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Learning Naturally: An Inquiry Study of Streams in Hawaii

By Becca Kesler

Jungle foliage arched high above the clear, knee-deep, rock-strewn stream. The melody of moving water was interwoven with the sounds of children as they worked their way down the bank and into its flow. One child picked a cluster of large rocks that he could hold on to, and walked around them several times, testing the difference between the way it felt to move upstream, round the top, and then get pushed downstream. Each time he repeated it, he seemed to gain confidence with what to expect at each point in the circle and how to move in response to the different directions and speed of the flowing water.

*—Waianu Stream, April 2014
(from my teaching journal)*

At a time when teachers are under tremendous pressure to quantify student learning and prepare students for standardized tests, it is easy to lose sight of the most essential part of our work as educators. In this climate, instead of responding with numbers, graphs, and narrowed gaps, perhaps we need to consider our role in our students' lives and ask a more fundamental question: What qualities do we want to develop in human beings?

As a teacher of young children, I ask myself: How can I nurture human beings who are productive, creative, responsible, and able to contribute to the future? Will they be able to care for and sustain the world they are inheriting? These are essential questions as children today are facing social and emotional challenges due to shifts in society and family lifestyles. These shifts often mean less unstructured time, less outdoor play and exploration, and less possibility for the experiences these activities provide. At school, children often contend with the pressures that teachers and administrators are feeling, either directly or indirectly. In these environments, I wonder: Where is the time for investigation, problem solving, creativity, and sense-making experiences?



I know that learning needs to be grounded in experiences. Developmental psychologists, such as Piaget (1990) and Vygotsky (1978), have shown us

that young children learn through their senses; they learn by talking and working with other learners; and they construct their understanding of the world through multiple experiences over time. Even before the developmental psychologists, progressive educators identified the importance of experience. Philosopher John Dewey (1990) contended that the concern of the teacher is to find ways in which subject matter may become part of the child's experience. In *Young Geographers*, Mitchell (1991) noted that since children's experiences begin with their immediate communities, "the school's job is to begin with the children's own environment, whatever or wherever it may be" (p. 8).

How can learning through exploration and experiences be achieved today? One possible answer, I believe, can be found in place-based education. As Sobel (2012) explains,

Place-based education uses the local community and environment as a starting point to teach concepts in the curriculum. It emphasizes hands-on, real-world learning experiences, increases academic achievement, helps students develop stronger ties to their community, enhances students' appreciation for the natural world, and creates a heightened commitment to serving as active, contributing citizens. (Distance from Beauty section, para. 7)

With these foundational tenets of my pedagogy and my awareness of place-based education, I designed a teacher-guided, place-based inquiry curriculum. I anticipated that it would give my students opportunities for exploration, critical thinking, problem solving, creativity, and collaboration, while developing a relationship with the natural world. This is the story I would like to share. My hope is that it will provide other teachers with the inspiration to consider the rich learning opportunities available in their local environments.

Designing a Place-Based Curriculum

As a kindergarten teacher at Punahou School, a large, independent K-12 school in Honolulu, Hawaii, I am keenly aware of the need to design curriculum that is locally based. Units of study created on the mainland about ecosystems that are distinctly different from the subtropical, island-based environment in which we live usually have little connection to the lives of my students. In addition, I have a curricular directive to develop, through inquiry, the broad themes of “Needs” and “Interdependence.” The school’s kindergarten program is coupled with first grade’s, and this curricular focus lasts two years in the hope that by the end of first grade, the children will have the basis of an understanding that all living things depend on each other and their environment to meet their needs, in order to survive and thrive.

Because children are developing these concepts over a two-year span, we alternate between a focus on the inland/mountain region of our island one year, and on the shoreline/ocean region the next. (In Hawaiian, these are called the mauka and makai environments, respectively.) Although children study each region in an alternating sequence depending on their year of entry, every child will focus on the total island environment over the two years. Teachers are given professional discretion in determining the specifics of how these big ideas are developed. Children’s interests and questions, parent and community resources, and teacher strengths and passions shape the studies in each classroom. This is summarized in the table below:

Curricular Overview

Theme: Needs and Interdependence

Essential Understanding: “All living things depend on each other and their environment to meet their needs, in order to survive and thrive.”

