



A Curriculum of Wonder: An Interview with Mark Wagler

Mark Wagler and Tim Frandy

Mark Wagler is a retired 4th- and 5th-grade teacher, former professional storyteller, folklorist, and now a consultant and writer. Raised Amish-Mennonite in Ohio, Wagler worked many jobs before settling into public school teaching at the age of 43 in Madison, Wisconsin, where he quickly became known as a profoundly engaging teacher. His classroom looked little like conventional classrooms. There were no desks, but rather couches, tables, and an enormous amount of equipment and materials; the classroom didn't face forward, but rather clustered in a number of circles; Wagler didn't primarily teach by instruction, but rather by embracing the power of unknowing and the innate curiosities of his students.

Wagler's innovative pedagogical techniques in the science classroom are rooted in inquiry-based learning, local learning, and interdisciplinary methodologies. None of this would have been possible without his deep training in the humanities. This radical redesign of his own classroom led him to win the 1996 Presidential Award for Excellence in Mathematics and Science Teaching.

As guest editor of this environmental humanities issue of JFE, Common Ground: People and Our Places, I sat down with Wagler in early June 2018 in his Madison home to talk about how he understood the relationship between local culture and the sciences in his classroom. What follows is an abridged and edited version of this conversation. We spoke about his journey, his inquiry-based science curriculum called "I Wonder," how classrooms could be like prisons, and how we as educators can create liberating learning environments.

A student observes purple coneflower in the Randall Outdoor Classroom.

Tim: *Can you say a few words about your professional journey into teaching?*

Mark: My first year of teaching, when I was 19, I taught high school geometry and American literature in a small Amish-Mennonite school, just over the hill from where our family lived out in the country. Since then I've taught in quite a few settings, urban and rural, public and private, traditional and progressive, from preschool to graduate school, and from religious education to artist residencies. That includes a cooperative family daycare, primary grades in an alternative school, college English, graduate education courses for teachers on using storytelling in language arts and the social studies, and working in more than 700 schools as a storyteller. For four years, I did research at the University of Wisconsin–Madison on how and what middle-school students learn when they use augmented reality games played on mobile devices to study local places.



Mark Wagler immersed in prairie plants.

T: *When did you start in the Madison school system?*

M: In 1987, I decided I didn't want to live on the road as a storyteller. I just needed to be home more. Since I already had my degree, I went through a fast-track teacher certification program, which took less than a year. I taught for three years at Glendale School on the Southeast side. From 1990-2006 I taught at Randall Elementary School, which is our own neighborhood school.

T: *Could you characterize your core curriculum?*

M: Folklore was explored everywhere, especially in social studies, where we balanced texts for required study of U.S. and Wisconsin history with our primary focus—extended investigations of what we called “local culture,” an integration of history, geography, economics, political science, and expressive culture. Students documented family and neighborhood culture for homework, and the whole class used classroom interviews, frequent fieldtrips, and design projects for yearlong cultural tours. In science, we combined student investigations based on their questions with observations of their backyards, the Randall Outdoor Classroom, biweekly Mornings-in-the-Marsh, and our Living Machine (a complex classroom system of connected containers that modeled multiple habitats and species in the marsh).

Mornings-in-the-Marsh

Mark Wagler routinely took his students out of the classroom to a Lake Wingra marsh within walking distance of the school. These fieldtrips supported all kinds of interdisciplinary curricula, including scientific observations, drawing plant specimens, service learning, and writing poetry and fiction about some aspect of the marsh. The lake critters they observed during these half-day field labs were regularly brought back to the classroom to incorporate into their Living Machine – and sometimes later used for I Wonder projects.

T: *What did your studies of culture and nature have in common?*

M: In both social studies and science students experienced real-world, place-based learning; in-depth, hands-on inquiries; extended documentation of what we discovered during our inquiries; analyzing patterns and uncovering complex systems; representing our research through many media; and probing areas where nature and culture overlap, such as health, beliefs, and sustainability. Our investigation of the world was bifocal: Whenever possible, we looked at the world both through the lens of STEM (Science, Technology, Engineering, Math) disciplines and the equally important complementary lens that I call LACE (Language, Art, Culture, Experience).

T: *But you had little training in the sciences, right?*

M: When I was getting my teaching credentials, the only science methods class I took was an independent study focused on what was back then called “children’s science.” The idea was that to teach science well, teachers first need to know the concepts their students have, and how they reason with these concepts, before we design curriculum to improve their understanding.

