extensive supervision to reduce its likelihood with little thought given to the potential implications. This



can not only limit children's outdoor play time because it is constrained by parents' abilities to supervise, but research also indicates that children are less physically active when there is an adult present. While the research has mainly focused on parents, this is likely also the case for teachers and other educators, who may feel bound to supervise as stringently as parents would. Referencing statistics may have little influence in motivating parents to change their behavior toward children's risky play. Rather, parents appear to be more motivated to change by discussions highlighting the negative impacts on their children's health and development resulting from limiting outdoor risky play.

Many children live highly structured lives and there is increasing emphasis placed on structured activities over self-directed activities. Parents can feel obligated to enroll their children in a wide variety of enrichment activities to ensure children will be competitive for schools and college, and so they do not fall behind their peers. This can also apply to teachers and other educators, who are challenged by increasing demands on their time and completing academic requirements. While there can be many perceived barriers to risky play, the benefits are numerous, and integrating risky play into practice does not have to be time consuming or complicated.

What Can Educators do to Integrate Risky Play?

Educators in all environments can be left feeling challenged by balancing rules and regulations with a desire to provide more risky play opportunities for children, especially in an environment where regulations may be designed to remove all risks. Educators may also be left feeling at fault if injuries do occur, or worrying about their job security if parents complain about the risks they allow children to take while



playing. Niehues et al.¹⁸ conducted education sessions with teachers and parents to reframe attitudes toward risk and found that teachers were sometimes more worried about risk taking than parents were. Furthermore, an open discussion between parents and teachers helped teachers to examine their own worries regarding risk taking and feel more empowered to encourage risky play. These discussions also allowed parents to better understand their own conception of risk and the importance of risk taking in play.

The Play Safety Forum in the UK produced a guide for play providers to assist in developing an approach that balances the benefits of risky play, along with the possible negative outcomes. This guide, *Managing Risk in Play Provision*, is intended to replace traditional risk-assessments solely focused on mitigating negative outcomes. The risk-benefit approach has been endorsed by the UK's Health and Safety Executive, thus sanctioning its use nationally.¹⁹ While this document is written in the context of the UK's legal system, it provides guidelines on how organizations can approach a risk-benefit analysis of play spaces and activities. These include: a clear play policy that sets out the values, understandings, principals and criteria that inform judgments about play; reducing hazards as far as reasonably practical; conducting a written assessment of the risks associated with the space or activity, as well as the benefits; looking at measures available to reduce the hazards and their effectiveness; the difficulty of application; any side effects and any possible unintended consequences of these measures. While this may seem daunting, their carefully described and systematic approach provides a useful roadmap to support risky play. In Canada, this approach is currently being used by Forest Schools Canada and Play Australia has just released a similar guide promoting a balanced approach to risk management play spaces.

As described above in discussing litigation, the Participation report card can be an important tool in promoting risky play. Embedded within the Report Card is the Position Statement on Outdoor Active Play. This evidence-based document provides an overview of the relevant literature, and resulted from extensive consultation with experts and agencies across a range of disciplines. The Position State-

ment lists specific recommendations for different target audiences, including encouraging teachers to embrace the outdoors for play opportunities more often and in all weather,²⁰ which really applies to all educators who work with children.

There are a number of resources to assist in creating risky play supportive environments. Herrington et al.²¹ developed the Seven Cs design guidelines for children's outdoor play spaces, consisting of: (1) *character* or overall feel of the outdoor space; (2) *context* or where the space is located in the environment (on a rooftop or in a valley) and how that influences its use; (3) *connectivity* is the extent to which the play space is unified to help children understand and use the space; (4) *change* is how the various places within the play space change over time, also whether there are various sized play spaces to allow for recognition

of orders of magnitude and spaces for various activities; (5) *chance* is the ability of children to leave an impression of their environment, for example 'messy' areas; (6) *clarity* is visual mystery created by the play space; and (7) *challenge* or the risk taking opportunities provided by the play space. While the seventh C is the only one that specifically addresses risky play, integrating various aspects described in this list can help to create opportunities for risk play.

The Sydney Playground Project in Australia can also provide ideas for introducing basic materials to increase risky play opportunities to teachers. In this intervention, materials, such as boxes, cartons and tires, were introduced to existing playgrounds. While these materials have no obvious play value, they were found to promote physical and cooperative play.²³

Conclusions

Risk was historically used to quantify the odds of an event happening, but it has evolved to imply danger and negative outcomes.²⁴ While at first blush 'risky play' may seem like something to discourage, research indicates its importance for children's health and development. It is our hope that there is a momentum building in the public and private sphere to swing the pendulum from *as safe as possible*, or excessive protection, toward a middle-ground that recognizes the importance of injury prevention but also children's need for risk taking in play, through an *as safe as necessary* approach. Educators in all environments can play a crucial role in supporting children's access to outdoor play and risky play opportunities and are important allies in these efforts.

Morgan Yates is a Registered Nurse and PhD student at the University of British Columbia in Vancouver. Her research focusses on what factors influence parental perceptions of neighborhood safety, specifically the role of crime, and how parental perceptions of safety influence children's health. **Dr. Mariana Brussoni** is an Associate Professor in the Department of Pediatrics and the School of Population and Public Health at the University of British Columbia. She investigates child injury prevention, including developmental importance of children's risky play.

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Learning to be Gentle Giants

Inspiring nature-focused values and habits in young children



Jane Frances Powell

By **Jane Powell**

DID YOUR MUM HAVE a “sun’s shining, get out of the house” rule? Mine did. In fact, “sunshine” was a subjective concept in my mother’s world and was understood more as “daylight.” If it happened to be raining or snowing, she would have our appropriate outdoor gear lined up by the door to help make our exit all the swifter. Fresh air was generally understood by her to be the magic ingredient in “happy kids.”

My fondest memories, both as a child and as an adult, are of playing in natural outdoor settings. Although I grew up only 40 minutes from Montreal, our suburban backyard was exploding with so-called “dirty knees” learning experiences. “Outside” was where my posse of friends and I discovered why salamanders hide beneath rotten logs, how snakes go about climbing steep rocks, how frogs manage to survive the winter, that a veil of cirrostratus clouds may mean rain is on its way, how to locate North via the Big Dipper, the mathematics behind igloo-construction, that snow can be made from boiling water in freezing tempera-

tures, and the amazing various forms of water, its cycle, and its importance. We got the details by asking local experts (including my dad) and going to the library. We sought after the details because we were inspired and questions came up as we explored.

As my parents were all for simplicity and recycling, the tools we used during our explorations were thoroughly reused and simple: a well-repaired fishing net, an old bucket, our hands, and whatever lay on the forest floor that seemed useful (fallen leaves and sticks for example). The value of reducing, reusing and recycling was instilled in us from an early age.

Along with a distinctly stimulating and educational connection with the natural world around me, my childhood explorations of nature and learned environmental ethics encouraged the development of environmentally conscious habits within me. As my curiosity and love for the mosaic of life found at my fingertips grew, I became aware of how my presence may affect other life forms. My friends and I learned to be gentle giants. Our expeditions always had an ingrained plan that seemed more like reflexive manners: wash sunscreen/bug repellent from hands, walk gently and quietly, use learned no-harm techniques for catching speci-

mens, catch and release time = two minutes, have the camera ready, leave-no-trace. Our empathetic relationship with nature encouraged the development of core habits within each of us that worked to prevent harm rather than cause it.

Core values and habits are instilled in each of us at an early age.¹ Similar to manners, the values and habits we learn during our early years become difficult to change as we grow older. Fresh air may be a magic ingredient in happy kids, while encouraging the exploration of natural spaces while employing environmentally sustainable ethics, helps create happy, educated, and inspired kids, who develop more inherent environmentally conscious values and habits. Two of the most significant ingredients in forming values and habits are opportunity and repetition. For environmentally conscious values and habits to develop, children need to be presented with repetitive opportunities for environmentally conscious nature exploration.²

In my work as an Environmental Education (EE) educator, I often meet teachers and early childhood educators who worry that they are “not expert enough” to offer their children nature-focussed outdoor opportunities. My response is that the opportunity itself is one of the most important parts; questions concerning what you find can be researched afterwards. The other most important part concerns the ethics you practice during your explorations.

Here’s my recipe for success:

- Before each nature exploration, have a conversation with your kids about the value in leave-no-trace ethics and link it to being “gentle giants.” Tie reduce/reuse/recycle into this conversation. Need inspiration for facilitating this conversation? Do a YouTube search for “leave-no-trace outdoor ethics” and “reduce reuse recycle for children”
- Ask kids to bring recycled exploration tools from home (e.g. containers)
- Packing a nature journal in? Make paper journals from recycled scraps. Need inspiration? Search Pinterest or Google it
- Bring a camera, take pictures and short films of what you find (to be researched later)
- Ponder specimens, encourage children to share their thoughts on what they find, create/record observations and questions
- Compare local habitats (a loon’s habitat vs. a frog’s, for example); identify the differences and similarities
- Include an interactive learning activity (see my EE Activity Cards, link in bio at end of article, or, prior to your adventure, do an online search for relevant activities)
- Ask a local expert to briefly drop in during your explorations
- Allow children plenty of self-guided unstructured time to give them the opportunity to make their own “AWE-SOME!” discoveries
- Follow up your fieldtrip with a class discussion on kids’ observations, look at the photos/films that were taken, do some library research, and allow them time to tweak/create their journals

Need some ideas of what to pack into your adventure-knapsack? Gather your outdoor gear, pack a picnic, and try one of these seasonal activities during your next awe-inspiring nature adventure.



Fun Prints Nature Journal

Planning on going for a muddy walk with students? Likely, you are not the only ones! As you wander through the muddy bits, keep your eyes open for prints. What kind of animals do you think have taken the same path? Are there any footprints, besides your own? Where are the prints going? Can you make your own prints? To make a plaster-print of the mud-prints you find and/or make yourself, follow these instructions.

What you need

- A patch of mud that is not watery, but not dry (test: put a finger in it and you should be able to see a defined print)
- Non-toxic Plaster of Paris (allow 100gr per child)
- Water (50 ml water per child)
- 2 measuring cups (1 for dry, 1 for wet)
- Mixing container
- Mixing spoon
- Animal foot print *or* fallen leaves/pinecones/sticks/other print-making material
- Bit of a drinking straw (2cm long) for each child
- An old tooth-brush or similar



How-to

1. Find a print in the mud or make your own by pressing pinecones, sticks or other object into the mud and then removing them (you should be able to clearly see the print). Remind the children not to step on the prints they've found or made.
2. Remove debris (leaves etc) from your print area.
3. To make a hanging-hole in your plaster-print, stick the piece of straw into the mud, so it is standing upright, just above your print (when smoothing your plaster-mix over your print, be sure that it surrounds the straw).
4. When your print is made, make your plaster-mix in your mixing container. Mix the plaster and water together. The consistency should be like toothpaste. Add plaster/water as needed.
5. Pour the plaster-mix over your print and smoothen it with the back of a spoon, remembering to surround the straw (but do not cover it). The plaster should be thick enough so that you cannot see the mud through the plaster (ideally, about half a centimeter).
6. Let the plaster harden - do not disturb it for 40-60 minutes (time depends on the consistency of both the mud and the plaster). Plaster prints should be handled gently for min. 2 hours after being made. After 2-4 hours, they are fully hardened.
7. After the print has fully hardened, use the toothbrush (or other similar soft brush) to gently remove the remaining dry mud.

If you plan to paint your print, thin water paints, applied lightly to pieces of sponge and dabbed gently onto the plaster print, will give beautiful results.



From Egg to Frog

Go on a pond adventure and learn about a frog's lifecycle with this curiosity-driven activity. Can you find the different stages of a frog's life and the resources it needs for survival? Find the illustrated clues and put them in order, from egg to frog. Then ask yourself what a frog needs in order to survive during each stage of its life.

Important notes: wash sunscreen/bug-repellant off your hands before going on an adventure that may include handling amphibians. Walk gently. Catch-and-release rule for frogs and tadpoles is 2 minutes. Do not disturb frog eggs. Leave-no-trace.

What you need

- A marshy area or a pond
- Rubber boots
- Net and bucket
- Camera

How-to

1. Prior to your field-trip, have the kids do some library research on frogs.
2. When you are on your fieldtrip, before your exploration starts, have an interactive discussion with the kids about what they learned about frogs during their library research.
3. Clarify rules: if kids are not aware of how to handle frogs without harming them, make it an “eyes only” activity. Talk to the kids about walking gently and leaving no trace. Talk to the kids about safety around water and give them boundaries.
4. Get your camera ready – take photos of what the kids find during their tasks.
5. First task: find the things a frog needs to survive (marsh, air, mud, water, mosquitoes, flies, etc)
6. Second task: Find the different stages of a frog’s life-cycle: eggs, tadpole, tadpole with back legs only, tadpole with front and back legs, and frog.
7. End the activity with an interactive conversation on the kids’ observations.
8. The next day, print your photos and have the kids make a collage of a frog’s life cycle. Put the photos in groups organized into this order: 1) eggs, 2) tadpole, 3) tadpole with back legs only, 4) tadpole with front and back legs, 5) frog

Snowball Lanterns

Snowball lanterns are fun additions in and around snow caves, igloos, and snow forts. While you build, have kids ponder: the type of snow needed for snowballs; the number of snowballs needed for each layer; the snowball angles needed for the layers to hold together; and other possible causes in the snowballs sticking together.

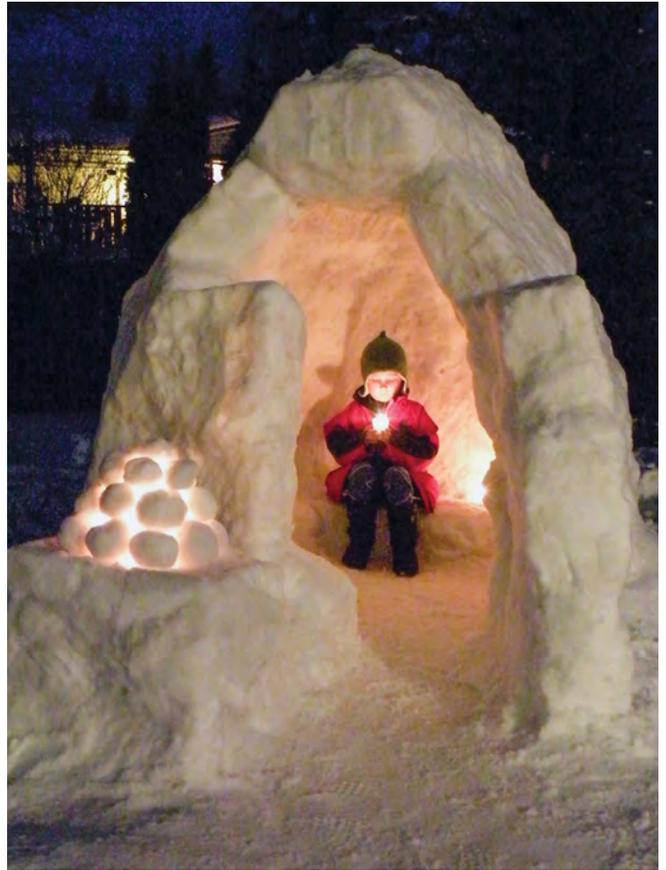
What you need

- Sticky snow
- Small candle (tea-lights are perfect) and matches

How-to

1. Make snowballs
2. Choose where you would like your lantern to be (they cannot be moved).
3. Flatten the snow: pack it down hard, to create a hard flat surface to build on.
4. Place a circle of snowballs on your packed-down surface (about 30 cm in diameter). Now, place another smaller circle of snowballs on top of the first circle. Then continue to place smaller circles of snowballs, until you have a gap big enough for only one or two more snowballs. Place your candle on the ground in the middle of your lantern. Do not fill the natural gaps that form between the snowballs.
5. Light the candle with a long match or lighter.
6. Place your last snowball on top.

Whether exploring between the rocks in a schoolyard, investigating rotten tree stumps in a neighbourhood woods, or sifting through weeds and mud in a local marsh, environmentally conscious nature explorations are invaluable opportunities for the development of happy, educated, and



inspired children who practice environmentally sustainable values and habits. Even more so than personal expertise in the natural sciences, *opportunities* for nature exploration that are fuelled by an educator’s or parent’s motivation and passion are the inspirational nourishment that help children thrive. As ethical adventures into the natural world unfold, and sparks of curiosity ignite more scientific investigations, the children who participate in these habitual adventures are encouraged to evolve into community leaders who will prioritise the environment.

Jane Frances Powell is both a freelance environmental educator and a Program Coordinator/Instructor at The College of the Rockies, in Golden, British Columbia. She created 20 EE Activity Cards that can be used during outdoor adventures with young children, and freely downloaded from: www.inaboutandfor.blogspot.ca

Notes

1. During their introduction to the United Nations Educational, Scientific and Cultural Organization document “The Contribution of Early Childhood Education to a Sustainable Society”, Ingrid Pramling Samuelsson and Yoshie Kaga write “There was a strong consensus that educating for sustainability should begin very early in life. It is in the early childhood period that children develop their basic values, attitudes, skills, behaviours and habits which may be long lasting. Studies have shown that racial stereotypes are learned early and that young children are able to pick up cultural messages about wealth and inequality. As early childhood education is about laying a sound intellectual, psychological, emotional, social and physical foundation for development and lifelong learning, it has an enormous potential in fostering values, attitudes, skills and behaviours that support sustainable development – e.g. wise use of resources, cultural diversity, gender equality and democracy.” (UNESCO 2008)

2. For an excellent exploration of the importance of environmental education in early childhood education, read “Young Children and the Environment – Early Education for Sustainability” (2010), Edited by Julie M. Davis.

Undercover Litter-Picker

Transitioning from anthropocentrism to Earth-centrism by way of a humorous photo contest



Flattened by a Giant Litterball

Children's Humorously Captioned Photography Competition

by **Ann Palmer**

The Litter Picker's Creed

*Every item a tale to tell
how it came to be not doing so well.
An identity-shift from bright package to trash
accomplished in a twinkling.*

*Their natural development – onward recycling –
I'll forward as best I may.
Retrieve from places they shouldn't be
items battered, broken, each day.*

*So every item a new tale to tell,
how it's doing better these days.
Recycled, reclaimed, the latest craze –
quite sure it will do rather well!*

CAN I HELP? asked 15-year-old Roxanne. 'I like to help.' I looked up from my litter-picking, quite sure an angel had just descended on the beach. For a teenager to approach an adult, particularly a stranger, with such an offer, felt miraculous. About to embark on her Duke of Edinburgh Award, awards that recognise adolescents and young adults for completing a series of self-improvement exercises, Roxanne decided to include litter-picking as part of its remit. I went to see her parents, who at first appeared to be happy with the idea, but it turned out that was not the case.