Mauka focus:

- How do we depend on the land to meet our needs?
- How do other living things depend on the land?
- How do the land and all living things depend on each other?

Makai focus:

- How does the ocean meet the needs of the plants and animals for which it is home?

- How do we depend on the ocean?
- How does it depend on us?

My story takes place in the mauka year. In the spring, as one part of our yearlong study, my kindergarten partner, our two first-grade partners, and I decided to focus on water. We began by asking our two classes what they knew about water. As I queried my kindergartners, I learned that they knew that if you didn't have water, you would die. They also mentioned using water for a bath, getting water from the faucet or from a hose, and having water in a swimming pool. (One entry point to our study might have been to research how our water is supplied. However, since our municipal water supply system comes from an underground aquifer and none of the pipe systems are observable above ground, we abandoned this idea as not being age appropriate.)

My kindergarten students also talked about the salty ocean water that surrounds our islands, which they knew you couldn't drink if you were thirsty. Further, they knew that if you dug down into the sand at the beach, you could find more water. And, of course, they mentioned the rain. They know it intimately, from momentary showers of gently blown, misty rain, to sky-emptying downpours. What became apparent is that they didn't understand how all these water elements are connected.

Our island geography is such that a mountain or ridgeline essentially forms a backbone up each side of the island; valleys then fan out from the ridgeline, creating multiple watershed systems around the island.



For the indigenous Hawaiians, these formed the basis of their land-division system. These areas were called ahupua'a and provided all the resources from the uplands to the ocean that were nec-

essary to sustain life. While our current land-use patterns are no longer based on this principle, this concept is helpful in recognizing the underlying physical geography, acknowledging the ways of the native people, and finding the paths of the streams from the mountains to the sea.

After some discussion, my teaching partners and I decided to focus on these stream systems, exploring the way water travels in streams, flowing down through the valleys and out to the ocean. This would be an observable and sensorial experience, rich with ideas to wonder about and investigate. It would also provide students with chances to collaborate with each other. Further, it would give the children “an opportunity to bond with the natural world” (Sobel, 1995 *What’s Important* section, para. 11).

From the outset, I suggested that we take at least three trips to three different streams. At the beginning of my teaching career, when I was a faculty member at the Bank Street School for Children, I learned that at least three similar trips are needed for an effective study. With one trip, children are not able to generalize. With two trips, they tend to do some comparing and contrasting, mostly recognizing differences. It is not until the third experience that children begin to create an overarching understanding of the topic being explored. So to this end, my partners and I agreed that we would explore three different valleys and three different streams.

Our First Trip: Visiting a Nearby Stream

First we decided to visit the stream closest to our school, Manoa Stream. It flows through the campus of the University of Hawaii (UH), and the Hawaiian Studies Department has developed an educational site along it. Here they cultivate a wetland variety of kalo (the Hawaiian word for taro), an indigenous, staple crop, and they demonstrate this ancient, yet current, agricultural practice. We wanted our students to be able to look not only at the stream, but also at the system that brings fresh water to the lo’i (the ponds where the roots of the kalo plants stay submerged).



Early in February, we loaded the school bus with 50 kindergartners and first graders, dressed for an immersive learning experience. The site's Hawaiian Studies educators led our visit. First, they introduced the children to the area and told an ancient story about two great ancestors who discovered fresh water here because they were so thirsty after a long ocean voyage. Next, the entire group walked along a trail to discover the source of the water in the lo'i. A little way upstream, we noticed that a rock dam was built across Mānoa Stream, causing the water to pool up behind it. Here we could see that some of the stream water is diverted to a side ditch, called an 'auwai. This human-made stream then brings water to the lo'i and fills them, and then the water exits and flows back into the original stream. After learning a song that explained all the parts of the system, we followed the 'auwai back downstream to the lo'i.