You know, in other fields, I’ve had so many real-life work experiences. Related to the social studies, I researched history articles for *Encyclopedia Britannica*, worked as a folklorist and community organizer, did neighborhood planning. In language arts, I’ve taught writing at a community college and have been a storyteller, freelance writer, and co-editor of a newsletter for alternative schools. Relevant to mathematics, while writing sections of a parks and recreation master plan, I immersed myself in statistical data collected from an extensive community survey. But with science, I didn’t know where to go.

I was already in the habit of creating curriculum in my storytelling residencies, but I just didn’t see that I could create anything lively in the sciences. So, in my first few years of teaching in Madison, I used standard science textbooks, with their “cookbook” experiments. They were the least lively thing I taught!

So very quickly, I began to focus on science ... first just to learn for myself. I really wanted to work with the idea of students as scientists. I created an exercise in which students looked with curiosity at the natural world and wrote sentences beginning with “I wonder ...” “I wonder what causes the breeze that’s blowing in the window, and why sometimes the breeze will come and then pause and then come again.” “I wonder why something falls when I drop it.” They were emerging questions about nature, really. Then students used these sentences to form questions that can be answered by collecting data and developed procedures that generate relevant data. There was an engaging quality to all of this: Kids liked creating experiments to answer their own questions.

Gradually the “I Wonder” curriculum emerged, replacing our textbooks. Student engagement and learning flourished. As I transferred methodologies from disciplines I was fluent in—especially social studies and language arts—to the area in which I felt most inadequate, I reframed my ignorance about science to experiencing my curiosity as a strength.

“I wonder what causes the breeze that’s blowing in the window, and why sometimes the breeze will come and then pause and then come again.”

T: How did your students respond to this kind of learning? It's certainly a different way of learning from the "cookbook" approach.

M: When it comes to "I Wonder," the most coherent thing I can say is that kids *loved* doing this. They loved being able to muck around in their own questions, and they loved the time we devoted to this practice. We're not talking about a day or two; this is a month after month kind of practice.

Now, I'm teaching both 4th- and 5th-graders in the same room, and working with these students for two years. Very often on the first day of school, the returning students would come back, and one of the first questions they would ask is, "When can we start working on our 'I Wonder' projects?" These are the 5th-graders saying this. Picture yourself as a 4th-grader, and these 5th-graders are there who already know this space, this learning style. In many ways it's not very much about me. I'm helping to create this space, but these kids come in with this huge drive and desire to be engaged. If you're a 4th-grader and you're watching this, you immediately are curious: "I wonder what the hell is going on here."

Imagine students working on long-term investigations based on their own questions, reflecting all areas of the curriculum. Conjure up classrooms of students working on multiple projects: here a survey, there an experiment, data everywhere. Picture kids doing interviews in the community, puzzling over algebra, or analyzing media.

Fancy those children working together, reporting on research, brainstorming strategies, drafting, and peer editing articles. Suppose they could publish what they've learned in a journal distributed to many hundreds of students and adult educators. Contemplate the pride kids will feel after all their hard work. Dream of the vast potential of student wonder and performance.

And open your eyes to Great Blue.

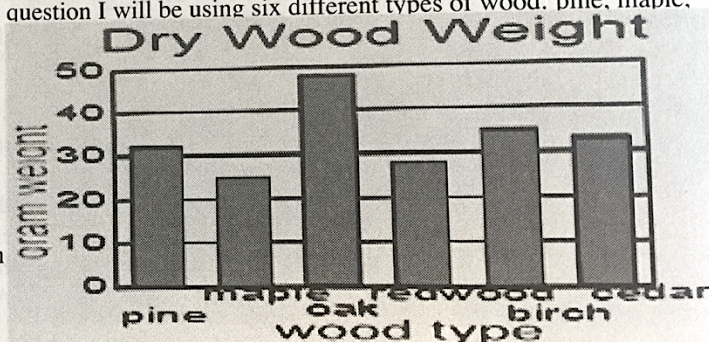
(Wagler 2002, 120-21)

Wood in Water: A Study of Absorption

By Ava Kay
Randall School

Introduction

My Great Blue question is, What type of dry wood soaks up the most water in 19 days and how quickly does the wood absorb water? To answer my question I will be using six different types of wood: pine, maple, oak, redwood, birch, and cedar. In this experiment I am weighing the wood in grams before and after the soaking. To determine which wood absorbs the water fastest I will be weighing a second set of wood samples in shorter time periods. I thought of this question after an hour of thinking with my dad. I picked this question because I wanted to do something on science that involved nature. This article



Fourth and fifth grade students published their research in the journal, *Great Blue*.