This is how I learned litter-picking has a stigma attached to it. If I wanted to involve young people in litter-picking, I needed to go much further than I had done so far. I recalled how I got into litter-picking myself. Three years ago, U.K. television presenter, Griff Rhys-Jones, had climbed Snowdon, the highest mountain in Wales, wearing a jacket with the moniker *Griff the Garbage* emblazoned on it. He did this in the company of *Ron the Rubbish*. The image of these two men taking such an upfront stance, and in a humorous way, went



deep with me. I wrote to the local council, offering to clean up my local patch if they would provide a jacket, litter picker and gloves. It was with huge delight I put on the high visibility jacket announcing my new identity – *Gaia the Garbage*.

To go into a public place alone and start litter-picking brings up an odd mixture of emotions. Ridicule I had dealt with through my chosen moniker. Mostly, people ignored me which was fine. What I dreaded was being challenged. The Outer Hebrides of Scotland is still heavily patriarchal where the unspoken law is *don't put your head above the parapet*. To have the support of the local council and its Zero Waste department eased this feeling. Those people who spoke to me often confessed – and by their demeanour and tone of voice it did feel as if they were indeed confessing to being secret litter pickers. This confirmed a collective attitude to litter picking which is part of environmental amnesia. *Do it if you must, but don't be seen doing it. Whatever you do, never talk about it!*

My partner and I tried to start a local litter-picking group, using local media and posters to publicise an initial meeting. After all the upsides are exercise, fresh air, the companionship of others and sometimes even the beachcombers' reward – finding an item of real value. Just three people attended a meeting that was well publicised. The promised local representatives from official bodies – Keep Scotland Beautiful, Scottish Natural Heritage, Marine Conservation Scotland and Zero Waste Scotland, did not turn up. At the last moment, the venue was nearly withdrawn. This is subtle, and suggests a general apathy. But it left me in no doubt that what we were trying to do was not wanted or approved.

The head of Zero Waste summed it up: *You have a mountain to climb*.

I disagreed. What we had to do was find a way to make litter-picking a want-to-do. One thing that 'sells' ideas is humour. To change the attitudes surrounding litter-picking,



to change its image, was key. My partner took our new digital camera to the beach and photographed me with some of the more unusual objects the sea deposited. I found myself mentally captioning the photographs, humorously.

In so doing, I seeded the best idea I'd had so far, for a Children's Photography Competition.

Local Business Support

The remit was to raise awareness of the importance of community involvement to tackle the litter-problem that horrifies visitors to the Western Isles, and therefore does little for the tourist trade. So at the outset, I felt there was a good chance local businesses would be in favour of the idea. To take the children's photography competition to the next level, the images needed to be presented humorously captioned. This would draw on the creative skills of pupils, something I personally feel is, as Sir Ken Robinson says, more important than literacy for the future.¹ When my idea was enthusiastically received by the majority of local businesses, who offered very generous prizes, I felt vindicated. Occasionally, even elated and surprised at the recognition – at last – of the importance of caring for our shared environment.

The school situation

In Western Isles schools, there is a person responsible for ecological co-ordination, but that does not translate as supporting an initiative sourced outside the school programme. As ever, to have any chance of success, all possible publicity outlets were covered, all schools informed three times, the deadline put forward a month – with increased publicity – to encourage entries. Just one school, Sir E. Scott School in Harris, supported the Children's Humorously Captioned Photography Competition by setting it as homework. With their teacher's help, they provided the most innovative images and captions in a competition that attracted 49 entries. To extend the life of this project, a calendar of the



behaves in seawater. It also points to a dark future fate of our species if we do not robustly address this problem of treating the shared environment as a global garbage dump.

The winning secondary school entry 'The grazing here is rubbish these days' points at the effect our rubbish has on animals. How plastic kills animals – the sea turtle is probably the most widely publicised – is implicated in the sheep's comment.

The all-hands-on-deck philosophy so beautifully summarised by the statement *We are all crew on Spaceship Earth* means it is permissible to include the help of animals, pets and even cuddly toys.

Children respond well to this

winners is planned for 2017. An e-version of this calendar is available to teachers who apply directly to us. Either with an email to gaidance@btinternet.com, or through the website www.gaidancebooks.com

Other inspirations

While my partner and I were forwarding this competition, we learned of a rather different anti-litter project being conducted by a young man, Martin Dorey. He set up the first Ocean School at the other end of the U.K., in Devon. An Ocean School is similar to the green Forest Schools but focused on the sea and Martin is regularly invited to talk about his projects on television and at conferences.

Martin also promotes the idea of a Two Minute Beach Clean.² By seeding the idea of litter-picking as something anyone can do on a beach-visit, he opened a quite different way of seeing litter-picking; as a habit or part of a regular routine. I quickly found myself doing two-minute beach cleans on the way to swim with the local seals first thing in the morning. It's an ideal approach when a full two hours is just not possible.

Closer to home for most Green Teacher readers, the Zero Tolerance Policy of New York police in eradicating graffiti³ worked. Removing graffiti, the moment it appeared, had the seemingly magical effect of solving a long-standing problem. My own belief in removing rubbish from my patch is based on the same belief.

The undercover stories of the winning photographs

Subtextually, each image tells a story with a serious message. The winning primary school entry, 'Flattened by a giant litterball hailstone' omits the child's face making the image universal. In all probability, for most entrants, the inclusion of the child's face would have been automatic. It is a powerful image, and an excellent composition photographically. The huge polystyrene ball shows the way polystyrene

expansive and imaginative approach to problem-solving.

In the world of business, as a brainstorming technique, it is often the craziest ideas that, when made do-able, are clear winners in a problem-solving context. The fact indigenous cultures used any and all methods – singing, dancing, drama, model-making – to act out their needs, often survival needs, reinforces this whole brain approach and reveals its deepest root in our species.

Re-seeing stigma

Stigma acts like an unspoken taboo. But it does raise a serious question. Evidence-gathering in a grassroots situation gives insights not otherwise available. The litter problem at the global level is publicised on television but little is done to reverse it, indicating a tacit cultural agreement to litter-blindness. The reaction of parents not wanting their daughter to help is echoed culturally, worldwide. Einstein said that problems cannot be solved at the level they are created. The mind set that creates the problem is unfit, unable or unwilling to solve it. The paradigm shift is key to breaking into and out of this vicious circle.

The power of new words

Not for one moment should we question the power of new words to change perceptions, and short-form communication by fulfilling the demand for the instant. To build a general eco-literacy in the minds of the young necessitates seeing differently. To use expressions like *litter-blindness* and *litteritis* – the disease of mindless litter dumping – newly frames the activity. At grassroots level, it is then seen differently, as contributing to lack of well-being if not actually illness, much as does Nature Deficit Disorder.

According to the internet, new words are invented at the average rate of one a minute. It is a global phenomena. *Green Teacher* has introduced me to words I have never met with before. These are words and terms to describe a present situation which previously did not exist. From the pages of *Green Teacher* recently came *biophilia*, our genetic pre-

disposition to love nature, *solastalgia*, the pain experienced when there is recognition that the place where one resides and that one loves is under immediate assault, and the concept of getting students involved in *Envirothons*.

Words have tremendous power. Once they are in common parlance, they take on a reality and are rarely questioned. If there is a word for it, it must exist.

I asked myself a different question. Do these words go far enough? Do they get to the root of the matter? They go part-way to be sure, but do they give us the *empowering handle*, or leave us in what the late great Irish poet Seamus Heaney called *limboland*.

Completing the first circle: holism

For an adequate exposition of any subject, there must be an attempt at holistic seeing. Generally, I believe we do not access the full field of potential because our individual specialisms keep us narrowly focused. This trains our brains into a left-brain bias, and 80 per cent of people in western cultures have this now. My own postgraduate training taught me we are all ppb; partial, prejudiced and biased, with no pejorative meaning attached. It simply describes the filtering state of our reality-processor, the human brain. Right-brain led training mitigates against this, but is not generally prioritised in schools. How we learn, the techniques, strategies, methods allowable, official and unofficial, sanctioned and tabooed, takes us one level deeper than the learning itself. This deepening exposes the roots, the source.

When patterns (that is patterns of behaviour, patterns of thought, patterns of development) are given precedence over simple logical reasoning and are seen as being more deeply informative, we key into the synthesis-skills offered by the functioning of the right hemisphere of the brain.

Earthcentrism and Anthropocentrism

Anthropocentrism noun. *The belief humankind is the most important element of existence.*

Earthcentrism noun. *The belief the human species should see itself primarily as part of the Earth's ecosystem. Derivatives, earthcentric adj. earthcentrically adv.*

Google Analytics reveals a rising interest in the term anthropocentrism. Unlike the status of other nature-connected words like ecology, conservation, environment. As both earthcentrism and anthropocentrism address human existence, our place in the cosmos, this new academic-sounding word links to this internet growth-pattern.

But before we begin to look at the implications of these two mind-sets or global overviews, it is absolutely essential not to set them up as dualities. All we are doing by stating one or the other is identifying our major allegiance at a global societal level. Without doubt, the duality-approach will be used to bring anthropocentrism and earthcentrism into conflict, but at least it offers an upfront and robust look at what we, as a species, are creating on Planet Earth. It makes things more real.

If the Diversity-in-Unity model of all existence, the very one given by nature herself, is prioritised and preferred, the duality-trap can be avoided altogether. The conclusion I came to in writing my book on Earthcentrism⁴ was that we are all, at different times, both anthropocentric and earthcentric. To exist within cultures forces this. The major

reason to invent the term earthcentrism is to offer an alternative, a vision of future possible, the subject treated so extraordinarily well by visionary Jean Houston.⁵ Working mainly in an anthropological context, she has discovered how disadvantaged indigenous people can empower themselves through changing the inner imagery associated with their situation. Others, like psychotherapist Dina Glouberman⁶, have long practised this holistic right-brain led transformative technique with astounding results.

Completing the second circle: development and expansion

The crucial matter of positioning oneself on any contentious issue is one we all face. The Hindu philosophy of *ahimsa* – no harm – helps, alongside the desire to leave enough for the next seven generations. The visionary will want to go a step further – leave the planet in a better state than at present. The native Amerindians talked of the Fifth World of Peace.

References to indigenous wisdom give a profoundness and depth to our collective understanding and work against superficiality of thought. The effect of introducing such ideas at appropriate moments to a group of concerned young people should not be underestimated. It can be done formally, by having an ‘indigenous wisdom’ theme running alongside the competition, or as a subject for a poem. Or less formally, by asking students to express their feelings in energy-raising ways that invite solutions. *‘Things that have not previously been connected’* are the source of both creativity and future syntheses of thought and ideas. What I personally find really useful about the term earthcentrism is it helps to position ourselves, give ourselves an identity in relationship to the planet, and not just a colour. Colour is the shorthand, but the tokenism of *green-washing* is part of the modern world too. There is a need for vigilance. If people were asked to state their baseline relationship to Earth, rather than their gender, sexual orientation, culture-of-birth and age on official forms – and there are certainly sufficient form-filling opportunities to make a societal impact – the way we see ourselves would be upfront, and therefore facilitate and encourage meaningful debate.

Completing the third circle: vision, action and results

Do I really believe that if the term *earthcentrism* were current in our language, the attitude of Roxanne’s parents would have been different? Is that pushing the argument too far?

To reframe that direct question is more helpful. What I believe I witnessed was the lag-factor in operation in inter-generational learning. The young person saw the need, immediately volunteered her services and her impulse to do the right thing was quietly and systematically eroded behind the scenes. At this juncture, any and all ameliorating influences – from humour-based competitions to naming the unnamed – are to be welcomed. By habitually engaging solely in *what is*, we do not give ourselves the space to access the clarity of mind needed to build a vision of what is possible in the future.

One heartening thing emerged from this Children’s Humorously Captioned Photography Competition. Early entries, posted on the website of our local newspaper, attracted interest. By the end of the competition, there were

A general template for the Humourously Captioned Photography Contest

Preparation

Before starting this project with students it helps to clear the emotional ground by asking for their felt-response to litter-picking. Handled sensitively, with reference to the earthcentric and anthropocentric standpoints, any demeaning connotations will come to light and can be transformed. It is an opportunity to point out that the cultural taboo on litter-picking is part of an anthropocentric rather than an earthcentric worldview. This depth of understanding may initially seem unnecessary. Seen as seeding part of a positive holistic mind set primed to tackle ecological problems, considered as the biggest overview attainable, our species collective positioning, our relationship to the planet, it takes discussion to a meaningful level. Ultimately, it will forward the anthropocentric/earthcentric debate.

Community partners

The heading up and development of this kind of project depends on personal contacts and the specific relationship of a school to its local community. Involve the local community by approaching local businesses for prizes. This gives valuable feedback before the project is launched. People in one-to-one conversations reveal their private opinions more readily. To this day, I am still surprised at the extent of the support this competition received. Initially, we thought we would have just one or perhaps two prizes. We actually were able to offer fifteen.



The remit for entries

A photograph of a child with a piece of litter found on a litter-pick. The photograph can also include an animal or a toy. The inclusion of animals and cuddly toys extends the humorous potential. Ideally, the objects used will be those found on an actual litter pick. In true creative spirit, children may spontaneously offer their ideas for humorous captions. Using two disposal bags will enable the choice between items suitable for photographs to be made on site.

Judging the competition

Outside judges are preferable. They bring a fresh eye to the competition and, if the entries are judged anonymously, ensure an independent assessment. The method the three judges of our competition used was to score the photographs on a 1 – 10 scale for a number of attributes, and then add up the totals.

Publicity

For children to lead the way in changing public perceptions feels, to me, like a big step towards empowering the younger generation to make a real difference. All adults involved become far more litter-aware and less tolerant of the general apathy surrounding this subject. Its newsworthiness is enhanced because of the deliberately introduced humour which lightens spirits and hearts, and is good for us all. Reach out to local news sources to let them know what you are doing, and ask if they would like to cover the contest before, during, or after it happens.

six and a half thousand followers of the progress of the competition, a very high number, coming in fourth behind major news events. It is testament to people secretly interested, like secretive litter-pickers. Only 49 actual entries, but 6500 watchers. That is six and a half thousand people out of 28,000 living on an island a hundred miles long off the west coast of Scotland whose awareness of the litter-problem has increased.

Meanwhile, I find my lone litter-picking has become a therapy and diminishes feelings of solastalgia. When I walk on the beach, or take the peat-road onto the moorland, the litter-free landscape reinforces in me the feeling we can all make a difference. One that shows.

Ann Palmer is a former headteacher turned writer who champions earthcentric grass-roots led campaigns. She teaches occasional residential Nature Writing courses for the U.K. Field Studies Council.

Notes

1. Sir Ken Robinson – TED talk recorded at TED2006 – *How Schools Kill Creativity* – www.ted.com/talks/ken_robinson_says_schools_kill_creativity
2. Two Minute Beach Clean - beachclean.net
3. New York Zero Tolerance of Graffiti Policy – www.newyorkdwiattorney.net/newyorkzerotolerancelaws.html
4. Ann Palmer, article, *Earthcentrism* www.resurgence.org/magazine/article3769-elements-of-existence.html
Ann Palmer, ebook 2015. *Earthcentrism: 100 questions, 1,000 answers: a Primer in Integrated Thinking*, www.amazon.co.uk/Earthcentrism-100-Questions-Answers-Primer-Integrated-Thinking-ebook/dp/B0151ZV692/
5. Jean Houston, *The Possible Human* (Jeremy P Tarcher/Putnam 1997)
6. Dina Glouberman, *Life Choices and Life Changes through Imagework* (Unwin Paperbacks 1989)

Discoveries in Nature Boxes

A place-based education program that could bring hands-on discovery into K-5 classrooms in your community



Megan Woolard Arredondo

By **Megan Woolard Arredondo**

“**T**HERE’S THE NATURE BOX LADIES!” is a commonly heard phrase shouted out by eager children in our area when they see a well-known group of educators arrive at their school. Students often remember the presenters of Nature Boxes years after they visit and will stop them at the local grocery store, or other areas about town, to remind them what a great time they had. Recently a kindergarten teacher noted that, “The children are always engaged and discuss the information they have learned. It is a great way for them to make a connection.” Inspired by their first encounter with the program in 2007, a group of Cibolo Creek Elementary students raised funds to purchase the materials for what would become the Cibolo Prairie box. This is now one of many Nature Boxes making their way around area schools. As a free program offered to local pre-school through 5th Grade students, the program depends heavily on donations such as these.

Located in Boerne, Texas, the Cibolo Nature Center & Farm is home to four unique ecosystems: a tallgrass prairie, riparian forest, live oak savannah, and spring-fed marsh. The Nature Box program takes our “place” to area classrooms through hands-on, inquiry-based learning that focuses on these four ecosystems. It was developed by two retired teachers in order to reach school children who were unable to visit the nature center, and operates much like a

field trip in a box. An army of volunteers provide science and nature-based education into the classroom for study and exploration by bringing all the materials and facilitating the lessons. The materials found in each box enable multiple activities that relate to theme; such as bats, native plants, watersheds, and local geology. Some of the boxes cover general science topics such as the phases of the moon, with a unique place-based approach that helps make an abstract topic familiar. Aligned with state education standards, all of the activities are designed to enhance current school curriculum. Now reaching approximately 7,000 students annually, there are currently 36 different boxes in operation, spanning Pre-Kindergarten through 5th grade.

The Nature Box program is an easily replicable program that classroom teachers, parents, and informal educators can use to enhance their curriculum and inspire young minds to gain a deeper sense of wonder and connection to the environment. In today’s early childhood setting, less and less time is dedicated to the sciences. Nature Boxes allow the educator to weave science into other studies, such as reading and math. This is achievable by integrating literature and mathematical concepts throughout the lessons, regardless of theme. Nature Boxes are place-based, meaning the students are learning about their local ecosystems, which makes learning more meaningful and relevant to them. Nature Boxes allow for in-classroom discovery of place, while encouraging at-home explorations of the child’s larger community.



Before developing your own Nature Boxes, visit a local nature center or park to learn more about the area's natural history. Ask yourself what is unique to your region. For example, is there a geological formation that could be used when teaching about rocks and minerals? Find out the name of the watershed your school is located on, and the names of nearby creeks, streams and rivers. What is the history surrounding these features? It is important to become familiar with the natural history of your particular region, as this is essential to making learning place-based.

After the investigations are complete, it is time to create your own Nature Boxes, which can be shared amongst teachers and stored safely for future use. Here at the Cibolo Nature Center & Farm, our Nature Box lesson plans were developed to follow the 5E Instructional Model (i.e. Engage, Explore, Explain, Elaborate, and Evaluate). Our center is home to a restored tallgrass prairie that we manage utilizing a variety of techniques, including prescribed burns. Tallgrass prairies are an extremely complex and endangered ecosystem and we are fortunate to have an example of one locally.

The following is a step by step example of how we present Cibolo Prairie Nature Box. If grasslands are indigenous to your region (and they generally are in some form), you will only need local modifications to use much of the following information. Usually, the Nature Box presenter will begin the lesson during a 45 minute classroom visit and then leave the teacher with all of the materials needed to complete the lesson over the next few days.