Next, it was the children's chance to become kalo farmers. They were asked to gather dead kukui (a native tree) leaves from the ground and then, leaves in hand, they were invited to enter the water of one of the recently harvested lo'i. "Stomp the leaves down into the mud," called our guides. "They make organic fertilizer for the next crop." Almost instantly, the children were covered in mud at least to their thighs, and some even higher! At first, a few weren't sure about getting muddy and wet, but when they saw how much fun their friends were having, everyone joined into the wondrous, cool, mucky experience. They loved rinsing off in the 'auwai before getting back on the bus to go back to school. "Best day ever!" they cheered.



Getting that muddy was a new experience for most of the students. I thought of Sobel's (1995) words about the natural world, and our responsibility to help children "learn to love it and feel comfortable in it" (What's Important? section, para. 11). I hoped that their love and comfort was starting to grow.

I also thought about how crowded the 50 children had been along the streamside trail. I remembered how they tried to get onto the rocks or touch the water, but that safety concerns had prevented the adults from allowing this to happen. I longed for the children to go back and revisit this place that was so close to our school but previously unknown to them. I knew there was more learning to be had.

An Unexpected Opportunity: A Chance to Revisit the Stream



As it happened, our PE teacher, Peter, had recently gotten involved in learning to farm kalo. One day, I asked him if he had ever been to UH's lo'i. He had not, but he was extremely interested in visiting it. Suddenly, both of us realized that we had a great opportunity. Since he already took half-groups of students around our campus for 45 minutes of physical activity, alternately, we decided to combine these two periods and take half of each class to the stream and 'auwai over two weeks. The assistant teacher would remain at school with the other half-group.

This second visit to Mānoa Stream allowed for the deeper experience I had imagined. Children were very keen to go back. With fewer children to manage, we were able to let them wander more and collect sticks, fallen coconuts, freshwater clamshells, and leaves along the way. We observed more closely how the rock dam stopped the flow and created a calm pool behind it. We also noted how the stream water flowed over and around rocks. One child said, “I love how it turns from the rocks. See how the water is turning from the rocks?” His classmate answered, “It’s like the water is going in paths.” The children threw coconut husk pieces into the stream and watched as they raced, whirled and eddied, got stuck, and then moved on again. In contrast, we noticed that the ʻāuwai with its unobstructed flow moved calmly and steadily. Again, coconut husk boats were floated, but this time they moved gently downstream.

As I watched, I could see that the children were starting to build an understanding of what a stream is and how it flows.

Back at school, in our K-1 outdoor play space, we have a hand pump that allows children to create a “stream” over a rock pathway and down into a sandy area. While the children had always been drawn to this area, after our two trips to the stream, I noticed a group of children who went back day after day and intentionally created streams there. They also constructed dams and watched the water pool up behind them. “Break the dam, now!” one of the leaders would shout, and they would all watch to see how far the water would go before it stopped. To support their exploration of water flow and to encourage their creativity, on different days, I provided buckets, scoops, and sticks.

The Second Stream: Observing a Waterfall

A few days later, we traveled to Nuʻuanu Valley, a couple of valleys away from where our school sits. Through a family connection, we obtained permission to hike to a beautiful waterfall in the middle of the rainforest, toward the back of the valley. It was an overcast day as the bus moved steadily uphill, and the view out the windows changed from residential neighborhood to rainforest. The fresh, damp air swirled in, and various types of trees in multiple shades of green became visible. Unexpectedly, a song arose from several of the first graders: “Deep in the forest by the sparkling stream, the trees are painted every shade of green; there’s a place that I can call my own, my home, sweet home.” These lyrics were part of a song they were learning for a school program, but the spontaneity revealed their connection between the song and this place.