T: *Your classroom itself was unconventional, with couches, plants, and an unorthodox layout. You almost need that sort of disruption to help students unlearn how they are encultured into formal education...and how they presume that real-world learning actually works.*

M: It was almost as if it wasn't school. We had a lab space by the windows where plants would grow, a presentation space by the blackboard, a studio space for creating, a reading space, and a variety of nooks and tables for collaborating. Things were different in this space, so when kids walked into this environment, at first, they're like, "Wait, wait, wait... where's my space? What am I doing?"

As they got used to it, and they start talking about things like their Great Blue projects (that would be published in our student research journals), then they started thinking and behaving differently. It's not your volcano project; it's not your states project. It's your Great Blue project; it's your great imagination.

Even our journal used different names for disciplines. We had five sections: "I Wonder" for science; "Kid-to-Kid" for cultural inquiry; "It Figures!" for mathematics; "Critics & Fanatics" for reading; "The Gallery" for art.

T: *This sort of framing is so important. We frame ideas, methodologies, knowledge production, and transmission in cultural terms...in cultural terms that reflect privilege and power. Challenging what a classroom is, what a classroom can be, seems to be essential in this educational model.*

M: One time we were talking about different cultural uses of lines and circles, between Native and Western cultures. In Western cultures, I told them, we're born in the hospital, in rows of rooms with straight hallways. They take us to the nursery where all the bassinets are lined up in rows. We get to school and line up to do things. We line up at the grocery store, and when we die we again are put in rows in a cemetery. Everything is in rows. And if we do something wrong, we might get put in prison. Of course, that's all rows—the rows of bars, and every cell is identical. Now, when I first told students this, I remember I said, "You know, doesn't it feel sometimes like school's a bit of a prison?"



Everyone is usually on task during Lab Time, as individual students and teams plan, observe, record, and interpret results.

The Great Blue research projects, student investigations at the core of Wagler's curriculum, were published annually in *Great Blue: A Journal of Student Inquiry*. Students from the entire Heron Network (a group of teachers using similar place-based, student-centered, and inquiry-based pedagogical methods) contributed to this journal. Like adult researchers, Wagler's students figured out what they wanted to learn, devised research protocols, presented their progress in classroom lab meetings, and published their findings in the interdisciplinary *Great Blue* journal.

“Oh, yes, yes, yes, Mr. Wagler! School’s like a prison.” “Why is it like a prison?” They talked, and decided it was because it could be boring. “So, when we’re bored,” I asked, “Whose fault is it?” Some got a little bolder: “Well, it must be your fault, Mr. Wagler!”

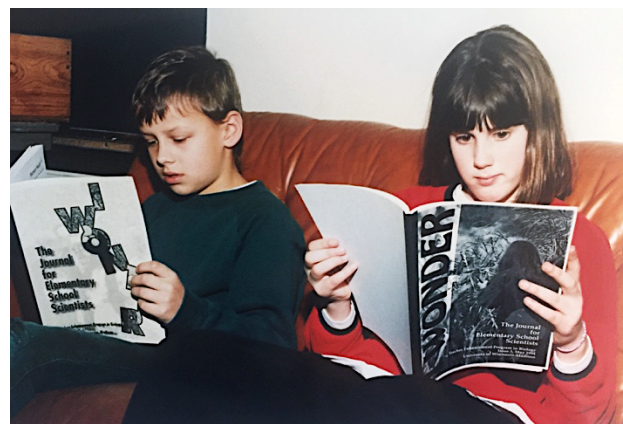
“Being bored feels really imprisoning, doesn’t it?” I said. “You have to be here, and here we are in this room and we can’t get out. Even when we go to Phys. Ed., we just can’t go and play. It’s structured by someone else. You know, sometimes I even feel like I’m your jailkeeper...like I’m the one that’s got to make you do all this stuff.” And then I said, “Well, so how in the world could we get out of this? How could we have a jailbreak?”

This metaphor resonated with my students, so I used it over and over, even though in hindsight it’s maybe somewhat problematic—corrections and especially jailbreaks really aren’t the same as elementary education, you know. Sometimes it’d just be a tiny reference, like when kids would be arguing with me over things like not wanting to do a particular assignment. “You know, I don’t have a choice of whether I teach you writing. I am also constrained. The one choice that I have is that I could work with you to find the best writing experiences that we can come up with together. But if you feel that I’m making you do it, and there’s nothing that you’re going to be interested in, I probably can’t accomplish it. We’re going to stay stuck. So, what would it be like to have jailbreak?”