Engage

Each of our Nature Box sessions begin with students viewing a map of the Cibolo Nature Center to see where the prairie is located. This enables students to make connections between the lesson and their community. When creating your own boxes, collect maps from the places you visit and notate where students would find the concepts being taught. For example, if you are discussing a specific creek be sure to show students where in their community the creek runs.

Students are then presented with a variety of items from the prairie such as pressed and laminated plants, actual grass samples, and photographs of the prairie and its' animals. We also use the "Life in the Cibolo Tallgrass Prairie" poster developed by a local artist because it shows the variety of life present in a tallgrass prairie. Additionally,

children are encouraged to touch and feel a real bison pelt. A lively discussion usually occurs about all that might be found in the prairie. This is an excellent opportunity to reinforce important vocabulary words such as herbivore, carnivore, predator and prey. Instructors often post the unit vocabulary words on the board prior to the lesson and reinforce these words throughout the session.

The instructor might choose to then read an age appropriate book or short story about a prairie ecosystem, such as "A Sea of Grass" by David Dvorak Jr.¹, or "A Day on the Prairie" written by elementary students in Long Grove, Illinois².

Explore (Hands-on Centers)

Grass Center: In this center, students observe samples of the "big four" grasses that dominated North American prairies in the past and currently grow in the local prairie (Big Bluestem, Little Bluestem, Indian grass, and Switchgrass). Samples of the four grasses are laid out on the table so that students are able to touch and feel them. Additionally, students have laminated photos of the grasses growing wild in the tallgrass prairie at the nature center. Using the "What Does a Grass Look Like?" activity from the Texas Prairies curriculum, children attempt to identify the individual parts of the grass samples they are viewing. Utilizing a nature journal or observation sheet, students write about and illustrate their observations.

Food Webs of the Prairie Center: Students look at the "Life in the Cibolo Tallgrass Prairie" poster and other laminated images of a tall grass prairie ecosystem³. Using this information, students create a simple food chain/web as a group. If age appropriate, they will then write a brief paragraph in their journals describing their food webs. Another option for older students, is to illustrate their own food webs, based on the information provided.

Indigenous Peoples and Bison Center: Students study the relationship between the prairie and indigenous groups and the bison through short, developmentally-appropriate informative pieces and laminated photos gathered online (see the Resources section for suggested readings). It is also a good idea to study the history of your region and look for literature that is relevant to your area's indigenous groups. Students can read as a group or independently. After reading, students answer guided questions in their journals such as: How did the bison help the prairies? How did the aborigi-

nal people help the prairies? How does today's bison population compare to the bison population in the past? What has caused the population to decrease? These questions will vary based on what reading materials are chosen.

Explain

Students come back together as a group. The teacher explains that we have very few prairies left today because most of the world's grasslands have been converted to farm land. Students then discuss why this might be. The teacher will list student ideas on the board or piece of chart paper. Following discussion, students can read an informative piece about prairie habitat destruction as a class or individually (see resources for ideas). One way that math can be integrated into this portion of the lesson is a grade-level appropriate graphing activity in which students plot the acres of grassland loss in their region over a course of several years or decades. This might require researching for the data and creating a table for student use. Good search terms are "acres of grasslands converted to cropland" with a specific region and timeline listed. You will likely find an abundant amount of research on this topic but will have to convert the information into student-friendly terms.

Elaborate

Students can break up into cooperative groups and use the information they have learned, along with the visuals they have created, to put together a brief presentation to give to their class (or a different group as decided by the teacher) on prairie ecosystems. Groups can focus broadly on all areas learned, or the teacher can assign specific topics to each group. Topics from this lesson include: plants and animals of the prairie, indigenous peoples and bison, and the current state of the prairie. These topics can be expanded or different topics can easily be included by the teacher.

Evaluate

Evaluation can be done in a variety of ways. An easy evaluation method is the "ticket out" or brief journal entry. You could ask the students to close their eyes and imagine they are visiting the local prairie and then write down the first five things that come to mind that they might see. Students would then turn this in prior to exiting the classroom, or transitioning to a new lesson. Another question that can be asked is "What is one new fact that you learned about prairies today?"

Our boxes are created with clear plastic storage containers that can be found at most big box stores or online. We use 23 x 16 x 6" containers. We like them to be relatively short in height so that they stack well and store in cabinets easily. Make sure to purchase the ones with lids and create a label identifying your box. Nature Boxes can be created cheaply if you are willing to create many of your own reading materials, lessons, diagrams, and image files. Materials that can be reused, replicated, or easily replenished work best. You can also do a search of your area and look for places specializing in materials such as these. A good place to look for is a local nature store. Before creating your box, you should set a budget so that you do not go overboard on purchasing. If allowed, create a wish list and have a class or grade-level fundraiser to purchase materials for specific boxes.

With a little exploration of your local landscape and a willingness to translate what you learn into engaging activities, Nature Boxes can be fun and relatively easy to create. Above all, they can help to make the local landscape come alive for students.

Megan Woolard Arredondo is a middle school science teacher who grew up around the Cibolo Nature Center & Farm and often volunteers her time with their programming. She has a Masters degree in Environmental Education and has developed curriculum in a variety of non-profit and formal educational settings. The CNC&F Nature Box Program was developed by volunteers, and retired educators, Dr. Kathy Ward and Kathy Wilson.

Resources

Curriculum Guides

Harrison, Patricia. *Texas Prairies: An Integrated Curriculum for Grades 4&5*. Fort Worth, TX: The Botanical Research Institute of Texas, 1996. Print.

The "Texas Prairies" curriculum from the Botanical Research Institute of Texas (BRIT) has a great deal of general information that is relevant to all prairie ecosystems and is a good resource regardless of where you live. If you are unable to obtain a copy of the curriculum, a general internet search for "parts of a grass plant" will provide you with useful diagrams. As a side note, BRIT is a global botanical research institute offering a variety of resources that might prove useful to any region.

Visuals

Hundley, Eunice. *Life in the Cibolo Tallgrass Prairie*. 1999. Print. Available at: www.eunicehundley.com/Murals/Pages/Cibolo_Nature_Center_Mural_-_Boerne,_Texas.html#0

Books & Articles on the Prairies

A Day on the Prairie. New York: Scholastic, 2008. Print. Kids Are Authors.

Dvorak, David. *A Sea of Grass: The Tallgrass Prairie*. New York, NY: Macmillan, 1994. Print.

Hunter, Anne. *What's in the Meadow?* Boston, MA: Houghton Mifflin, 2000. Print.

Rector, Barron. *Know Your Grasses*. College Station, TX: Texas Cooperative Extension, Texas A&M University, 2003. Print.

Wallace, Marianne D. *America's Prairies and Grasslands: Guide to Plants and Animals*. Golden, CO: Fulcrum Resources, 2001. Print.

Books & Articles on Indigenous peoples and Bison

Baker, Olaf. *Where the Buffaloes Begin*. New York, NY: Puffin Books, 1985. Print. Picture Puffins.

Freedman, Russell. *Buffalo Hunt*. New York, New York: Holiday House, 1988. Print.

Patent, Dorothy Hinshaw. *The Buffalo and the Indians: A Shared Destiny*. New York: Clarion Books, 2006. Print.

Simmons, Marc. *José's Buffalo Hunt: A Story from History*. Albuquerque, NM: University of New Mexico Press, 2003. Print.

Winner, Cherie. *Bison*. Minnetonka, MN: NorthWord Press, 2001. Print. Our Wild World Series.

Miscellaneous

Teachers can purchase books, lesson plans, and models for student use from places like Acorn Naturalists (www.acornnaturalists.com) or Nature-Watch (www.nature-watch.com).

End Notes

1. Dvorak, David. *A Sea of Grass: The Tallgrass Prairie*. New York, NY: Macmillan, 1994. Print.

2. *A Day on the Prairie*. New York: Scholastic, 2008. Print. Kids Are Authors.

3. Hundley, Eunice. *Life in the Cibolo Tallgrass Prairie*. 1999. Print.



Cathy Scott

Citizen Science: Collecting Real-Life Data

Tips for conducting citizen science projects with K-12 Students

By **Cathy Scott**

HAVE YOU EVER WONDERED how you could get your students involved in local scientific research, and what opportunities exist for students to take part in collecting data and learning more about the world around them?

Citizen science, or scientific research completed by amateur scientists (i.e., the general public), provides ripe opportunities to engage students in learning scientific content and how it applies to their local environment. Not only does citizen science provide wonderful opportunities to contribute to scientific research, it also engages students in work aligned with educational standards and goals, making it ideal for both in-school and out-of-school learning.

One key characteristic of citizen science is the value of context. Citizen science is completed locally, often in the participants' neighborhood, schoolyard, or local parks. Researchers¹ note that a sense of "place" is huge for urban youth, and that opportunities to engage in citizen science allow students to make connections to the community and the history of place. Another critical aspect of citizen science is that it provides a

humanistic view of science for children², enabling them to work with animals (a passion for many children), something that can often be lacking in traditional lab-based sciences.

A number of citizen science projects are fairly well known, such as Cornell University and the National Audubon Society's Great Backyard Bird Count. In the count, which takes place annually each February in both the United States and Canada, citizens count the number and types of birds that they see in a 15-minute time span in their yards, then report the data to Cornell labs. Another popular project is Journey North's Monarch Tracking, where citizens across North America report when they see monarchs in their area. This enables scientists to monitor monarch migration patterns as they head south to Mexico. There are many resources online for teachers interested in completing citizen science projects with their students, such as:

- Nature.org's annual blog about the most popular citizen science projects³
 - The Citizen Science Alliance
 - Scientific American's database of International citizen science projects
- Journey North's Citizen Science project hub, geared towards U.S. and Canadian K-12 classrooms

Things to Consider

The age of your students will impact which type of citizen science project you might undertake. Children of any age can complete a citizen science project, but some projects require more advanced skills or work than others; for instance, kindergarten students might have an easier time monitoring tulip growth for The Journey North's Tulip Test Gardens Project, yet struggle to capture and mark turtles to share data with The Carolina Herp Atlas. Knowing your students' interests and capabilities is critical.

Another factor to consider is the seasonality of the project. Monarch watches, for example, only work well during monarch migration time; likewise, all migration projects are going to provide better data at certain times of the year than others. Similarly, tulip test gardens can require some forethought before planting. I was surprised, when planning to do a tulip test garden with students in the spring, that I needed to refrigerate the bulbs from November until January before we could plant them. Fortunately, I'd ordered them early enough to do this!

Finally, do not overlook the value of both your interests and the interests of the students. If your students show an interest in birdcalls, for example, you might consider having them participate in the Great Backyard Bird Count. If they're interested in reptiles and amphibians and live in the Carolinas, they can collect data on local species and upload it to the Carolina Herp Atlas. If you live in an urban area in Canada or the United States with fewer opportunities to view wildlife, Project Squirrel, Celebrate Urban Birds, or Project Bumblebee might be viable options for your students. Or, if dealing with animals is not something you're comfortable with, you might consider a Tulip Test Garden or Season Spotter for a citizen science project.

Tips from Experience

Often, we learn the hard way how not to do things with our students, and citizen science is no exception. As a teacher, one suggestion that I would recommend is making sure to contact the appropriate individuals at your school so that projects are not inadvertently damaged or interrupted. One year, our school system's mowing crew mowed over the newly planted blueberry bushes we'd installed with fifth graders as part of a slow foods movement; it had not crossed my mind that the markers we placed next to them might not catch their attention. Another time, when I was collecting turtles in turtle traps for a mark and recapture program with pre-service elementary teachers, the campus police waded into the water and cut open the traps one night to "free the turtles" after a group of college cheerleaders became concerned for their well-being. This latter incident was despite my having contacted grounds crew, administration, and even secured state permits to collect the turtles! If you plan to engage in a project that involves longer-term data collection, it would be wise to contact your administration, grounds crew, parents, and campus security, if applicable. Use your classroom or school's social media platforms, such as Facebook, to your advantage too. After the turtle trap destruction at our school, now affectionately known as *Turtlegate*, we took to social media to educate others on campus about why the turtles were being collected and how they could come participate, if they wanted to do so.



Student collecting turtle data



Tulip Test Gardens

You also want to consider how you are going to manage and carry any equipment needed for your project, if applicable. Devices such as tablets and smart phones make recording data, taking pictures, and uploading information easier than ever, but it takes manpower and effort to lug equipment for catching reptiles, monitoring dragon flies, and other intensive projects. If you work with younger students, it may be wise to choose a project that involves simple photography and observation for data collection. If you do leave equipment out, such as traps, then be sure to label, label, label. Make sure individuals are clear on what you are doing and how to contact you. I've found that index cards with my name, email, phone number, and a brief description of the project, work well for labeling traps and other equipment. Laminating them helps to protect against water and weather

Citizen Science Projects

Canada & the United States

Birds and Windows Project (<http://birdswindows.biology.ualberta.ca>) – This Canadian-based research project determines factors that cause birds to collide with windows. Data is collected via online survey.

Bumblebee Watch (Project Bumble Bee) (<http://bumblebeewatch.org>) – This citizen science project relies on participants to record bee and bee nest sightings via an online system, enabling scientists to determine overall bee population health.

Celebrate Urban Birds (<http://celebrateurbanbirds.org>) – Celebrate Urban Birds provides participants a data sheet and identification guide to help them recognize birds in their area. The sheet is then mailed back to Cornell University, where scientists keep track of bird sightings. The website includes lessons, art activities, and other resources for teachers; bilingual materials are provided.

Carolina Herp Atlas (www.carolinaherpatlas.org) – The Carolina Herp atlas is a database where amateur herpetologists can upload their observations of reptile and amphibian species in North and South Carolina.

Project Squirrel (www.projectsquirrel.org) – The University of Chicago's Project Squirrel enables participants to record their squirrel observations at home, work, or school. The site provides directions for experimentation with food sources that can easily be completed by schools, and data is shared via the website or Project Squirrel app.

The Great Backyard Bird Count (<http://gbbc.birdcount.org>) – For the GBBC, participants count the number of birds seen within a 15-minute time period at least once during a four-day window. The data are submitted via online system or with the eBird Mobile app.

Journey North (<https://www.learner.org/jnorth/>) – The Journey North provides K-12 citizen science projects focusing on tulip growth, monarch tracking, seasonal studies, bird studies, and whale citizen science projects. Each citizen science project includes classroom lessons, resources, and readings. Teachers can input data, including photos, online or via the Journey North app.

International

Citizen Science Alliance: Zooniverse (<https://www.zooniverse.org/projects>) – This is an online hub of citizen science projects covering a variety of topics, ecosystems, and countries; currently over forty projects are listed for participants.

Herp Mapper (www.herpMapper.org/about) – Herp Mapper is an online database where participants store records of reptile and amphibian observations, which are then shared with scientists.

Scientific American (www.scientificamerican.com/citizen-science/) – Scientific American offers links to a plethora of citizen science projects covering a variety of topics, including life and earth science.

United States only

The Great Sunflower Project (www.greatsunflower.org) – Participants in the Great Sunflower Project observe a plant and count the number of pollinators on the plant in a five (or more) minute time period. The website includes resources for schools and the public to create pollinator-friendly gardens. Data is submitted online.

Canada only

Ontario Bioblitz (www.ontariobioblitz.ca) – The Ontario Bioblitz is a 24-hour project where participants inventory all species in an area that they can find, and scientists verify the identifications. This project is designed to determine the biodiversity of Ontario's ecosystems.

Citizen Scientists (www.citizenscientists.ca/Citizen_Scientists.html) – This Toronto-based organization focuses on ecological monitoring, and environmental education and training. Current projects focus on birds, road ecology, insects, vernal pools, and endemic species. Data is collected via fieldwork.





Water quality testing

conditions, and using neon colored index cards makes them hard to miss.

The timeline for data collection is another factor to take into consideration when planning a citizen science project. Some projects, such as the Great Backyard Bird Count, Celebrate Urban Birds, and The Great Sunflower Project require just a few minutes a day for less than a week's time. Other projects, such as collecting reptiles and recording data, take longer classroom periods and often need time to get established and attract the animals. Finally, projects involving plant growth can take months or more. As a result, it is important to consider when in the school year you choose to start your project.

Finally, do not forget to consider funding sources for your project. If you're interested in monitoring birds, insects, or reptiles, for instance, Donors Choose⁴ is a fantastic starting place to request the supplies you need for projects. Public K-12 teachers can register for a free account, where they describe their classroom, project, and items needed to complete the project. As a K-5 science specialist, I had a number of projects funded this way. They supplied my classroom with materials for citizen science such as gardening tools, dip nets, field microscopes, and even cameras for

data collection. Other organizations and foundations also fund educator projects which align with curriculum standards and hands-on learning: one might consider visiting the Teachers Count⁵ website to find funding sources for both the United States and Canada.

Let the Data Collection Begin!

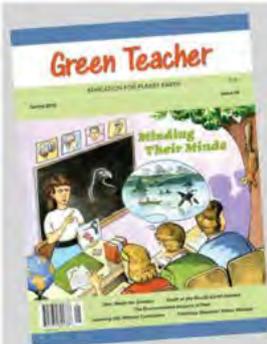
Citizen science provides a fantastic opportunity to engage students in data collection with real-life scenarios, whether it be through tallying the count and species of birds seen in the schoolyard, the number of bumblebees seen in a ten-minute time span, or the number of squirrels found in a given area, creating a bar graph to represent this data, or through measuring the length, width, and weight of a caught reptile. Students can use this data to engage in graphing and data analysis, a mathematical concept applied from kindergarten through twelfth grade in the Common Core State Standards for Mathematics.⁶

Citizen science provides an opportunity to teach children more about their local environments, serving as an outlet to teach them how they can contribute to the protection of the animals and plants that live nearby. As stated by one of my students, "We get to help animals and scientists? That's so great – and we're going outside to do it, which makes it even better!" What more could you want?

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Notes

1. Calabrese-Barton, A. (2012). Citizen(s) science. A response to "the future of citizen science." *Democracy and Education*, 20, 2.
2. Jenkins, L.L. (2011). Using citizen science beyond teaching science content: Making science relevant to students' lives. *Cultural Studies of Science Education*, 6(2), 501-508.
3. Feldkamp, L. (2015). 10 popular citizen science projects. Retrieved 20 December 2015 from <http://blog.nature.org/science/2015/02/17/citizen-science-10-most-popular-projects-best-nature-conservation/>
4. Donors Choose. (2016). DonorsChoose.org: Support a classroom. Build a future. Retrieved 20 January 2016 from www.donorschoose.org.
5. Teachers Count. (2014). Retrieved 26 January 2016 from www.teacherscount.org/grants/.
6. National Governors Association Center for Best Practices & Council of Chief State School Officers. (2010). *Common Core State Standards for Mathematics*. Washington, DC: Authors.