Soon the bus turned and took us to the end of a long driveway. As we disembarked, verdant cliffs reached up around us on three sides. The tops of the mountains were hidden, shrouded in misty clouds. “It could be raining up there,” Anna remarked. As we headed down the trail, carefully calculating where to step on the wet, grassy slope, the children squealed excitedly. Before long, the trail leveled out and followed the course of a stream. Here it became a mud path surrounded by moss-covered rocks, stands of bamboo, and large leafy plants. We pushed our way through the dense understory as shoes stuck, sucked, and slid. “Eeeeww! This is really muddy! I think it must have rained before we got here,” Taylor declared. Then as we parted the last branches, we stepped out into a clearing. Directly in front of us, 40 feet of water thundered down over black volcanic rock. The children stopped abruptly and the chilly spray brushed our faces. While most were speechless, Carolyn cried out, “Oh my gosh! That is sooooo beautiful!”

We moved forward toward the falls. The sheer volume of water and noise that it created mesmerized the children. They loved the spray on their cheeks and noted that it was cooler than rain. They also dipped their fingers in the pool near the base of the falls and found it to be cold too. Several children talked about how the rain would come down the mountains, make a stream, and then become this waterfall. Once children really had the chance to take it all in—sight, sound, touch, and smell, we all—children and teachers alike—made colored-pencil drawings of the falls.



This really focused our attention on how the water flowed down and around the rocks. In the middle of all this activity we heard children asking, “Where does this water go? We know it goes to the ocean, but where does it go into the ocean?” We really wished we had been able to have our bus driver take us there, but we had to go back to school.

Since the children were beginning to make connections between the clouds, the rain, and the fact that water flows downhill, we decided that it was time to do some more work back in the classroom. We checked books out of the library that we read to the students, we taught them a song that described the water cycle, and we did the classic demonstration of boiling water so they could see water vapor being made. We also set clear bowls of water with plastic lids out in the sun, so that some of the water evaporated, condensed on the lids, and then dripped back into the water below. For now, we figured, that was enough, since these demonstrations were just an introduction to the water cycle for the children. In *Beyond Ecophobia*, Sobel (1995) states, “The water cycle isn’t something to be taught in two weeks; it is best done over the six or eight years of elementary and middle school” (The Right Places at the Right Times section, para. 7).

The Third Stream: Getting Into the Flow

By now a month had passed since the waterfall trip. We were able to arrange our trip to a third stream because a student in my class had relatives who own a farm on the other side of the island. These farmers grow kalo and other crops, and the Waianu Stream runs alongside their land.

Again, we were fortunate to be able to involve Peter, because that was the same farm where he was learning to grow kalo. Since we planned our trip for the day we would normally go to our art special, we were able to include our art teacher as well. Once at the farm, we had the 50 kindergartners and first graders divide into three groups. They spent the morning rotating through different locations, or stations. One was the lo'i, and another was the stream itself. At the third station, children could choose between observing a water wheel system that produces electricity for the farm (and drawing it), or taking a guided tour to find and identify the variety of food produced on the farm.

Peter's station was the lo'i, where he took groups of students to harvest the kalo. This time, there was no hesitation. The children were familiar with the mud, the water, and the overall experience. They were truly excited to be working like farmers. They knew the plants needed to be harvested and delivered to the people who would eat the kalo. The children embraced getting muddy, pulling up each kalo plant, placing it with the others on a boogie board, and then floating the kalo plants to the bank of the pond, where they were stacked for later transport.



At the stream rotation, I was the teacher in charge. Before the children entered the stream, I showed them which parts of it were safe and where the boundaries to their explorations were. Some stepped cautiously from the bank into the cool, moving water. Others strode in boldly, only to be surprised by the water's force against their legs. Rocking back and forth, they would crouch and grasp for one of the large river stones to steady their balance. There were squeals of delight, outbursts of surprise, and barely audible mumblings as children reassured themselves that they were going to be able to do this.

As I stood on the bank, I noticed that while no child was talking about "flow" and water moving "downstream," their bodies were all working on understanding these concepts. I was pleased to see that their learning was being taken to a new level.

One child picked a cluster of large rocks that he could steady himself against and walked around them several times, testing the difference between the way it felt to move upstream, go around the top, and then get pushed downstream. Each time he repeated the circuit, he seemed to gain confidence with what to expect at each point around the circle and how to move in response to

the differing directions and speeds of water. Further downstream, a group of friends all hung onto a row of rocks so that their legs dangled behind them, chests and heads up out of the water, pretending they were mermaids.