At the end of the day on Fridays we would even yell “Jailbreak!” Which is so interesting because we didn’t totally think our classroom was a jail, but we realized how trapped we could be. So, it worked as a metaphor for us. It had multiple levels of meaning, and a community feeling. And it was a release, a chance to scream together.

T: Can you talk us through the “I Wonder” curriculum a bit? What does it look like in practice, on the ground?

Though it differed year by year, a typical way to start might be pulling out all our student-research journals from the year before, the *Great Blue* journals, which had a section called “I Wonder.” I would assign them to read certain articles. And we would discuss the research questions, the procedures, and especially whether we trusted the conclusions—and how could we continue this research, or improve upon it. The returning students liked us reading their articles, but they were also ruthless on their own work, saying how they were limited, or that they didn’t have enough time to collect sufficient data. So that was a reading and discussion exercise.



Using past issues of *I Wonder* (in later years incorporated into *Great Blue*) to generate new research ideas.

From there, we'd often use the set of *Great Blue* journals, have students take a question raised by one of these student-scientists, and then change something in the procedure to see if they could improve on the results. That's valuable because that's what real-world scientists do. They're not always making up their own research questions. They're working within a community of other scientists, and they're working together. We'd start asking, "Is this research replicable?" We're using big words, grounded in practice. "Replicable" was not an abstract word on a spelling test, but a precise word used repeatedly in lab meetings. It established the idea that when we do research we present results to other scientists who may repeat and thus confirm or improve our research.

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Helping them come up with research questions and developing methods of inquiry was the core experience of "I Wonder." The meat of "I Wonder" is kids just getting in way over their heads. In the beginning, I'd allow students to work on any question they wanted—like, "Is my male or female guinea pig smarter?" How will a student answer that question? And how will it teach us anything of value? But eventually I began pushing back against that question, as if I were a professional scientist. We always had students wanting to work with pets, or wanting to figure out which tastes better, Pepsi or Coca-Cola. But if we can't learn anything about the sense of taste with our experiment, we'd need to keep talking. I would be constantly trying to help them get to a question that has a real potential. After we negotiated a question and a method of inquiry, we had students report to the class, and the class worked as a team to troubleshoot, to help Sara or Martin with whatever challenges they were facing this week. And that's how we learned, and how we met curriculum standards, with everybody working together trying to solve problems across multiple fields of study.

T: Treating students as young scientists must shape their identity, and their identity in relationship with learning.

M: I would sometimes ask, "How many of you think of yourself as scientists?" In many classrooms, you might get a few hands going up, wagging a bit. But for us, their hands would shoot up high toward the ceiling. What informed their practice was not mostly me, or this classroom environment, but it was their own identity. They're working out of a rich identity here. Because I am a scientist, now I'm doing science differently and I'm thinking differently.

T: And it seems that asking questions is essential in this process. Often classrooms are much more oriented toward having the right answers instead of asking the right questions. It seems very artificial, linear, and top-down. It doesn't model the way that knowledge is produced in the real world.

M: Exactly. One time I was presenting with my students at a series of workshops that brought K-12 science teachers together with university professors and staff. I was asked if I would present on my work with "I Wonder." So, we gave a presentation about our process, and one of the professors asked us how long we would be working on a project if it's not being successful. So, students

talked a bit about that... about being stuck. Then I flipped the question back to the university scientists: “How long might *you* be stuck?” And they said, “Well, sometimes for years.” And we went back to our classroom, and realized, “Oh my God. Being stuck is not a bad thing.” It was such a revealing insight.

T: What sort of projects came from your students?

M: Well, there were plenty. One project that led me to the idea of publishing a journal started with two 4th graders who wanted to know about E.S.P. and if it was real. So, they devised a few methods to test this, and before I knew it, they were testing people at recess, after school. They just wanted to do this all the time, and the kids who participated would do it over and over. Eventually they ended up with more than two thousand bits of data.



Students record observations in their “I Wonder” notebooks.

Another project involved my daughter, Cassie. She was actually in 3rd grade at Randall School, and she wanted to do a project a year early. She wanted to do something about nearby Lake Wingra. We got in a canoe that summer, and we paddled around the lake, trying to figure out what she was interested in. And she was looking at things. She started with surface level things. There was trash in one spot, and she wanted to clean the trash. But we kept pushing forward and eventually she noticed the foam. She wanted to know what caused it. Now, this was so much fun for me because I had more time with her than any other experiment that I ever did in my classroom. But it was still part of my own growing and learning how to support student inquiry.