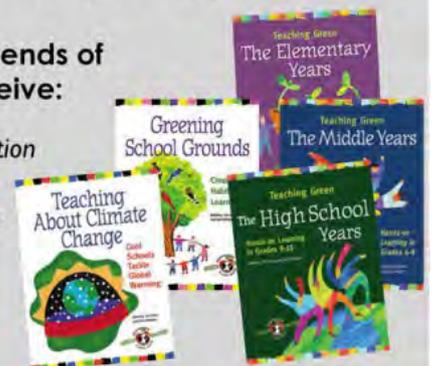
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Uncaging Imagination with Guerilla Geography

An innovative way to creatively transform learners of all ages into curious explorers



Thomas Larsen & Lisa Tabor

By **Thomas Larsen** and **Lisa Tabor**

MISSION ONE: life can be boring. Drop this article and go outside. Walk around your immediate area. Take note of every detail around you and come back when satisfied with your trek. A learner's greatest source of inspiration occurs in the community. It starts by taking that first step out the door and seeing how the community reflects what's being learned in the classroom.

Mission Two: teach with guerrilla geography. This term provokes several well-known images. The adjective "guerrilla" can be viewed as primitive (with an emphasis on "primate") or relating to unconventional warfare, like the kind used during the Cuban Revolution. Geography educators created guerrilla geography, a form of place-based education, lending zero thanks to *revolucionistas* like Che Guevara. It is a free-form approach to education that combats boredom and breaks through comfort zones as it takes learning "to the streets." Schoolyards, backyards, playgrounds, family dinners, neighborhoods, and public places become spaces of possibility. Learners combine their five senses with memories, emotions, and play to explore meaningful aspects about their local surroundings. Guerrilla geography encourages the learner to be creative and unconventional in their explorations of different places.

This article is an invitation to further infuse guerrilla geography into both informal and formal education systems. As the authors of this article, we have over a decade's worth of combined experience creating unconventional and practical ways to incorporate geographic learning into educational content both in and out of the classroom. Particularly, we actively work with the National Geographic Network of Alliances for Geographic Education to promote geography education through policy advocacy, pre-service and in-service teacher workshops, research, and outreach to K-12 schools. The idea of guerrilla geography has received much success in places like the United Kingdom and could be used elsewhere in the world. To demonstrate the idealism and practicality of guerrilla geography as a pedagogy, or way of teaching place-based education, we developed our own open-source booklet called *Mission: Explore Zoo, Call of the Wild*.¹ A free digital copy of this resource can be found on our website provided in the endnotes. The following sections provide guidelines on how to create, implement, and assess your own guerrilla geography learning.

Guerrilla Geography In Situ

If the world is a stage, then guerrilla geography *deconstructs* the stage and has the learner build it into something personally meaningful to them. Many of the teachers we met while working with the Network of Alliances for Geographic Edu-

cation swore by this approach to learning about the world, particularly the *Mission: Explore!* books that instigated the movement. Guerrilla geography was the brainchild of The Geography Collective, a network of U.K. geography educators, whose work spawned the series of books. These interactive books contain “missions” which ask the reader to do a distinctive activity with the finite goal of learning something personally relevant, bond with the local landscape, and interact creatively with the world.²

The guerilla geography experience does not mean that you are taking your learners on a glorified scavenger hunt. Rather, the purpose is the development of critical thinking about the places one encounters. As your learners explore different places, they are threading memories, emotions, and experiences into the landscape around them. Smells are documented. Boundaries, both physical and social, are transcended. As a result, The Geography Collective states that “Explorers who use *Mission: Explore* will never see the world in the same way again.”³

Guerilla geography turns your learners’ ordinary spaces into extraordinary spaces. The *Mission: Explore!* book series provides a useful place for educators to begin looking for ideas. For example, one mission invites the learner to put on a performance for a random security camera, where they could improvise a short play, show off a dance routine or hold a full-blown talent show. Some assignments are existential and artistic in nature. In *Mission: Explore! Camping*⁴, the learner is challenged to watch the sun rise and set on the same day and write a poem about their experience. Other tasks contribute to the betterment of the local community, such as having the learner set up a stall in their local market to collect positive messages about their area and publish their findings in the local newspaper. In another example, the learner uses their memory and a pencil to draw a map of somewhere, then explores the place using only their map, taking note of what they included and excluded, enlarged and shrunk. Many, if not all, of the missions in our program are unambiguously geographic in nature and each mission unlocks a new aspect of the world and forces your learners to reflect on how they interact with it.

Connection to Standards and Existing Institutions

A possible problem that educators might encounter is, “How does guerrilla geography apply to the standards used by my educational institution?” Because it is largely interpretive, this pedagogy might be viewed as too chaotic and distracting to be utilized effectively. This criticism is a misconception. The lessons learned are grounded in numerous geography standards, including Geography Standard Six: How culture and experience influence people’s perceptions of places and regions.⁵ Both guerrilla geography and Geography Standard Six challenge learners to be mindful of how complex and interesting their communities are, as well as how differently they and their peers view the world. Additionally, the two concepts attempt to counteract the apparent “placelessness” (i.e., lack of awareness, an inauthentic connection or appreciation of localities) of the modern education system⁶. In other words, guerilla geography grants learners the permission to see their surroundings through different lenses and perspectives, while still being relevant in education.

The local area that your learners witness every day is a zoo of interesting places to experience. It is chaotic and unpredictable. Fruitful exploration of the world at any scale provides a place to start the path of guerrilla geography. What better way to begin the journey than at an actual zoo? Compared to the world, a zoo appears far more controlled. An orderly space surrounded by borders. Many zoos are even spatially organized according to continents and climates and thus provide an ideal domain for young explorers to begin to hone their place-based exploration.

Sharing Our Story and Creating Your Story

The creation of our *Mission: Explore Zoo, Call of the Wild* was part of a science communication fellowship program we participated in at our local zoo. Being geography educators and explorers at heart, we sought to create a place-based method of interpretation that builds upon the learner’s own knowledge, interests, and experiences.

Picture yourself going to the place where you teach with a box of DIY booklets filled with unconventional ways for learners to reinvent how they explore places in their community. That was precisely what we did in November 2015 when we put our guerilla geography skills to the test. You can easily put the thought into action too. What you need is an educational display and booth where you can engage with zoo patrons and provide an informal and personal presentation of how to use the materials. If possible, communicate with your local zoo regarding potential opportunities or events to set up an exhibit and hand out your own adventure booklets.

The experience is not reserved just for children. Missions are fun and educational for all parties involved. Zoo patrons of all ages and groupings (e.g., families, couples, and friends) were asked to participate in our activity. In our experience, zoo patrons who had been there many times before were interested in the idea of teasing the extraordinary out of a routine and familiar place. Be open to any and all visitors willing to uncage their imaginations at the zoo!

If warranted, aspiring guerrilla geographers may need a quick lesson to contextualize their excursions. Brief learners with a discussion about what geography and exploration mean using a series of props like globes and maps. Ask patrons to complete a mental map activity with you to get them thinking geographically. Then ask them to recite the explorer’s oath on the first page of your book. Encourage groups to work together but take their own paths and keep their own field notes, emphasizing what was important and made sense to them.

The experience asks the learner to extend past just strolling through the exhibits, to pay attention to what was outside of the exhibits as well as inside, and to ask authentic inquiry-driven questions based on self-exploration. After the patrons receive their booklet and recite the oath, they can then be set loose to explore the zoo as guerilla geographers. In our experience, the learners found many of our activities playful, novel, and thought-provoking. You have the creative license to either replicate the ideas presented here or tailor this type of project according to your audience, location, and interests. Additionally, you can use this example as inspiration for an event in a different setting and series of missions.

Table 1

| Missions from Mission: Explore zoo, call of the wild | |
|--|---|
| Mission 1: | Tall trees – find the tallest tree in the zoo. Where is the tree located at? Why do you think the tallest tree is there? Draw what the tree looks like. |
| Mission 2: | Follow your ears – when you hear an interesting animal sound, follow it to the source. Come up with a mission dance to the beat of the sound as you follow. |
| Mission 3: | Animals are everywhere – find an animal outside of the zoo exhibit. Where did you find this animal? What is it doing? Draw it here. Give the animal you found a name. |
| Mission 4: | Conversations – find a friendly animal and talk to it. What animal did you find? In what part of the zoo is the animal? What does it say back to you? How can you figure out what it wants? |
| Mission 5: | What’s that smell? – make this page smell like the zoo. Find three different scents. |
| Mission 6: | Something new – look for something you’ve never seen before. Draw what you discovered. |
| Mission 7: | Dinner time – find an animal that is eating. Draw their food. What do you think it tastes like? |
| Mission 8: | Caged and uncaged – which animals can roam free outside of a cage at the zoo? Why do you think they get to roam uncaged? |
| Mission 9: | Making tracks – draw your hand. Now draw some of the animal tracks that you see. Compare. |
| Mission 10: | Walk like an animal – animals cover distance in different ways. Think of the different types of ways that you have seen animals move in the zoo (for example: using wings, walking on two or four legs). Why do you think they move this way? |
| Mission 11: | Call of the wild – list some of the sounds you hear at the zoo. What might they be trying to say? |
| Mission 12: | Turn yourself into a zoo exhibit – what noises would you make? What would you eat? How would you move? Draw your exhibit. |
| Mission 13: | World map – draw a map of the continents based on the animals you’ve seen at the zoo. |
| Mission 14: | How the zoo looks to you – now that you’ve had a great day at the zoo, imagine the path you took and how the zoo looks. Draw out your own mental map of the zoo. |

Activity: Explore Zoo

The beginning of the *Mission: Explore Zoo, Call of the Wild* is composed of three parts:

1. the explorer’s oath,
2. exploration rules, and
3. a table of contents of missions to complete.

The oath instills learners with the values to leave no trace, be honest, protect and care for their world, and to never stop exploring. The rules inform learners that the missions may be completed in any order, may be started and finished at any time, and should be done with a commitment to science and exploration. The 14 missions follow on separate pages; each mission has a catchy and fun title and includes directions for completion. The missions can be found listed in Table 1. The last page of the booklet is a “Mission Accomplished” certificate for the explorer.

As you now know, the goal of using guerilla geography is to systematically reinvent how we teach learners to think about and engage with the world around them. To do this as part of your own educational program, we have created a list of guidelines to consider (see Table 2). We consider mission building to be a constructivist activity, in that “knowledge is not transmitted directly from one person to another but must be actively built by the learner.”⁷⁷ We would like to note that

not all guidelines listed will be appropriate for every learning program and to tailor the following recommendations to your individual program and to meet your own learning objectives and goals.

Assessment and evaluation is certainly possible if the activity learning objectives call for it, even though it is currently not common in the pedagogy. We offer three possible ideas to measure student learning; again these are general ideas and because of the unique and individualistic nature of guerilla geography they should be adjusted to fit mid-activity assessment or final evaluation needs.

Assessment and Evaluation Measure #1: Pick one mission and have all learners share their findings and why their findings were important to them; this measure corresponds with the idea that guerilla geography is personal to the learner and encompasses creativity and idea sharing. Encourage learners to use creative methods to communicate place and their understanding of place.

Assessment and Evaluation Measure #2: Have learners take turns leading the group on a mission. This enables measurement of the process and learner action, not the end result or perception. It would also be possible to have other learners in the group evaluate their leader and create a group

Table 2**Suggested guidelines for building a guerilla geography activity**

- Identify program learning goals and objectives
- Investigate the local landscape you wish to focus on
- Set forth parameters for the exploration (e.g. explorer oath, exploration rules)
- Determine if the event will be a one-day task, multi-day task, or open-ended exploration
- Decide if the exploration will be completed individually or in groups
- Brainstorm a list of initial mission ideas
- Vary the senses used in the missions (based on your learning objectives and feasibility of the landscape you are exploring)
- Use multiple reporting methods (e.g., for some missions a learner documents their findings in writing while other missions are completed with a dance or through making sounds - this encourages students to take their learning outside of the box while simultaneously accommodating multiple learning preferences)
- Create missions that have the learners explore things that meet your learning objectives but also include ones that will open the learner up to self-exploration and demonstrate to you what is important to them and what they learned/made sense of their local landscape all on their own

dialogue focusing on how place is special and often interpreted differently by individuals.

Assessment and Evaluation Measure #3: Ask learners to create a set of missions and/or booklet as a way to document their expectations and planned learning events based on their own inquiry-driven interests as a journal or record of a lesson, unit, semester, or other time period; grade accordingly.

This article serves as a call to action. All places, from the bland-manila to the exotic-technicolored, hold the potential for something new to learn. It is our job as educators to unlock these dimensions for our learners. We encourage you to do so by using the resources already available, developing your own place-based missions, and by enjoying teaching and learning using guerilla geography. Start out small or GO BIG, but work your way up, regardless. If everything goes according to plan, you and your learners may be able to open yourselves to new vistas of your everyday world.

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Mary Dudley

Best Practices for School Gardens

Giving you the tools to overcome the challenges and be successful

By **Mary Dudley**

SCHOOL GARDENS ARE popping up everywhere! Capturing the attention of the media, parent community and global organizations alike, the excitement around these initiatives is palpable. While this recent surge is inspiring, it is by no means novel. Using nature to teach students biology, ecology, life cycles, genetics, soil science, etc. has always been a facet of quality education. There are mountains of research that point to the benefits.

Gardening with students can be daunting. School gardens suffer from staff transition, rigorous testing schedules, summer maintenance issues and more, but the rewards far outweigh the challenges. Developing a sustainable school garden program starts with careful planning, acknowledgment of the challenges and devising strategies to overcome them. This article will give you the tools to get started.

Keeping a few basic principles in mind will add to the overall sustainability of a garden and allow for the school community to participate in the project. Based on several years of research and experience with dozens of school gardens, we've developed a list of basic steps and best practices for school gardens. We encourage you to incorporate them into your own plans for establishing and sustaining a garden at your school.

1: Form a Team

Growing a healthy school garden takes more than just seeds and soil. Sustainable school gardens are an integral part of the school community. They rely on the combined efforts of teachers, administrators, facility staff, students and parents. Establishing a strong team from the beginning will instill a sense of ownership in the project that will bolster support when times get tough. Gardens that are supported by only one or two individuals often fail. We have worked with schools whose gardens fell into disrepair and neglect because the passionate individual who spearheaded the effort moved on to a new place. We can't stress it enough: building a solid team should be your first priority and a constant part of your school garden project. Identify stakeholders who will support the school garden. In addition to those in the school community, include local organizations. They can bolster your assets by donating goods, providing volunteers and advertising your gardening achievements. Hold regular meetings and form subcommittees to divide up the work load. While it may seem easier to make decisions with a small group, a sustainable project will have several groups involved. Subcommittees to consider include public relations, financial development, garden maintenance and curriculum development. Elect a chair person (or persons) who will be the main liaison for the garden in the larger com-

munity. If at all possible this person should be paid for their time. Having a paid coordinator adds a level of professionalism and importance to the project. The coordinator will organize meetings, create a calendar so items are completed on time, oversee larger events, encourage teachers to use the garden and ensure the garden doesn't fall into disrepair.

Common challenges & creative solutions:

1. Finding and forming relationships with local organizations: start asking your students and fellow faculty members to suggest partners for the garden. Local environmental education organizations are a great place to start. Reach out to them with a phone call and sign up for their mailing list. Arrange a meeting in person and spend an hour together talking about different ideas. Remember to touch base with them via email every few weeks so you maintain the relationship. Invite them to events and enlist their help whenever possible.
2. Keeping meetings fun and productive: branch out and consider holding meetings at a nearby restaurant or someone's home. Create a structured meeting agenda with time allotments for each topic of discussion and stick to it, nothing is worse than a rambling meeting that ends late and doesn't result in clear action steps.

2: Set Goals & Craft a Mission Statement

The tendency when starting out is to go big right away, but the best idea is to start small. You can always expand, but it can be discouraging to have a large garden that isn't getting adequate use. When articulating your goals for your school garden, ask who will be using the garden. Surely students, but also consider community members, parents, siblings, etc. What is the purpose for the garden? Gardens are established for many reasons such as beautification, memorialization, use as a curricular tool and providing food for the local community. How can the garden reflect the local community? Each garden is unique and should be a source of pride for the community. What makes your community special? How can you incorporate those aspects into the school garden? Once you have discussed these questions with your team, form a mission statement. Having a clearly defined mission will help explain the garden to potential stakeholders and volunteers. It's important to make sure that there is an achievable pathway forward with tangible benchmarks to measure success and progress.

Common challenges & creative solutions:

1. Setting goals that are difficult to measure: there may come a time when you need to justify your garden initiative to your administration or funding partner and having attainable goals with measurable outcomes will provide the data needed. A great goal would be "to teach students about plant lifecycles by having them start seeds and harvest fruits." You can record the actions of the students and have them journal their findings on lifecycles. Another goal could be "to expose the students to new foods by growing culturally significant plants and having tastings." Measurement of this goal would include a survey of the students and having them complete taste tests and record observations in their journals.
2. Forcing an outdated mission statement: plan to analyze

and revise your mission annually. Include students in the process to help brainstorm ideas. When new members join the team ask them for input. Avoid stretching your mission to include every aspect of nature education and focus on one or two unique aspects of the school community such as the presence of a culinary program, parent community, extracurricular clubs, service learning classes, etc.

3: Design an Outdoor Classroom

Once you've determined who will be using the garden and the purpose for its creation you are free to move forward into the design phase. Gardens come in all shapes and sizes. Some of the most successful school gardens we've seen have been just one or two plots tended by a few classes and parent volunteers. Assess potential sites for the garden. Consider the following criteria: safety, available space, access to water, access to the site, amount of sunlight & shade (should have at least six hours of full sun for edibles and pollinator plants), topography, security (does the site require protection from wildlife or passersby?), visibility from classroom/street, potential for noise pollution (making it difficult to teach) and zoning restrictions. Creating an outdoor classroom is very similar to turning an indoor space into an ideal learning environment. Here are some of the basic elements to consider as you plan your outdoor classroom: gathering space with tables and chairs, storage for tools & lesson materials, access for wheelchairs, shade for students, learning stations (weather, reading, etc.), exploration areas (digging pit, butterfly garden, wetland, etc.), planting areas, hand washing station and compost area. Even though this list seems large all of these elements are not necessary at once. Remember, start small and grow!

Adding a theme to your garden is a fun way to organize plantings and classroom activities. Here are a few ideas, but there are many more: salad garden, salsa garden, pizza garden, herb garden, cultural culinary garden, international garden, wildflower garden, butterfly garden, rainbow garden, historical garden, alphabet garden, storybook garden, sensory garden, give-away garden, memorial garden, playscape and rain garden. Create a base map and allow students and other stakeholders to contribute to the design process. You'll be impressed with some of the ideas the students come up with! While you may not be able to include a waterslide and zip line, some of their notions for experimental beds, a compost corner and ensuring the garden is able to be accessed by elderly and differently abled persons can easily be included and will give them an increased sense of ownership in the project.

Another important factor to consider will be the space between each planting area. Will there be grass pathways? If so, the space between them should be enough for a lawn mower. We suggest installing raised beds for edible plantings. Raised beds allow you to build an ideal soil composition and reduce the worry of contamination. Build beds that are no wider than four feet to allow students to reach into the middle of the bed without stepping inside. Younger students may benefit from even smaller beds.