Unlike their mermaid play on land, this required them to orient themselves to the flow of the stream. Another child created a challenge for himself by balancing on the top of a submerged rock, as if daring the stream to push him off.

A few children, who did not go into the water, found a spot downstream where the stream banks widened and the water flowed over a smooth bed of pebbles, creating a calm pool. Here they spent time tossing stones into the water. As they searched for larger and larger stones to make bigger and bigger splashes, they became fascinated by the different “kerplunk” each one made. At one point, one of the kids said, “Hey, this is like music! The big rocks make a low note.”



Taking all this in, I thought about Louv's (2008) concept of "nature-deficit disorder" and how he hopes that "by weighing the consequences of it, we can also become aware of how blessed our children can be—biologically, cognitively, and spiritually—through positive connections to nature" (p. 36). As their teacher, I knew that several of the children in the stream that day who did not do as well in traditional school settings were happy, engaged, and learning here.

At the end of our day, we finally had the opportunity to get back to the question the children had raised on a previous trip: Where does the stream flow into the ocean? Our visit had been to the side of the island that has the advantage of being less developed, so the human overlay is not as great. The distance from the mountains to the sea is also shorter there. Therefore, we had made plans with the bus driver to make certain that we would be able to follow the stream to its outlet.

When we left the farm after lunch, we had the bus stop on a bridge over the stream so that by looking out the windows on both sides, the children could see the water flow underneath us. For the first time since we began our investigation of streams and fresh water, I noticed that many of the children could observe which direction the water was moving by looking to the valley and ridgeline and that they could make reasonable predictions about the direction to the ocean (even though it was not visible). A few miles later, we crossed the stream again. It had increased in width and was so flat that it was barely moving. Yet here the children could clearly make the connection to the parts they had already seen, and as we drove a few hundred yards more, they exclaimed, "Here's where it goes into the ocean!"

The "Stream Homework Project"

At this point, I could see that the children were making the connections that they had not made a few months earlier. I knew that their understanding of mountains, rain, fresh water, streambeds, direction of flow, and relationship to the ocean had all been strengthened. However, I was not certain that they had created a mental construct that would put all these pieces together in a generalized way. As I was trying to decide what a final experience for the study might be, I had a burst of insight. What if I got the families involved?

While I have long believed that parents have a role to play in the educational lives of their children, the attention to that relationship in the schools of Reggio Emilia in Italy has further shaped my understanding. Rinaldi (as cited Cagliari & Giudici, 2001) explains that

Participation is an educational strategy that characterizes our way of being and doing school. Participation involves the children, the families, and the teachers and is viewed not only as "taking part" in something but even more in being a part... There is a recognition that everyone—children, teachers, and parents—is an active subject in the educational relationship, each contributing complementary and necessary knowledge. (p. 136)

As we concluded our study, I realized that I had an opportunity to broaden our learning community in just such a way.

One benefit that I could easily see was that each child would get individualized instruction because he or she would be met at the level of his or her understanding, and the families could answer questions, fill in the gaps, and clarify their children's specific misunderstandings. In addition, the parents would be learning alongside their children.

As I imagined the families doing this project, I knew it meant that they would spend time together exploring a natural environment. Chawla (as cited in Louv, 2008) says, "There is a great need to educate parents about this research—to awaken or inspire the parents' pleasure with nature play—as a necessary context for continued nature experiences for their children" (p. 36). While I didn't directly introduce the families to the research mentioned by Chawla, I hoped that participating in the culminating project would help them to see the joy and beauty that is available when we reconnect with the natural world—a very different experience than the sports practices, dance lessons, and errand running which fill the weekends of so many of my students. I became excited by the possibility that as urban, modern people, they might become aware of which stream is near them and how they are related to that watershed. They might think about how it all flows to the ocean. They might even go back again or strike out on their own to discover other streams. This is how the stream homework project was conceived.