Get creative! Reusing old containers, shoes, toys, etc. will incorporate a component of recycling for the students and add some whimsy to your garden. Native plants will

thrive when planted in conditions that mimic their natural habitat, and can usually be planted directly in the soil. Playscapes and rain gardens require some preparation to the site before planting and some additional research.

Common challenges & creative solutions:

1. An urban site with no green space: there are several crops and native plants that have shallow root systems and can grow in pots or raised beds placed on pavement. Another option is to research the structural integrity of the roof and build a rooftop garden.
2. Very constricted space: consider vertical gardening by adding trellises. If you are concerned about a lack of sunlight you can add wheels to your containers and move them throughout the day.
3. No water access: add a rain barrel to collect water from a downspout, shed roof or other water catchment surface.

4: Dig In!

Once you've chosen your site, determined your theme based on your team's goals and have a design drawn, it's time to plan for construction. Set a date and begin to order materials and shop for seeds and plants. If you are writing a grant to fund the garden set the build date after the funds would be disbursed. Be sure to have everything you need, ask several team members to help make a list so nothing is forgotten.

Make your planting day public. Invite journalists, television reporters, community members, business owners, family members, students, faculty and administrators to volunteer their time and resources to help establish the garden. Put up posters and signs at the school. Plan a few activities for the children and provide refreshments. Find a local gardening organization such as a garden club, landscape company or beautification committee to mentor the school garden. Having a few experts on hand to answer questions, identify weeds, provide organic solutions to pest problems and offer training will be a huge asset to your program.

While this article won't cover the myriad of topics on gardening, we will take a moment to state that healthy soil is the key to healthy plants. Plants depend upon the composition of the soil to provide minerals and nutrients for growth. A soil test is an easy way to determine the composition of the soil while providing suggestions on ways the soil can be amended to enhance plant growth. Ensure the continued success of your garden by adding compost and quality soil each season.

Common challenges & creative solutions:

1. Lack of funding: search for grants, both nationally and locally, to fund your garden. Ask local community groups for ideas. Approach the parent community for support. If you aren't able to fund the full project divide the construction into phases.
2. Confusion on how to build a garden: attend a workshop and ask a local landscape expert to help. Post specific



Sam Dunlap

jobs with clear directions so people are engaged and participating in the work. Hold a planning meeting with the team and designate each member to lead an activity.

5: Implement Curriculum

The garden provides a unique opportunity to integrate many different subjects. Science, math, language arts, social studies, physical education, art, music and foreign languages all have connections to botanical themes that can be explored in the garden. Creativity and collaboration between teachers, students and environmental education organizations can help expand your lessons to include all of these subjects. Incorporating standards and academic assessments will add to the validity of your garden initiative.

Recording observations, taking pre and post tests, engaging in research are all important aspects of school gardens. To avoid maintenance issues, arising from neglect, plan to garden with your students on a weekly basis. There are wonderful published works and websites with garden based lessons.

Extend student learning in the garden by sending home plants, seeds, produce, recipes and photos. Think of how proud they will be to reveal the radish they grew and enjoy it at the dinner table! Gardening can be a very powerful and therapeutic activity for over scheduled youth and their families. Encouraging the students to connect their school experience with their home life can spark conversations and support from unexpected places.

Evaluating garden learning can be challenging. Pre and post assessments can show learning over time, as well as journal entries, and long term projects. Consider inviting younger students and community members for tours or lessons so you can observe how the students pass on the knowledge they have learned. For example, when kindergartener Susie wants to plant peas with third grader Alex and Alex directs her to plant them close to the fence so they can have a place to climb, that indicates a significant amount of learning: peas are vines that need support to grow. Does Alex show her how deep to plant the seeds? Do they water the seeds together? Put together a rubric and use it through the year to assess student development.

Common challenges & creative solutions:

1. Managing student behavior outdoors: often students are not used to structured activities in the school yard and instinctively behave as they would at recess. A few strategies include giving students directions before heading outdoors and familiarizing them with any tools and tasks. Repeat the instructions after heading outside and enlist the help of volunteers to keep the students focused. Establish clear boundaries and consequences for behavioral issues. The students should understand that going outside is a privilege and they need to work together and listen during the experience. Over time, this routine will help the students complete outdoor lessons.

2. Enlisting volunteers: recruiting a core base of volunteer helpers opens up additional opportunities to explore the garden, cook any harvested produce and manage behavioral issues. Ask parents to come on garden days just as they would for a field trip. Local garden clubs may also be interested in helping. Finalize a yearly calendar and stick with it so volunteers can arrange their work schedules around garden events. Host a thank you dinner to honor those who have donated their time to help.
3. Unaware of outdoor conditions: always check for safety issues before bringing students outside. Walk the area to check for garbage or other dangerous items. Tell your administration and other faculty members that you are heading outdoors. Check the weather and do not go outdoors if there is lightning. Request that students dress appropriately and have a change of clothes on hand.
4. School year doesn't align with gardening season: there are several options available to teachers who live in temperate regions and miss out on the bulk of the traditional garden season. Some schools plant cool weather crops in the spring then cover the garden with plastic to avoid weed germination. When they return in the fall the garden is ready for planting the same cool weather crops. While this may seem repetitive it allows students to revisit what they learned several months later and compare the two experiences. Other schools plant a summer garden and invite summer school program participants to tend the plots. Neighbors and other community members may also be interested in helping with summer maintenance. A third option is to experiment with winter gardening, a concept that is gaining attention. Adding season extension hardware such as row covers and cold frames allows gardens in temperate regions to continue harvesting cool weather crops.
5. Theft: whether you are dealing with herbivores or human vandals, theft can discourage even the hardest gardener. Do not leave valuable tools unsecured. Install signage to explain to passersby that the garden is for the students and produce should be left for them to harvest. If funds allow, consider installing a fence to keep out intruders. Remember your goals and mission; a bountiful harvest may not be needed to attain your goals.

6: Reflect & Revise

Keep records of your program to help you revise methods for future growing seasons. Take time to reflect at the end of each week on how well things went during lessons, note any issues with certain plant species, identify pests and record weather conditions. You may think you'll remember details like these when planning for next year but it is easy to forget! Your garden journal will be a welcome source of information for other teachers wanting to start school gardens. Have an annual meeting with the team to discuss challenges and possible strategies for overcoming them. Bring your issues to community partners and ask for their advice.

Common challenges & creative solutions:

Disagreement between team members for future plans: this challenge can create a standstill at meetings. Ask team members to support their ideas with examples from the garden. If they haven't kept notes and are functioning off of memory they may have an incomplete view of the situation. Welcome all suggestions but explain that not all ideas can be implemented and may be tabled for next year's conversation.

We hope you join us in the school garden movement. Take pride in the unique aspects of your school community and incorporate them into the garden. Celebrate the combined efforts of your team and have fun. Gardening is an experiment and each day brings new opportunities to learn.

Mary Dudley is the Youth Education Coordinator at the Civic Garden Center of Greater Cincinnati in Ohio. She has worked with school garden initiatives since 2008 in both temperate and subtropical climates. Mary holds a Master's Degree in Botany. The Civic Garden Center would like to thank the Haile Foundation for funding our school garden program and research initiative.



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Integrated, Social Justice Learning for Those At-Risk

An integrated unit on marine debris makes learning relevant and real for 12-18 year-olds



Gloria Shaw

By **Natalie Zayas Delgado**

FALLING THROUGH THE CRACKS, left behind, not able to learn, won't focus, can't pay attention, has behavior problems—these are phrases all educators have heard or spoken. These phrases have deep meanings and history rooted in societal ills and structural inequalities, but they refer specifically to learners who deserve every opportunity to grow as individuals. Many schools have created programs and services for at-risk students, but alternative school programs are usually better able to address the educational needs of those with behavioral and other challenges.

Meeting the needs of disadvantaged students while motivating them to learn and enact change, and develop the metacognitive and technology skills needed in the 21st century is critically important to their development. To increase student engagement I developed a marine debris program for middle and high school students that was taught over one semester and integrated science, math, technology, reading, writing, and the arts. I designed the course to be integrated and project-based so the learning was real for students while at the same time each academic subject was addressed within the context of the course and not as separate subjects that did not seem to relate. These students needed to see the bigger picture of the world and know that what they were learning mattered in their lives so that their education was not just bookwork and requirements dictated by adults.

Students met with me one day a week for three hours. During the week they completed readings, journal writing assignments, other written work, and worked on their art projects. Students were able to receive course credits in

Science, Art, and English (creative writing and reading). At the time, the school did not have lab or field science courses, but they now have an excellent science teacher who is providing these lessons. In this article, I will describe the program in the hopes that it might inspire you to create similar learning experiences in your community.

To create such a program, the first question to ask yourself is what theme would most benefit your students and/or the community? Because our school is located near the ocean on the Monterey Peninsula on the Central Coast of California, marine debris was selected as the focus. Keeping the curriculum local ensures that the learning is relevant to students.

Other questions include what subjects can be integrated and what are the main lessons you want to teach? In my case, wanting to include active learning, constructivism, group learning, and reflection, I focused on math, reading, writing, oral communication, technology skills, science and the arts. I also wanted to provide students with field experiences and to expose them to professionals to help them consider related careers and college studies. Local conservation groups may be able to suggest field study locations in your community, and local agencies may also provide your students with field trips or guest speakers. Scientific research centers, natural history museums, aquariums, zoos, and colleges are also places to search for guest speakers and field trips. For us, local beaches provided the study sites that we needed.

In the years I ran the program in Marina, California, the course included field trips to the Monterey Regional Waste Management District facility and guest speakers ranging from a state assembly member to artists, photographers, scientists and science writers. One scientist and science writer spoke to the students about his travels, his writing, and spe-

cifically his writing on marine debris. After he mentioned all of the plastic food waste on an airline flight, my students suggested better options for the next time he travelled. Having already covered the “what we can do” part of the unit, the students were familiar with reusable travel mugs, bamboo silverware, etc. and they felt empowered.

In looking for a diverse group of speakers who did not all follow a straight path from school to a career, I recruited fellow students from my university days. They explained how they got into college and what it was like for them. Some were first generation students or had financial or personal struggles, and/or were themselves considered “at-risk” while in high school. As guest speakers, they exposed my students to views and life experiences that were often not discussed.

When designing a program or workshop consider the subjects you can integrate given your knowledge and skill set and others working with you. Stick with what you know to establish the program. The program can grow later.

In the marine debris course, students were given the book “The Last Song of the Whales”¹ to read. They were then assigned chapters to read and journal writing assignments each week—in journals from cereal boxes and reused paper.² They had other writing assignments such as reports on a book on the topic of marine debris and essays and writing for their art projects. Some of the book titles are listed in the reference section at the end of this article.

Students were exposed to artists who create recycled or trash art³ and sand art and mandalas.⁴ They looked to these artists for inspiration for their own projects that included sculpture, sand art, mandalas, video and photography. An art teacher from the school led the art portion of the course. Students created beautiful art pieces that they would write about and, later at the presentation day, talk about to others. My favorite assessment was listening to them relate their art to the overall condition of the environment.

For the science and math portion, I started with short lessons on how science works. To learn about data analysis and graphing they completed a lesson written by Ann Meyer to introduce the scientific method.⁵ In this collaborative lesson, my students learned how to use Excel to make bar graphs. When asked how many M&M candies are in a bag, students posed hypotheses that they could then test. They counted M&Ms by color in the bags given to them in order to get an actual total. They then graphed this information and wrote conclusions regarding their hypotheses. Students in the program gained skills in observation, hypothesis writing, project development while learning about marine debris, ocean currents, and health concerns in food webs. They also viewed the student version of the film, “Bag It”⁶ which helped them examine their own lives in relation to waste and consumption. Students conducted waste inventories during the week as homework, examined products they purchased and used, and looked for ways to lessen their impact on the environment due to their consumer choices. They reported back on this in class.

Collaboration and Presentation

Students worked in groups on marine debris projects, collecting beach data and sorting and classifying what they found. Working in groups allowed them to simulate real-world work situations of working with others, and provided

them an opportunity to learn skills such as conflict resolution and effective communication.

In *Effective Alternative Education Programs*⁷, the authors emphasize that conflict resolution and peer mediation are skills students need to develop. They also point out that becoming an expert on a topic empowers them to become leaders. They state:

“While becoming the expert at something, intrinsic change becomes evident as they develop skills and train others. These students should be afforded the opportunity to be leaders, and teaching others has an incredible learning effect. These skills will not only expose them to strategies to be used at school, but the transference to home and community will last a lifetime.”

The students conducted background research and made and wrote conclusions. They created PowerPoint and/or poster board presentations, which required them to learn new skills. When it came time to present their conclusions to community members, their pride and confidence was apparent. They had become experts. It was a beautiful thing to stand back and watch them become the teachers at this point.

Funding

I sought funding to offset costs of needed cameras, video cameras, copies of the assigned book, materials for their poster boards, a projector, and to hire a student assistant. Student assistants that were hired each year had themselves been at-risk students. It was important for these middle and high school students to see someone who had walked in their shoes in college. They could relate to the student assistant. The assistant helped with all aspects of the class and with grading. This in turn also gave the student assistant work experience for their resumes. Instead of submitting grant proposals, I wrote letters to community groups including the local Sierra Club, the Grange and Rotary groups and local environmental groups to explain our program. Funding that was needed was raised from these groups with enough for a party at the end of the class. At the end of our program, the funders were invited to a presentation of the student projects and a poster session. This further helped the students develop their presentation skills and provided an opportunity for the funders to interact with the students and learn how their sponsorship had improved the lives of our students. These funders then gave more money the following years. The first year the cameras and video cameras purchased were not of very good quality. The second year new cameras and new video cameras were purchased. The following year a projector was purchased. Each year supplies were needed for presentations. Depending on what topic you choose, possible groups who might provide funding, speakers, or field trips include Audubon Society, water agencies, non-profits, civic groups, and local waste management companies.

To celebrate the student’s success, the school director purchased pizzas, snacks and drinks for the presentation day. The snacks were homemade, all the dishes were reusable/washable, and we used cloth napkins. Students set up a “compost” container for leftover food and buckets to wash dirty dishes. They recycled as much of the pizza boxes as possible to reduce waste. Later, the students reflected on how little waste was generated by the number of people who attended in comparison to how much would have been generated if we had not provided less wasteful options.

Assessment

Students completed pre and post surveys that had questions such as “what is marine debris” and which probed their attitudes to consumerism and waste. Not surprisingly, the post surveys revealed higher content knowledge and significant attitude changes about how our daily choices can negatively affect the environment. Student responses included:

- “I had not realized there was so much trash in the ocean or on our beaches. It makes me want to do more clean ups and tell others about this problem.”
- “I learned about science in a way that was fun and makes me like science more.”
- “I liked being able to decide if I wanted to make videos or do photography. I did photography and enjoyed taking photos of not only debris but also of nature to show the beauty.”
- “I liked that the book and our writing related to the rest of the class. It made reading and writing more interesting.”
- “I liked making sculptures from the debris. When we were collecting the trash I had no idea that we would get creative and make sculptures from it.”

Lessons learned: Challenges and Successes

Over the course of the three years I taught the program, not a lot changed in curriculum from one year to the next. In the last year, when I met with the school, we decided that the school would assign a writing/English teacher and the art teacher made the art section more in depth. This was done to allow me to focus on the science and to involve the school’s teachers more since I knew it would be my last year teaching the course.

The marine debris study ranged from comparing the same beach over a few weeks to comparing two different beaches. Field trips were included the second year and guest speakers varied. I asked a local State Assembly Member to come since he was working on legislation that related to the course content, and he did, which added a connection to political action.

The obvious challenge in running a similar program for students with behavior problems the organization of the course. Those not used to working with ‘at-risk’ learners need to read about useful strategies beforehand. There were times some students would not show up for class. I worked around this, but it made it difficult to keep groups running smoothly. Anticipating this can help you adjust your lessons and find ways to work with such students so they can be successful in the course. For example, near the end of the course we set aside a few weeks for those who had missed days for working on the posters/presentations and art projects

While students’ language may be shocking to some, I chose to not allow it to draw attention away from the work of the class. Small classes, like large, can bring challenges. I would suggest that the class size be determined by your comfort level, the size of facilities, and with consideration of the learners. I found that small classes made it harder to create groups to work on projects, but they did allow me to provide more time to work individually with students on their science process skills, hypothesis writing and technology skills. Shy students are always a challenge, but within our small classes, these students were talking and partici-

pating more by the end. The inverse of course is the louder students. Keeping active learning in mind, students who need more attention should be kept busy and finding ways to allow these students to be spokespeople for group work can alleviate disruption while serving their needs.

At first, I was an outsider to the school and my students needed to bond with, and trust me. Trust is important when working with at-risk students. This took a few weeks, but was built through compassion, caring, listening and giving them a voice and decision-making roles.

Another more minor challenge was the weather. The central coast of California can be windy, foggy and cold. On cold, foggy days when the beach cleanups were scheduled, students were not motivated. During warmer, sunny days, they wanted to run and play. To adjust for this, I shortened the data gathering (i.e. beach cleanup) time and allowed more time for exploring. Most of the students commented that they had either rarely or never been to the beach, mainly due to a lack of transportation, (the beach is about two miles from their school).

From the viewpoint of the school, the students, the funders and myself, this program was successful. It was enjoyable to teach and I learned as much from the students as they did from me. I watched students who seemed “hard” at first reveal their own beautiful personalities as the course progressed. Students who felt they were not good at science showed skills that demonstrated that they can do science. Watching their confidence blossom and seeing their skills develop along with their thinking about future careers and college, reminded me why I teach. I would like to leave you with one more quote from Effective Alternative Education Programs, “So many of our at-risk learners are merely unchallenged, inquisitive learners who have never been allowed to create, inquire, or explore their own ideas.” This program allowed students to learn content while they were allowed to create, inquire and explore their own ideas. While integrated learning helps all learners, it can especially help those at-risk to be more engaged with the learning process and to retain more; And programs like this have a social justice aspect, because they help those who are otherwise falling through the cracks to more effectively learn and explore careers, college, and life.

Natalie Zayas Delgado teaches environmental science and environmental studies courses at California State University, Monterey Bay. She has taught Pre-K through adult courses for 17 years.

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How-To Float a Classroom

Use sailing to teach water ecology and environmental stewardship

By **Dayna McRoberts** and **Jen Guimaraes**

LIVING ON THE SHORES of a lake has its many advantages – beautiful sunsets, days spent at the beach, afternoons exploring local wildlife – but for students in Burlington, Vermont, living by Lake Champlain has provided so much more by way of an unlikely learning opportunity. While most students spend their school days staring out the window longing to be outside, the fourth and fifth graders here are taking their notebooks to the lake. Donning brightly colored life jackets, the students board sailboats and embark on the Floating Classroom, a journey to better understand local water ecology and environmental stewardship.

What started as a simple ecology and stewardship-based program has grown and evolved substantially in the past seven years, and it continues to do so. Between the support of teachers and principals, generous grantors, and the dedicated staff at the Lake Champlain Community Sailing Center (CSC), these years have proven that Floating Classrooms is the CSC’s little sailboat that could. And while it wasn’t built overnight, and there is still more to do, we invite you to follow along as we recount our journey and provide some useful tips should you want to start your own sailing-based program.

Identify Your Mission

Whether a non-profit, a school, a large organization, a summer camp, an afterschool program, or a traveling circus, being able to answer the *why* of your program is vital to its success. For some entities, the mission is the centerpiece of all of their work, while others may not have their values and mission statement written down and publicized for all to see. Either way, understanding what your overarching mission is and why must come first, because the values backing that mission must be represented in the program you create.

When Dayna first joined the team at CSC in May 2015, their mission was clear to her from the start. Before she even began working there, she knew the CSC was a place where anyone – regardless of socioeconomic status, sailing/paddling experience, or physical ability – could get out on the water and feel like they belonged and were supported every step of the way. Having taken part in the CSC’s Learn to Sail program as an undergrad at the local university, she immediately recognized and appreciated their mission of inclusion and access. “Lake access. Life Lessons. For All.” Jen has been a part of developing this mission for over ten years in her role as Associate Director of the Community Sailing Center. The mission is instilled in every program, curriculum and idea she has.

The body of water in our community is the focal point



that jumps to the foreground immediately, create that something. We had our niche before we had the program. Sailing is our medium and the outdoor playground of Lake Champlain is the realm in which we utilize that medium.

Sailing provides the perfect platform to cover school topics such as weather, climate, water quality, lake ecology, and even engineering, math, and physics. A sailboat's motion is completely reliant on the strong principals of physics (Bernoulli's principal, lift, force, etc.), and one must utilize basic math calculations to uncover the answers to how a sailboat moves. The environment in which we sail directly relates to the ecology of the area – i.e. how mountains surrounding your area affect wind, currents, and wildlife. With all of this information at hand, students can also begin to understand the different careers associated with certain

of the physical environment, yet many people have never accessed it. As an organization, we believe that every single person should feel a sense of ownership toward the lake, and in order to do that they need to experience it first hand. Through sailing, people get out on the water in an entirely new way and are more connected with the lake than ever before.

When you're first starting out your mission may evolve and branch off into different directions as your program grows, however, knowing the general direction of where you're going or want to go before you start programming is vital. Our program began as a simple sailing program that incorporated science, ecology, and stewardship lessons. In the early years students and teachers came to the lake for a three hour visit which included an on-land lesson and on-water sailing component. Students engaged with the local ecology of the lake environment and the watershed through inquiry-based, hands-on learning on the shore. They then applied their new knowledge while experiencing the lake first hand from a sailboat, providing a vantage point of the natural environment that they had never considered.

Today, we create custom programs when necessary, align lessons with public school curriculum (Next Generation Science Standards, Common Core Standards), partner with US Sailing's official educational platform (Reach Program), and ensure flexibility and safety around scheduling and weather. Students visit the lake twice a year and CSC educators visit classrooms to provide winter lessons, weaving a theme throughout the entire year of learning rather than just one visit, enhancing their learning application and retention. All of this and more evolved from our initial program format.

Find Your Niche

Once you have your mission, you have to find your niche. What makes your program different? Whether it is a sport, a catchy motto, a special environment, or an academic focus, distinguish your program from others. If there is nothing

topics. They are introduced to the world of cartographers, watershed managers, wastewater consultants, mechanical engineers, mathematicians, geologists, etc. Sailing unleashes a whole new frontier for students to consider. As they lean over the side of the boat to fill a test tube with lake water to test dissolved oxygen, a sense of real world 'can do' is sparked within each student.

When you create a program using sailing as the forefront you'll need to evaluate your surroundings to develop your curriculum. Whether you're in a freshwater or saltwater environment will impact what science topics will be relevant to your students. No matter where you are you can always create lessons around the weather and geography of your region. Other pieces to consider are the type of sailboat you would use – a larger sailboat that can hold a group of children and chaperones is preferred. The sailing instructor is on board at all times, allowing students to comfortably experience the content they are focused on while having an opportunity to steer a keelboat through the water, a transformative experience in and of itself. These logistical steps are vital as they shape your place-based program and make possible the life lessons that your program will inspire.

When we first started planning our curriculum, we knew that an experiential learning program would be the best way to impact our target population. Having considered all the potential topics listed above and how we could go about teaching them we realized – what better way to teach students how to test water quality than off the side of a sailboat, or discuss geology while staring at the ridges of the Adirondack Mountains? By putting the students on a sailboat, we are likely to foster a more memorable experience than a typical science lesson.

When a fifth grader who has never been on a sailboat glides their hand across the water, or a teacher relays the change they see in a student that has typically had a difficult time in the everyday classroom, something special happens.

Floating Classrooms has taken these collaborative opportunities and partnerships and turned them into the foundation for students to learn about themselves and their public school educational standards in a natural way.

In order to provide these experiences for the students you need to create a program format that sets the stage for the on-water learning. When students arrive for the water quality lesson (Module 5 of the US Sailing Reach Program) they start their visit on land reviewing the components of what makes a healthy body of water. This brainstorm then leads to a game that familiarizes students with the different aspects of water quality to test for in order to see if the lake is indeed healthy (pH, dissolved oxygen, phosphorus, turbidity, salinity, etc.) Students then head to the docks and test the water themselves. This is a great way to focus on place-based education – students are more invested in their learning because it includes the body of water in their neighborhood, and in many cases their drinking water. Once students have completed their on-land work they head out on the lake and collect water from different areas. They can test these areas, compare them to their shore side sample and make deductions around why the results may or may not be different. For example, differences could relate to recent weather events, if they collect near a river input.

One of our most intensive fifth grade lessons takes place during winter visits that build off of the above mentioned water quality curriculum. In the winter, every fifth grade class has three visits from a CSC educator. The first visit paints a picture of water quality and ties all of the students to the topic personally. They sit in a circle and tell the history of the lake. Every part of the story introduces something new that was put into the lake as time progressed, and they add a representative object into a bucket of water (an apple represents food waste, food coloring represents harmful runoff, etc.) and stir it around. As each stage of the story is told, the students answer whether they would swim, eat food, and drink water from this lake. At the end of the lesson they answer, “Who dirtied the water? Who is responsible for cleaning it up?”

The next visit has the students create an image of the ideal lake, and then explore water quality matching games to solidify their understanding of the different vocabulary and definitions. For example, the word *phosphorus* can be described as “comes from soap” and “increases plant growth.” The final winter visit has the students learn how to test water quality and record data like scientists do. We use La Motte testing tablets and litmus paper, Instant Ocean hydrometers, and a Secchi Disk. The classroom is set up in stations, allowing for group work and experimentation. Depending on the station, students test liquids such as salt



water, soapy water, lemon juice, and tap water. They then apply these skills when testing water quality at the lake in the spring. They understand what the results mean and can infer why they might be so.

The association between water, memories, fun, and the surrounding landscape will create a spirit of accountability, ownership, and stewardship within every student. They may not all grow up to become marine biologists or environmental lawyers, but we are planting the seed for lifelong stewardship. The combination of sailing and environmental education is what allows for true experiential education and for participants to learn something about themselves at the same time.

Choose Your Audience

After you’ve got a mission and a niche, you need to figure out whom you want to reach with your program. Narrowing down the audience not only makes things manageable as you start off, it also forces you to do a more thorough job with those you are reaching out and providing programs for. Learn about your target population and determine how your program will address their needs. The more information you have about your audience the more successful you will be when you start promoting it.

We knew our program was geared toward students between K-12th grade, but we weren’t immediately clear on the grade level. We’ve tested different grade levels over the years and found the elementary school grades are the perfect fit (for now). Once we identified public schools as our primary audience, we needed to make sure our program aligned with their needs. Oftentimes, public school teachers function within many constraints and must achieve certain goals within certain times, and in order to gain traction and be recognized as more than just a sailing field trip, we needed to help teachers meet those standards and reach those goals.

Next Generation Science Standards (NGSS) and Common Core Standards have been adopted by the Burlington School District; therefore, they are important to Floating Classrooms. Find that perfect balance between public school standards and your mission to narrow down your audience and curriculum design. Each of our lessons are designed to not only work with US Sailing’s educational platform Reach, but to also address one or more of that grade’s testing standards in a way that reaches that age group. Today, the focus for Floating Classrooms is on the fourth and fifth grade. Once the curriculum and logistics for these two grades are sustainable and function like a well-oiled machine, our intention is to use the same framework and expand into for all other grades in K-12.

Get Moving

Once you've honed your mission, niche, and audience it's time to start putting things together. Take a moment to finalize everything you've come up with so far and see what steps still need to be taken to start putting this in motion. You may want to use U.S. Sailing's Reach program for curriculum guidelines and explore developing additional curriculum that is specific to your physical location, using your direct surroundings as a teaching tool. Pieces you may want to consider when designing your program are:

- Staff – certified sailing instructors and trained on-land environmental educators.
- Management – someone to be the point of contact for all teachers and partners. This person manages paperwork, contracts, scheduling and most likely is the staff who is a Director that is on land throughout the duration of program implementation.
- Equipment – larger keelboats (20+ feet) are ideal vessels. Groups of students, teachers, and a certified sailing instructor can all fit on board.
- Safety – you will need a safety boat (at least in the water by the dock) in the event of an on-water emergency. First aid kits should also be on board the boats and on-land. All staff should be certified in first aid and CPR. Radios are a must for communication to the office where the Director is monitoring weather and able to support the group.
- Paperwork – make sure to have a written agreement with your partners indicating the services each is providing, payment, and liability waivers.

- Evaluation – creating a tool to evaluate your program is one of the most difficult pieces of the puzzle. Without it though, you won't know if you're doing a good job and if students and teachers are enjoying it and learning something

Once you've got a plan for most everything above, you'll want to reach out to potential partners to let them know the program is in the works, and start to solicit some feedback on what they would like to see. Their answers may range from scholarships and monetary support, to incorporating pirate puns, to a specific lesson. Figuring out what your partners need is vital, so build that foundation of donors, grantors, certified instructors, skilled educators, program directors, and logistics thoroughly. Starting this step early in the process is recommended, as we've found it can take quite a bit of time. Once you start talking with people about your new and innovative program they're going to get excited and want to be a part of it.

While we started our program at a non-profit sailing center and sought out school partners, we recognize that you could be thinking about starting this program from the teacher's point of view. To get started, research local sailing centers and yacht clubs, and use US Sailing's website as a resource to find out who in your area is using the Reach curriculum, and if that curriculum makes sense for your class. Talk to other non-profits to see if they may be interested in partnering, and remember – don't be afraid to reach out to organizations that have successfully started a program to ask for advice.

Be Patient

Floating Classrooms has come a long way, and the road to success has been challenging. We've worked hard to fix what can be fixed while respecting the process and the individual needs of those involved, paying attention to details, and being patient and positive. All of this is key to creating a successful experiential education program on land and water. As experiential education itself promotes, the experience is everything. Understand that the experience aids in learning and that, in this case, the trial and error process will be difficult, but worth learning from and full of potential for growth.

The young people of today, whether they're in fourth grade, high school, or college, represent the generation that will be responsible for the conservation, restoration, and overall health of the environment. When thinking about your own program, remember that even a modest program can promote a large scale lasting impact, and that there is beautiful potential and achievability in all experiential education.

Dayna McRoberts is the Education & Outreach VISTA at the Community Sailing Center in Burlington, Vermont, and has worked with the program since May of 2015. **Jen Guimaraes** is the Associate Director at the Community Sailing Center, and has been managing programs and curriculum for the past 10 years. She is the Chair of US Sailing's Community Sailing Committee, a US Sailing Instructor Trainer for Small-boat and Reach and a member of their National Faculty.

Notes

1. US Sailing Reach Program <http://reach.ussailing.org/>

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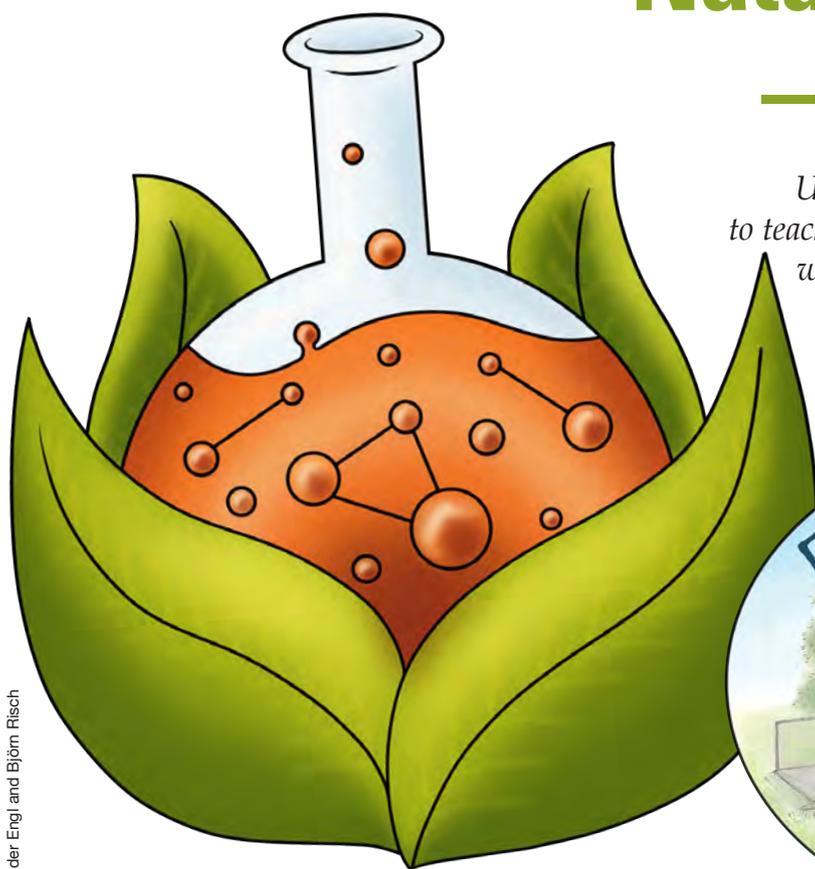
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Natural Chemistry – Outdoors!

Use fluorescence and sunscreen to teach chemistry to high school students while immersed in the outdoors



Alexander Engl and Björn Risch

By **Alexander Engl** and **Björn Risch**

THERE IS A BROAD CONSENSUS that experiences in nature positively affect physical and mental health and social development. Children who play outside several times a week are generally happier than those who don't, especially if those outdoor settings are stimulating ones. Since youth now spend an increasing amount of time in a virtual world, too often they become alienated from nature. And they experience fewer sensory opportunities than those who have regular contact with the natural world.

Richard Louv identified this problem as nature-deficit disorder: "the human costs of alienation from nature: among them diminished use of the senses, attention difficulties, and higher rates of physical and emotional illnesses."¹ In spite of this however, "nature" as a place of learning is not sufficiently integrated into science classes.

The concept for teaching chemistry outdoors is intended to make youth more aware of nature and the processes occurring there. The central idea is to shift parts of chemistry lessons outdoors, ideally into natural settings. Such outdoor lessons help students to better connect with the natural world and hopefully enjoy much more their time spent outside.

In order to better understand environmental processes, we encourage students to work in small groups and conduct

outdoor experiments using natural items that they have collected. There is another less obvious benefit of conducting experiments outdoors. The impacts of environmental stressors, such as UV radiation, are not immediately visible to most people. When outdoor experiments are set up to investigate those impacts, it helps the participants to better appreciate those impacts.

In contrast to traditional chemistry lessons which many students find abstract and complex, the objective of our *Natural Chemistry* approach is to build a bridge between chemistry instruction and every-day, natural phenomena. The starting point of our program is the "Outdoor Mobile", a former circus caravan that has been converted into an environmental outdoor student laboratory. This caravan is primarily used to store the materials and act as a meeting place for debriefing what has been learned. While it is very helpful for us, you will not need a mobile caravan in order to implement the concepts outlined in this article.

The Natural Chemistry units are designed for senior high school students with the following criteria in mind:²

1. Experiments take place outside of the classroom ("nature is my lab")
2. Minimal laboratory equipment and chemicals are used and reactions occur from naturally occurring substances
3. Environmental processes are demonstrated on real objects
4. The focus is on basic chemical concepts

5. Digital media, such as GPS devices or tablet computers, are used

Our program's philosophy is best seen in the following, multi-part activity. The first part of the activity uses model experiments to understand the curse and blessing of UV radiation.³ It will enable students to answer questions related to the effectiveness of sunscreen, clothing material, and skin types. In the second part, we look at natural sunscreens derived from plants such as horse chestnuts. With an extract of the bark, we take a closer look at the phenomenon of fluorescence and we show the dependency on the pH value of the fluorescence dye.

Decades of research have shown that an increase in knowledge does not necessarily lead to a change in behavior.⁴ For this reason, environmental education programs should focus on active and experiential engagement in real-world environmental problems, rather than the transfer of knowledge.⁵ Issue-based, project-based, and investigation-focused programs in real-world (place-based) nature settings will commonly achieve the desired outcomes. Natural Chemistry responds to these findings by actively involving students in the learning process – outdoors!

Alexander Engl has studied chemistry and biology and is currently a Ph. D. student in the Department of Chemistry Education at the University of Koblenz-Landau in Landau, Germany. **Björn Risch** is a Professor of Chemistry Education at the University of Koblenz-Landau (Campus Landau). They would like to thank the *Fonds der Chemischen Industrie* (FCI) for funding the project.

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Activities

Activities 2 and 3 can be found at <http://greenteacher.com/natural-chemistry-outdoors/>

1. Sunscreen in a Model Experiment

Part A: Production of photo-sensitive cyanotype filter paper

The photo-sensitive cyanotype filter paper displays UV radiation by changing color. This demonstrates the powerful effect of UV radiation. Follow these instructions to create some for the experiment.

Materials: Beaker (50 mL), graduated cylinder (50 mL), glass rod, petri dish (≥ 7 cm), tweezers, 5 regular filter papers (≥ 7 cm), shoe box, paper towels, safety gloves, waste container

Chemicals: 2.5 g green ammonium ferric (III) citrate, 1 g potassium ferricyanide (III), distilled water

Time: 10 minutes

Safety instructions: Wear latex safety gloves to prevent your skin from being stained blue.