I decided to ask each family to do some research to find out which stream flows closest to their home. They were also asked to try to find the source of the stream in the mountains, follow it down through the valley, and discover where it entered the ocean. I also wanted them to document their trip(s) so that their child could share his or her learning with classmates back at school. I left the medium for sharing open, so that families could do what they could afford and could work with whatever technology was available to them. I suggested some possibilities—making a poster, creating a book, emailing me digital photos, putting together a slide show, or filming a video—and invited them to do whatever worked for them.

However, I must admit that as soon as I had this idea, I began to doubt its feasibility. I worried that parents could see it as a burden and that they might perceive it as something that was my responsibility, not theirs. I was concerned about the technical aspects of getting the digital projects to me. I wondered if children would present their projects well enough, and if their peers would be attentive and gain anything from the sharing. However, after conversations with colleagues, reminding myself again that home-school connections are valuable, and deciding to give families more than three weeks to complete the assignment, I went ahead with it.

As the projects began to arrive, I was amazed at the quality and strength of understanding that they revealed. As varied as the final products were, it was apparent in each one that the experience of learning along with their families had accomplished the goal of enabling the children to generalize that rainwater becomes a stream, flows downhill, and eventually empties into the ocean.

In one instance, four families that all lived in the same area met to do the work together. The video that one of these families produced revealed discussions among the adults that showed that they were constructing their understanding alongside their children.

The students were fascinated by every project. No matter the media, they listened respectfully and asked the presenter meaningful questions or made relevant comments such as: “Did you get to go to the waterfall?” “Where are the two streams coming together? How did you know that?” “That stream is by my house, too!” It took us about nine school days to find the time to view all the projects, sharing a few of them at each sitting. Regardless, excitement and engagement remained high throughout.

While these projects could never have replaced the experiences the students had visiting actual streams with our class, now the children were able to take these virtual trips and learn from them. The stream homework projects allowed them to “visit” many more streams than would have been feasible otherwise. As the children viewed more and more places, they began to see similarities and differences that had not emerged earlier. They were fascinated to discover that almost every stream had at least one bridge. Along with learning the vocabulary, they learned the difference between “natural” streams and “man-made” streambeds, as many of the streams flowing through neighborhoods are in cement flood-control canals. They discovered that some of the streams join together before they get to the ocean, and several of the children found out that “their” stream entered the ocean at the same place as another child’s. Interestingly, the source of one child’s stream was a spring and didn’t start in the mountains.

Full Cycle

At the end of the year, I asked my kindergartners again what they knew about water. Abigail described the whole water cycle with great enthusiasm. Many mentioned that water flows downhill and that streams empty into the ocean. James commented, “You have to be careful what gets into the stream because it can end up in the ocean and might hurt the animals there.” Then Carolyn and Anna chimed in, “Waterfalls are so beautiful and they tickle you.” William talked about the difference between fresh water and salt water. He stated that although stream water is fresh, it must also be “clean” before we can drink it. “But it can be used for plants and you can play in it,” Emily added. I was satisfied that our study of stream systems had helped them to deepen their understanding of how we depend on the mauka environment to meet our needs. They know that fresh water is not only necessary for survival, but that it also helps us to thrive.

But more than learning any of these concepts, in the process the children discovered that they are learners. They were involved in being productive, creative, and responsible. They now know that to observe, to wonder, to touch, to test ideas, and to figure things out is immensely satisfying. They know joy and beauty and are developing a relationship with the place where they live. They are learning to care about it. These children have the potential to contribute to the future and to care for and sustain the world they are inheriting.

My story took place in Hawaii, the home for the teachers, students, and families at my school. However, such a story should not to be considered unique. It could take place anywhere around the world in any environment. If teachers can look to their local environments and the rich opportunities they provide, we could be shaping the kind of human beings the world needs everywhere. Place-based education says, fundamentally, that who you are, where you are, and what you

experience has value and is worth knowing. We could be learning naturally. That is something that can never be accomplished with a one-size-fits-all, generic, standardized curriculum. Just imagine the possibilities—for children, for teachers, for families, for communities, for the earth.



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