Procedure

- Put on latex safety gloves.
- Using the graduated cylinder, measure 25 mL of distilled water.
- Place the 50 mL beaker in the shoe box to avoid as much UV radiation as possible.
- In this beaker, prepare 1 g potassium ferricyanide (III) and 2.5 g green ammonium ferric (III) citrate in 25 mL of distilled water.
- Mix beaker chemicals with a glass rod.
- For best results, place the petri dish inside the shoe box beside the beaker for the next steps to keep it shaded or place it on the counter beside the box.
- Pour part of the solution from the beaker into a petri dish and put all five filter papers in the dish to soak up the poured solution.
- Using the tweezers, lift the filter papers from the petri dish and pat the filter papers dry using paper towels.
- Remove the beaker from the shoe box and store the filter

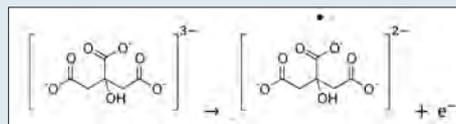
papers in the shoe box until required.

- Expose one of the five filter papers to UV radiation from the sun. You can also cut a small paper template to put over the exposed filter paper to show the difference between the fully exposed and covered portions.
- Leave the remaining papers in the shoe box.

Disposal: Collect the remaining solution in the beaker and petri dish and the one UV exposed filter paper to place in a waste container. (Hold onto the other four filter papers, for later use, as mentioned below.)

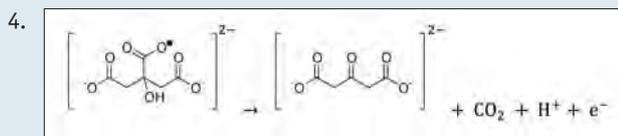
Explanation: The basis for these sunscreen experiments is the cyanotype process, which involves a photochemical-induced reaction between ammonium ferric (III) citrate and potassium ferricyanide (III) (red prussiate). If a watery solution of the two chemicals is exposed to sunlight (or an alternative source of UV radiation such as an ultraviolet lamp, overhead projector etc.), a distinctive blue color forms within a minute. Exposure to high-energy UV radiation causes an electron of the citrate ligand (from the ammonium ferric (III) citrate) to be transferred to the ferric (III) ion of the ammonium ferric (III) citrate, which is in turn reduced to a ferric (II) ion:

- Oxidation:

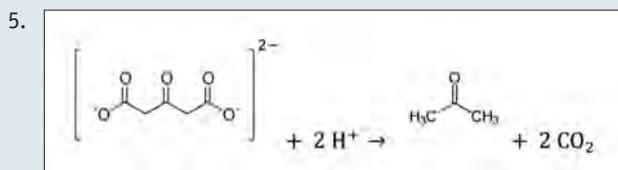


- Reduction: $\text{Fe}^{3+} + e^- \rightarrow \text{Fe}^{2+}$

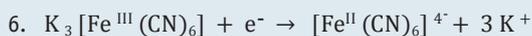
The resulting ferric (II) ions in chemical equation (2) react with the potassium ferricyanide (III) to form Prussian blue. The simply oxidized citrate radical releases a second electron and forms acetonedicarboxylic acid due to decarboxylation.



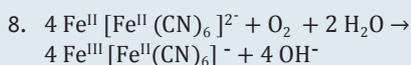
The acetoacetic acid can undergo decarboxylation two more times, with the Fe³⁺ ions being reduced. The final products are acetone and carbon dioxide:



If the UV radiation is very strong, white color can form on the filter paper. There is a transfer of electrons from the ferric (II) citrate to the ferric (III) ion of the potassium ferricyanide (III). This forms a ferric (II) ferricyanide complex, which reacts with the unbound ferric (II) ions to form so-called Prussian white. This process is called the solarization effect.



The Prussian white reacts with atmospheric oxygen to form Prussian blue. Contrary to the insoluble Prussian blue in chemical equation (3), the complex contains a ferric (II) ion.



Part B: Sunscreen by Reflection

These three model experiments compare different options for skin protection from UV exposure such as cream, clothing and skin types.

Materials: 3 cyanotype filter papers from Part A, 3 glass sheets, a paintbrush, template of different skin types (see figure 4), a piece of silk fabric, a piece of cotton fabric, 2 clothes pegs, waste container

Chemicals: Sun cream, hand cream

Time: 15 minutes

Procedure

- Put a cyanotype filter paper between two sheets of glass. Using the paintbrush, apply thin layers of hand cream and sun cream side by side to the top glass sheet. The same quantities should be used of each and the thickness of the layers applied should be identical.
- The pieces of silk and cotton fabric should be placed side by side over a second piece of cyanotype filter paper and fixed with clothes pegs, if necessary.
- Place the template of different skin types on a third cyanotype filter paper and weigh it down with a glass sheet.



Alexander Engl and Björn Ritsch

Students prepare photo-sensitive cyanotype filter paper for sunscreen in a model experiment.

- Expose these three prepared cyanotype filter papers to UV radiation from the sun.

Disposal: Collect the exposed filter papers in a waste container.

Explanation: A comparison between the hand cream and the sun cream reveals different colors on the cyanotype filter paper. The hand cream provides no protection from UV radiation so a photochemically induced reaction occurs, resulting in a blue color. The sun cream, on the other hand, prevents this process and the filter paper remains virtually yellow-green. Mineral sun creams contain the primary light-screening substance titanium dioxide, in the form of nanoparticles that reflects or absorbs the UV radiation.

Silk and cotton also leave different shades of color on the cyanotype filter paper. Thin fabrics that are not densely interwoven, such as silk, provide very little protection against UV radiation, although people often like to wear these lightweight fabrics in the summer.

The third model experiment demonstrates the protective effect of different skin types. A color template consisting of four brown tones with varying degrees of transparency provides a basis for this experiment. After the experiment, the different shades of the color scale are reflected by different degrees of blue color on the filter paper. The color scale is intended to represent the different concentrations of melanin in skin. Melanin is the color pigment that is produced when skin is sun-tanned. The results illustrate the differences between the skin types with regard to their ability to resist UV radiation. The varying formation of Prussian blue symbolizes the exposure of the deeper skin layers to UV radiation.



Invisible UV radiation forms a distinctive blue color due to the cyanotype process. Sun cream, cotton, or sun-tanned skin prevents this process and the filter paper remains virtually yellow-green.

Part C: Sunscreen Through Absorption

This experiment is concerned with the protection mechanisms of plants in strong sunlight.

Research task: Not only do people need to be protected from UV radiation, plants also require sunscreen. For example, cacti in the highlands are covered in dense hair which enables them to reflect part of the UV radiation. The horse chestnut, ash, and narra trees or common orange lichen have a different strategy. This experiment shows how UV-active substances absorb sunlight. (Tip: The horse chestnut contains a water-soluble, UV-active substance between its bark and wood.)

Materials: 1 cyanotype filter paper from experiment A, scissors, 2 snap capped vials with a seal, glass rod, tweezers, a horse chestnut twig, waste container

Chemicals: Distilled water

Time: 15 minutes

Procedure (hidden for students)

- Put a small horse chestnut twig into a snap capped vial.
- On one side of the twig, remove up to half of the bark using the scissors.

- With the twig and loose bark in the vial add distilled water and stir several times with the glass rod.
- Use tweezers to extract the bark pieces and twig from the snap capped vial so that it only contains water with the extract of horse chestnut.
- Place the snap capped vial containing the horse chestnut extract and a second snap capped vial containing only distilled water on a cyanotype filter paper and expose it to sunlight.

Disposal: Collect the blue filter paper in a waste container. Keep the horse chestnut extract for subsequent experiments.

Explanation: In addition to sunscreen through reflection, some chemical substances provide light protection by absorbing sunlight and, as a result, reduce the intensity of UV radiation. UV-active substances such as 4-aminobenzoic acid derivatives are used in sun cream for this purpose. Selected substances contained in plants also absorb UV radiation and show the phenomenon of fluorescence. These fluorescent dyes are characterized by an extended conjugated π -electron system, which does not absorb visible light like other dyes, but is stimulated by short-wave UV radiation.



The horse chestnut contains a water-soluble, UV-active substance between its bark and wood. This chemical substance provides light protection by absorbing UV radiation. The left snap-capped vial contains water as a blank; the right snap-capped vial contains horse chestnut extract. The upper shade in the right picture is more yellow-green due to the sunscreen through absorption of the horse chestnut extract.

RESOURCES

Reviewers in this issue: Ellen Bees, Patricia Darby, Tim Grant, Phyllis McKenzie, Deb Roe, Becky Tzagadouras, Stacey Widenhofer, Veronica Uzielli, Tiina Vilu



Mission Sea Turtle Rescue

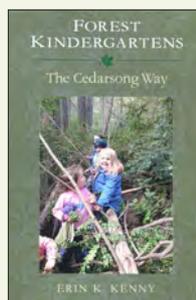
I've been a fan of National Geographic Kids' books for a while now and *Mission Sea Turtle Rescue*

does not disappoint. In the introductory pages, Karen Romano Young teaches children about the life and rescue of a sea turtle named Ace. Each chapter of the book contains an excellent mix of stories, fact files, rescue activities and challenges. The book is filled with bold colorful photographs that will appeal to children in the grade three to six target audience. The descriptions are fascinating and detailed. With the help of National Geographic Explorer, Daniel Raven-Ellison, the author does not shy away from difficult terms. This book highlights sea turtle conservation efforts throughout the world and shows the diversity of people working to save these amazing animals. The resource page at the end of the book provides a platform to help students dive deeper into their sea turtle saving mission. Best of all is the call to action and the variety of tips showing children how they can participate in these efforts. – (DR)

National Geographic Society, 2015, ISBN 978-1-4263-1893-1 (pb), 112 pp., US \$12.99 from (800) 647-5463, ngchildrensbooks.org

Forest Kindergartens

Forest Kindergartens: The Cedarsong Way describes the first U.S. Forest Kindergarten based on the German Waldkindergarten model. Through detailed description, Erin K. Kenny explains the evolution of Cedarsong from a small camp-like program to a full-fledged forest kindergarten. While many resources show and tell what children are doing in a forest preschool, this book also illustrates the



role and activities of forest kindergarten educators. The Cedarsong educational program “uses interest-led flow learning which results in an emergent curriculum.” Inquiry learn-

ing and place-based learning are key elements of the program. The author, who co-created Cedarsong, portrays her own transformation over time, “from feeling like I had to provide the preschoolers with coordinated activities to gradually taking away more and more indoor props.” Along with an overview of the forest kindergarten model for early childhood education, this resource delves into the curriculum, while also sharing spontaneous and guided activities for preschoolers. This book will be valuable to all preschool educators who are involved in nature preschools and especially forest kindergartens. – (PM)

Cedarsong Nature School, 2013, ISBN 978-0-615-84920-1 (pb), 111 pp., US \$20.00, from www.cedarsongnature-school.org



Imagine Childhood

In this amazing age of technology, sometimes we need a reminder to slow down and remember what

it was like to be a kid. Looking for a way to refresh your memory? Take a look at the book *Imagine Childhood: Exploring the World through Nature, Imagination, and Play*. Sarah Olmstead gives the reader a gentle reminder through short narration and descriptive photos of fun, easy activities that anyone can participate in. She encourages curiosity and investigation with wonderful and beautifully described activities. It becomes easy for you, the reader, to get the little ones in your care started. With complete directions, patterns and templates for each activity, the adventure is easy to begin! The

25 included activities are arranged in three simple yet encompassing categories: nature, imagination and play. There are activities for all age groups in this book, from something as simple as making a cape or kite to something a little more advanced like making a flip book or a Rube Goldberg device. As an added bonus most of the items you need can be found in your existing supplies or with a quick trip to your local craft store. – (SW)

Roost Books, 2012, ISBN 978-1-59030-970-4 (pb), 220 pp., US \$19.95, from www.roostbooks.com

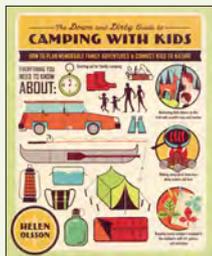


Connecting the Dots

Connecting the Dots provides a systems perspective of education and learning. A framework is the best way to describe this text.

The authors, Stan Kozak and Susan Elliot, provide an outline for transformative educational practices “that engage students as active citizens in supporting environmental, social and economic sustainability.” Subtitled, *Key Strategies that Transform Learning*, the book provides an outline and seven strategies to prepare students to meet the challenges of an ever changing world. Strategies include: Learning Locally, Integrated Learning, Acting on Learning, Real-World Connections, Considering Alternative Perspectives, Inquiry, and Sharing Responsibility for Learning with Students. A variety of brief case study abstracts will empower the reader and trigger educators to use their own experience to create programs that cross disciplines, encourage critical thinking skills, and “reflect the complexity of life”. *Connecting the Dots* is a stream-lined resource that can help teachers of all ages create engaged life-long learners who use critical thinking skills and understand that learning happens within and outside the school environment. – (PM)

Learning for a Sustainable Future, 2014, ISBN 978-0-9937510-0-4 (pb), 107 pp., US \$24.95, from www.lsf-1st.ca

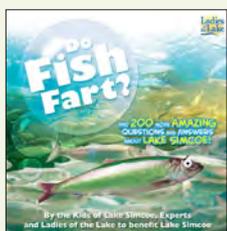


Camping with Kids

While *The Down and Dirty Guide to Camping with Kids* doesn't quite succeed in its goal of providing "every-

thing you need to know about gearing up for family camping," it does make a good stab at this impossible task. Author, Helen Olsson, writes in a friendly narrative style and you can imagine you're sitting across the kitchen table from her as she gives you the skinny on the ins and outs of camping with young ones. This guide, subtitled *How to Plan Memorable Family Adventures & Connect Kids to Nature*, attempts to cover a lot of ground. All of this material is catalogued in four major parts: Getting Started, In the Field, Activities and Adventures, and Hygiene, First Aid and Safety. From clothing to cooking, safety to outdoor activities, the author is able to provide more detail in certain sections than others. This non-fiction book is text heavy and could use a few more photos and helpful graphics. With that said, the wealth of information provided is accurate and useful what-to-bring lists are included in every section. Experienced campers will nod their heads and smile as they remember experiences similar to those described. However, the guide will be of greatest use to first-time campers. – (DR)

Shambhala Publications, Inc., 2012, ISBN 978-1-59030-955-1 (pb), 254 pp., US \$17.95 from roostbooks.com



Do Fish Fart?

Kids ask the funniest and most interesting questions about the world around them.

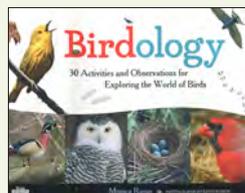
In the fascinating book, *Do Fish Fart?*, the Ontario Water Centre attempts to provide the answers to some of these questions. Students, aged 7-12, have posed fascinating inquiries about the freshwater lake environment of Lake Simcoe. The questions relate to larger topics of learning that include the environment: "Do fish impact the cleanliness of the lake?", systems: "Do forests help the water or does water help the forests?", biology: "How can fish survive in

the winter?", history: "Is mud at the bottom of the lake dinosaur poo?" and geology: "What's the difference between a lake and a big pond?" All such questions have been answered by experts on the topic, presented in simple language and accompanied by diagrams and colorful images. This book is a great resource for anyone who wants to teach children about freshwater lakes, not just Lake Simcoe. Questions can be used to open a lesson, or children can enjoy flipping through the pages on their own. The book also includes QR codes throughout, which link to additional websites and videos that will help make your lessons interactive. By using children as the source of questions this book supports a greater scientific understanding of freshwater lake life in a way in which children can relate to. – (TV)

Ontario Water Centre, 2015, ISBN 978-0-9947928-1-5 (pb), 96 pp., CAN \$14.95, from www.lakesimcoekidsbook.com/

Birdology

There is so much more to the science of birdwatching beyond simple identification! Monica Russo helps educators and young birders learn more in *Birdology: 30 Activities and*



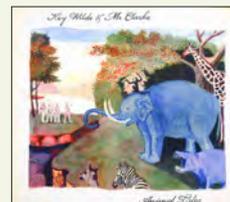
Observations for Exploring the World of Birds. This guide is packed full of amazing photographs,

crafts, and activities that everyone can appreciate, participate in and learn from. Learn how to start a bird journal (and why you should), a bird sketchbook, make bird feeders and draw a territory map. One of the numerous included "Try This!" sections encourages the reader to become a bird worker. Many of these activities, walk the reader through making their yard more bird friendly. This is a wonderful guide for bird enthusiasts, ages seven and up! It encourages journaling, writing and drawing, and most importantly independent nature observations. For the newly found bird enthusiast that would like more information (teachers included) additional resources are also included in the concluding pages. – (SW)

Chicago Review Press Incorporated, 2015, ISBN 978-1-61374-949-4 (pb), 108 pp., US \$15.95, from www.chicagoreviewpress.com

Animal Tales

The breezy songs on the 40-minute CD, *Animal Tales* by Key Wilde & Mr Clarke, will help kids learn about animals from around the world. The



lead song, *Animal Kingdom*, uses an island tempo to tell the listener of animals from every continent. *Bear*

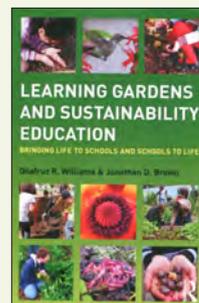
Song introduces the eight species of bears known worldwide; describing their field marks, some of their most notable behaviors, and where each of them can be found. Each tune is witty and whimsical while also managing to provide accurate information about the various insects, mammals, reptiles, amphibians and crustaceans covered.

A great potpourri of Animalia that is sure to bring smiles to children and adults in both formal and non-formal settings. – (PM)

Worm Hole Productions, 2014, US \$9.99, from www.itunes.com

Learning Gardens

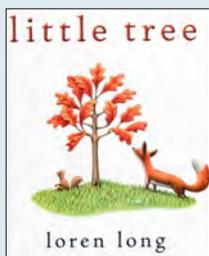
Many gardens have been added to school grounds in recent years. In *Learning Gardens and Sustainability Education*, Dilafruz R. Williams and Jonathan D. Brown argue that living soil is a metaphor for life and that "schools themselves are living systems and that learning gardens are legitimate academic venues and more than just a curricular add-on." The authors describe that living soil offers seven principles that guide learning gardens pedagogy: cultivating a sense of place, fostering curiosity and wonder, discovering rhythm and scale, valuing biocultural diversity, embracing



practical experience, nurturing interconnectedness, and awakening the senses. In the book fittingly subtitled, *Bringing Life to Schools and Schools to Life*, each of these principles is

shown using case studies and lessons from real garden classrooms. In one case study, a school superintendent emphasizes the value of these garden lessons, including joy, wonder, work

Children's Book Reviews

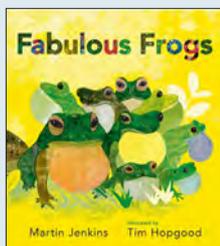


Little Tree

Change is difficult, and can be scary. *Little Tree* is the story of a tree who is happy with the way his life is. As told by Loren Long, he has little leaves that keep him cool in the heat of summer, other tree friends surrounding him and squirrels and birds that like to play on his branches. Slowly, autumn begins to roll in, and life begins to change. His leaves change colour, and the other trees drop their leaves. However, Little Tree is too afraid. He doesn't know what will happen if he lets them go.

As the seasons change, so do the other trees, but Little Tree does not. Because he did not drop his leaves in the fall, he does not grow in the spring. Seasons come and go, and the forest grows, but he is still afraid to change. Eventually, Little Tree is ready. Although it was a little scary at first, he eventually grows into a tall tree like the others, and all the animals want to play on his branches again. The Little Tree is an inspirational story of courage and overcoming challenges to embrace and understand the importance of change and personal growth. With vibrant, beautiful artwork, this story will be loved by all from toddlers to adults. – (BT)

Penguin Canada, 2015, 978-0-399-16397-5 (hb). 40pp., US \$17.99/CDN \$19.99 from www.penguin.com/youngreaders



Fabulous Frogs

For anyone fascinated by frogs, *Fabulous Frogs*, is a fun and informative non-fiction picture book. Martin Jenkins introduces the huge variety of sizes, adaptations and abilities of frogs from around the world. The reader first learns what the more than 5,000

different kinds of frogs have in common. Then in the following pages, learns what makes some of them unique. Small type gives further explanation to the larger story-book text, often letting us know in what part of the world that type of frog can be found. The simplistic illustrations by Tim Hopgood are colourful and engaging. This book is written for K-3 students and would be helpful when introducing adaptation to young children. – (VU)

Candlewick Press, 2015 ISBN: 978-0-7636-8100-5 (hb), 32 pp., CDN \$22.00, from www.candlewick.com

Awesome is Everywhere

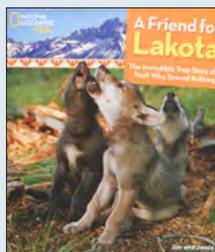
With a tap on the Earth your journey begins. In Neil Pasricha's *Awesome is Everywhere*, imaginative thinking and reader interaction are encouraged with every turn of the page. We begin the exploration by zooming in to Earth's surface from space, closer and closer, illustrated using aerial and composite photographs. As we actively touch, tip, shake, and blow the pages, an awesome journey unfolds from beach, to waves, to underwater until we see a magnified view of grains of sand. Children ages 3



to 7 will enjoy participating in this awesome journey through active engagement and thoughtful meditation. Moments of mindfulness practice ask the reader to pause and reflect on the sights, sounds and textures in nature. All the while asking the reader to wonder about the awesomeness of

nature, both distant and right where you are. – (PMD)

Puffin Canada, 2015, ISBN 978-0-670-06933-0 (hb), 32pp., CAN \$21.99 from: www.puffinbooks.ca

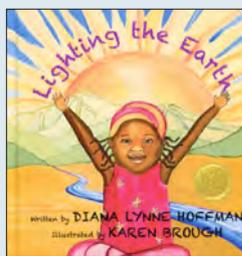


A Friend for Lakota

In *A Friend for Lakota: The Incredible True Story of a Wolf Who Braved Bullying*, the reader watches as the young wolf pup grows up. Through Lakota's story, as told by Jim and Jamie Dutcher, we learn about wolves and their pack behaviour and how this timid

but playful wolf is affected by such behaviours. As the pack grows, the omega Lakota is bullied by the bigger and stronger wolves. However, the beta wolf takes a stand and befriends him. Together they are able to be themselves and help each other out. The amazing photographs taken by the authors, as they lived and studied this wolf pack over six years, give us a glimpse into these creatures lives. It's a beautifully laid out story, with great attention to detail, which leaves us wanting to learn more. The back of the book helps to provide some of this information, along with linking to further resources for this journey. For K-3 students the story will also provide a unique way to approach the subject of bullying and the power of friendship. – (VU)

National Geographic Society, 2015 ISBN: 978-1-4263-2082-8 (hb), 32pp., US \$16.99/CDN \$19.99, from www.kids.national-geographic.com



Lighting the Earth

There is so much extraordinary beauty packed into *Lighting the Earth*. The story, told by Diane Lynne Hoffman, can be used to discuss many different topics for happiness, growth and development. The author shows us the true love and amazing

bond between mother and child, as mother nourishes her child to discover herself, her purpose and her passion. As daughter grows, she becomes passionate about protecting the Earth, and the importance of caring for our rivers. Most prominently though, the book beautifully describes how each and every person has a unique purpose in life. Mama helps her daughter to see her inner shining light and guides her to understand what her light means. Hoffman's writing makes you feel the story, as you find yourself looking for your own inner light. The illustrations of Karen Brough bring to life the characters and add

ethic, and patience. “In forging multi-dimensional symbiotic relationships between learning gardens, school, students, teachers, community members, and living soil, life becomes a central focus of teaching and learning.” This resource will bring fresh insights and new levels of awareness for teachers and administrators considering (or already using) garden spaces in their schools. – (PM)

Routledge, 2012, ISBN 978-0-415-89982-6 (pb), 227 pp., US \$43.95, from www.routledge.com

Angry Birds Playground

In the wildlife themed picture book, *Angry Birds Playground: Animals*, children are invited to join in the search for the angry bird’s eggs. In this *Around-the-World Habitat Adventure*, Jill Esbaum brings the reader along as the well-known characters travel



damp Rain Forest to the dry Desert, the deep Ocean, the flat Grassland, and finally to the cold Polar environment to the North and South. The book uses large colorful photographs, overlaid with the cartoon birds, and minimal text. Children can follow the dialogue of the birds as they come across the animals who call each of these habitats home. There is also a small amount of descriptive text and a fun fact box providing details on the species of focus on each page for interested older readers. By making

to some of the worlds most unique environments. This adventure takes the reader through climates ranging from the

the story a search for the missing eggs, children between 4 and 8, will follow along as each page is turned. – (TV) National Geographic Society, 2012, ISBN 978-1-4263-2457-4 (pb), 128pp., US \$9.99, from kids.nationalgeographic.com



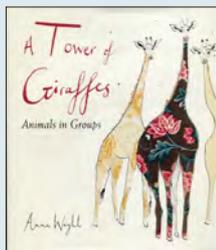
Great White Lies

Few animals invoke greater fear than sharks, but just how much of a threat do they actually pose?

The documentary *Great White Lies* seeks to answer this question and condemn shark culling practices. Skyler Thomas reveals the devastating effects of the Western Australian shark cull, which inhumanely targets several shark species, while unintentionally killing many

depth to the emotions brought forward by this beautiful tale. Children of all ages will fall in love with the characters and be moved to find their own inner light. – (BT)

Aurora Books, 2014, ISBN 978-0-9891296-4-0 (hb), 34pp., US \$19.95 from www.ecojusticepress.com



A Tower of Giraffes

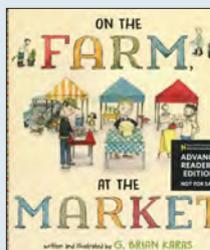
In a *Tower of Giraffes: Animals in Groups* we are introduced to what groupings of different animals are called. The author, Anna Wright, also provides us with interesting and fun facts about each of the animals. We learn that geese are called a gaggle when they are on

the ground, but when they are flying they are called a skein! We meet many different animals, from a colony of koalas to a drove of pigs, a prickle of hedgehogs to a romp of otters. Some of the names seem to fit perfectly, like a herd of elephants or a flock of sheep, and others may make you giggle, like a mischief of mice and an ostentation of peacocks. Wright mixes facts with fun, and tops it off with gorgeous sketches with added real elements such as feathers, wallpaper and wool clothing. This book will be a hit with toddlers learning new animals, to school-agers learning interesting facts about each animal. – (BT)

Charlesbridge, 2015, ISBN 978-1-58089-707-5 (hb), 32pp., US \$17.95/CDN \$19.95 from www.charlesbridge.com

Farm to Market

Food and community is the focus in G. Brian Karas’ *On the Farm, At the Market*. Young children, ages 3 to 8, will get a glimpse into how food gets to our tables; from farms directly to farmers’ markets. This contemporary look at small farms is formatted into two sections; farm



and market. The farm section shows three farms readying goods for market; a vegetable farm harvesting and packing fresh produce, a dairy farm making cheese, and a mushroom farm showing various methods of mushroom cultivation.

The market section shows each farmer setting up tents and stalls, selling their wares, and interacting with community. The illustrated scenes of the farms and market are skillfully composed with gritty earth and sunlit compositions. – (PMD)

Henry Holt and Company, LLC, 2016, ISBN 978-0-8050-9372-8 (pb), 40pp., US \$17.99 from: www.mackids.com



Leaflets Three

Did you know that just like snowflakes, no two poison ivy leaves are exactly the same? Although often seen as a villain to many a hiker, *Leaflets Three, Let it Be: The Story of Poison Ivy* by Anita Sanchez turns this much maligned plant into an unlikely protagonist. We learn

that poison ivy is an important native plant that provides food, shade and shelter to many native animals. Robin Brickman uses a combination of drawn and collaged elements to supplement the text and create a visual seasonal guide to identifying poison ivy in its various growth stages. The “Itching to Know More” section has further information on poison ivy’s place as a native plant and how humans can avoid the allergen. All this makes it an interesting read for older readers as well as for the target audience of 4 to 8 year olds. – (PMD)

Boyd’s Mills Press, 2014, ISBN 978-1-62091-445-8 (hb), 32 pp., US \$16.95, from www.boydsmillspress.com.

other innocent aquatic animals. Noting that this practice has a negligible effect on beach safety, the film examines possible economic and political motivations for the shark cull. In the classroom, the film can be used to promote discussion about the impact science, media, and politics have on environmental decision making. Due to some graphic images of the shark cull, it is probably best suited for high school students. – (EB)

Green Planet Films, 2014, (DVD), 50min, US \$149 (colleges/universities) or \$39 (K-12), from <greenplanetfilms.org>

Solar-Powered Showdown

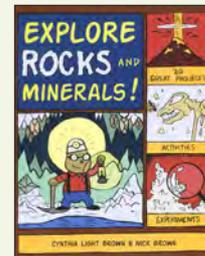
Have you ever wanted to explore solar-powered gadgets with your class, but weren't sure where to start? Picking up *Nick and Tesla's Solar-Powered Showdown* should motivate students to get building. The book, by "Science



Bob" Pflugfelder and Steve Hockensmith, follows siblings Nick and Tesla as they use their ingenuity and scientific know-how to find and rescue their missing parents. The twins use a variety of solar powered gadgets (including a long-range rover, a spy birdhouse, and even a "guaranteed-not-to-explode-frankfurter heater-upper") to outsmart the villains. Detailed instructions for building these devices are provided throughout the book, allowing students to get involved in the action. The book's humour should appeal to students aged 8 to 12, although younger children may need support with vocabulary and gadget construction.

Science teachers of older students can conceivably use the existing gadget designs as stepping stones to student-designed projects. – (EB)

Quirk Books, 2016, ISBN 978-1-59474-866-0 (hb), 259 pp., US \$12.95, from www.penguinrandomhouse.ca



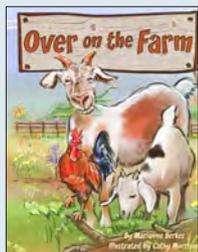
Explore Rocks and Minerals

It's time to shake things up with *Explore Rocks and Minerals*. Cynthia Light Brown and Nick Brown take us for

an exploration of the gems that make the world go around. The authors provide a crazy amount of facts about rocks, which you might need to help break things down for your students.

Over on the Farm

Take young children on a visit to the farm to meet all the animals and sing, count and dance along together, without ever leaving the classroom. The story of *Over on the Farm* is based on the traditional song, "Over in the Meadow," and is a continuation in the series written by Marianne Berkes. The lively illustrations by Cathy Morrison will have everyone giggling as children learn the movements, sounds and names of the baby animals. There's a built in search and find game throughout the



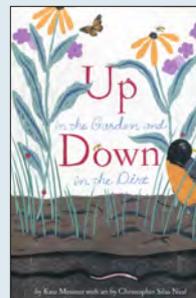
pages and lots of suggestions in the back. These suggestions includes a section on fact or fiction that sets one straight on the numbers of animals a mother would actually give birth to rather than the liberty that was taken in the book. Ways to integrate the book into Math, Science, Language, Music, Art and Cooking lessons are also included. The kindergarten to

third grade curriculum opportunities abound with this book that covers habitats, animal families, counting, movement and music. The website provides further links to help actively engage students. – (VU)

Dawn Pblications, 2016. ISBN: 978-1-58469-549-3 (pb), 32 pages, US \$8.95, from <www.dawnpub.com>

Up in the Garden and Down in the Dirt

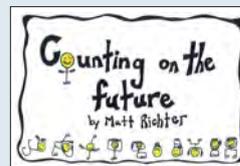
The relationship of gardener, garden and nature is beautifully depicted in *Up in the Garden and Down in the Dirt*. Kate Messner has us following as a young girl and her Nana prepare their garden plans in the winter, create garden beds and plant seeds in the spring, care for and enjoy the fruit and vegetables in the summer, harvest in the fall and say goodbye as winter returns. The story is



told as a back and forth above and below the ground, highlighting the relationship and importance of all insects and animals in nature and your garden. True respect is given to all creatures in this book as they explore each one's purpose. Christopher Silas Neal beautifully draws two-dimensional images which highlight the symbiotic relationship between gardener and nature. At the

end of the story comes three informative pages which provide a closer look at each of the animals mentioned. This book is a wonderful way to help children of all ages value gardening, nature and life. – (BT)

Chronicle Books, 2015, ISBN 978-1-4521-1936-6 (hb). 52pp., US \$16.99 from www.chroniclekids.com



Counting on the future

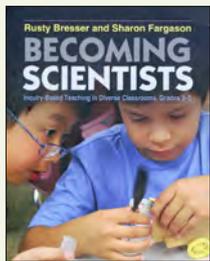
Counting on the future by Matt Richter is a counting book for young children that is designed with sustainability in mind.

On one side of each double page spread are sequences, such as "three wind turbines" or "four solar panels", which link numeracy with the symbols of a greener future. To reinforce the featured number, matching syllables encourage young learners to clap out the numbers. The opposite pages are mostly blank to encourage students to post photos, draw their own illustration, or add their own questions and ideas. A refreshing take on the more conventional counting book! – (TG)

Matt Richter, 2015, ISBN 978-0-9949847-0-8 (pb), 24pp., US \$12.95/CDN \$12.95 (no tax), from 705-385-8721 or kmrichter@vianet.ca

This book is packed with projects, activities, and experiments that allow students in grades 1 to 4, to relate to and get excited about the concepts of rock formation, mineral and rock types, the earth's structure, fossils, and forces of friction and gravity. It contains lots of neat teaching tricks, such as explaining the pressure on the Earth's core by laying on the floor and having someone rest over you to feel their force as the earth does and using a hardboiled egg to represent layers of the earth. – (TV)

Nomad Press, 2010, ISBN 978-1-934670-61-3 (pb), 92pp., US \$12.95 from www.ipgbook.com



Becoming Scientists

Inquiry-based learning in science class can be a challenging endeavour even for experienced teachers. *Becoming*

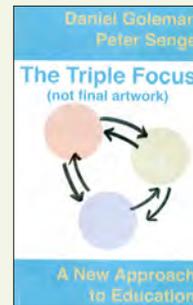
Scientists: Inquiry-Based Teaching in Diverse Classrooms, Grades 3-5 is a helpful resource to get started. In this

book, authors Rusty Bresser and Sharon Fargason emphasize the importance of open inquiry in fostering scientific understanding and critical thinking skills. The authors delve into how to facilitate student-centred inquiry in the classroom. Of particular interest is the focus on Fargason's own classroom, where students ask questions, design experiments to find answers, and analyse their results to come to a deeper and more powerful understanding of scientific concepts. While these students are in grades three to five, many of the strategies are still relevant with older students. – (EB)

Stenhouse Publishers, 2013, ISBN 978-1-57110-978-1 (pb), 180 pp., US \$20.00, from www.stenhouse.com

The Triple Focus

The title of this book, *Triple Focus*, may evoke the phrase 'triple bottom line'. However, in this densely packed, quick read, the topic is social emotional learning (SEL) and the value in whole child education. The three focuses of the method are inner, outer, and other. Daniel Goleman and Peter Senge describe core abilities taught in top SEL



programs, and follow this with chapters on Focusing on Ourselves, Tuning into Other People, Understanding the Larger World: Systems Thinking and Systems Intelligence. In their final chapter

focused on joining SEL with systems education, the authors note that when either topic is taught well, "there is a natural emphasis on experience-based lessons, and on project-based learning, action learning, and cooperative learning." As described, this program has students engaging what is important to their lives and asks them to take control of their own learning. *The Triple Focus* will provide case studies and ideas of use to any educator working to apply social emotional learning systemically in their educational setting in order to better prepare children for their future. – (PM)

More Than Sound, 2014, ISBN 978-1-934441-78-7, (pb), 78 pp., US \$14.95, from www.morethansound.net

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Teaching About Invasive Species

Our newest book

Whether working inside or outside schools, youth educators will find in Green Teacher's latest book the tools to engage young people from 6-19 years of age in this challenging topic.

Invasive species, if unchecked, will continue to have significant negative impacts on our environment and on our economy. Fortunately, the spread of many invasives can be checked. To succeed, we'll need effective education strategies to be widely deployed. This book aims to fill that gap. Included in its 80 pages are descriptions of 11 innovative, youth education programs, and 20 ready-to-use activities that are appropriate for various age groups.

\$14.95 single copy, bulk prices as low as \$3.50

Education and awareness are key to preventing the spread of invasive species across the landscape. Green Teacher Magazine has compiled an excellent resource for teachers and other youth educators to guide young people through this important subject and encourage practices that will help maintain balance within ecosystems.

Luba Mycio Mommers, Executive Director, Canadian Wildlife Federation Learning Institute

Studying invasive species creates conflicting ethical and ecological dilemmas. This book excels at defining invasive species and helping teachers navigate and understand the complexities while teaching their students this important topic.

Jeanine Huss, Associate Professor, Western Kentucky University

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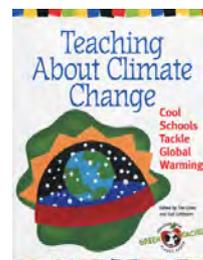
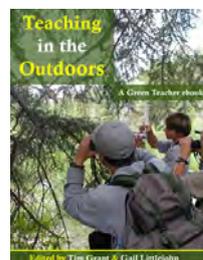
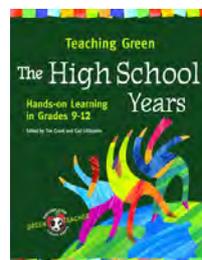
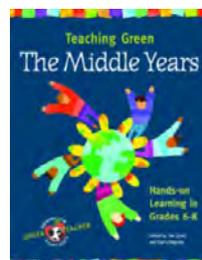
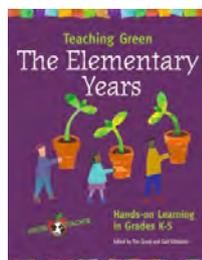
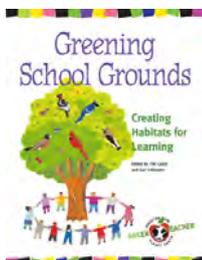
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