So, we had this foam. And we’re looking at it, and we’re trying to figure out what caused it via observation. And we just don’t get anywhere. She’s totally lost. Frustrated. I mean, that’s one of the things that happens with “I Wonder” is a lot of frustration, and then breakthroughs. It’s the emotional aspect that makes this model so captivating. I say, “Well, Cassie, what do you want to do? Do you want to find out what that foam is? What would grown-up scientists do if they’re stuck?”

Eventually, she decided to talk to a limnologist, a nationally acclaimed one at the University here. And she interviewed him. So, here’s this 3rd grader, and she’s asking the questions, interviewing him. And he says it’s most likely caused by the proteins in the water, and the action of the waves and the wind by the shore. Now, Cassie was totally intrigued by all this. He said we could actually test this by speeding it up, by using a blender to break up lake weeds.

Then we came home. We came home, and Cassie was peeved. She said, “Why would I want to continue doing this experiment when Professor Carpenter already knows the answer?” “Okay,” I said, “so what are you going to do next? He thought there was some more that could be done here.” So, we got different kinds of lake weeds, we blended them at different rates, and we measured the amount of foam. And that fall Cassie entered my classroom as a 4th grader, and she still had all

these gallon jars with all this mushy stuff in them. And so, what did she want to do? She wanted to observe these different jars with this blended sludge in them and see what happened to them. And they just got smelly in the classroom closet, so eventually we had to get rid of them. This was early in my discovery process. I was more open-ended in those years.

T: So, we've already spoken a bit about the culture of classrooms and how it figures into learning. Are there other ways you have seen culture figuring into the sciences, or the science classroom?

M: Well, I can tell you a story. This would have been 1990, my first year at Randall. Before I began at Randall Elementary, I had spent time living with a Hmong family, and I'd done lots of research on Hmong stories and culture, and I immediately had put up this huge Hmong story cloth in my classroom. Lo and behold, walking into my door that fall, there were seven Hmong students. Two girls, five boys. So, this was the first time that I started teaching "I Wonder" by myself, not as a student teacher. I explained the idea and modeled it a bit. I said you need a question, you need to know how to answer it, you need materials, and so on.

We spent a few days going through this process. With 25 students, some kids were struggling, and trying to think of things to do. So, I said, "On Friday we're going to begin our first science experiments. Everyone who has their research question and a method that's approved by me, you can set up your research materials and begin." Lab time Friday, the students were sitting, and I asked, "How many of you are ready to start?" Fifteen hands went up. "You can go ahead, but there are ten kids here I need to talk with still. Are you able to begin without interrupting us?" I always had to manage this—kids who were ready, kids who weren't—so we could all stay focused.

So, 15 kids are off working. And I sit down with the other kids. "Let's collect some data," I said. "Let's just look at who's already working on 'I Wonder,' and who's sitting here struggling. We don't yet have topics, right? Is that fair?" I asked, "So what do you notice about us, and what do you notice about them out there?" It didn't take long to realize that they were all boys. All ten of them were boys. There were two other boys who were already out doing science projects. Two out of 12 boys... I wrote that on the board. "So, is it harder for boys to do science?" We were kind of puzzling over this. Of course, they're not going to say that they're not as smart. And it wasn't a put-down in this context. We were just trying to ask a question. I thought let's have some fun with this. "Do boys follow directions differently than girls do?"

So, we're thinking, and somebody noticed and said, "Well, half of us are Hmong." There were five Hmong boys there. Now, remember all these kids know I've lived in a Hmong home. They feel comfortable giving Hmong words for spelling tests for all the students to learn. They see that huge story cloth in front of the classroom, and we talk regularly about Hmong culture. I said, "Oh? So is it particularly hard for Hmong students to do science?" And someone immediately noticed that the two Hmong girls had their projects going. "So, is it something about Hmong boys?" We really started digging into this.



Creating an experiment with a pulley.

Well, then, I asked the Hmong boys, “What’s the Hmong word for experiment?” They didn’t know. I said, “You know, the strange thing is, my first language is a dialect of German, and we didn’t have a word for experiment either.” I said, “What’s the Hmong word for science?” And they’re quiet. “You guys speak Hmong at home, right?” They said they just didn’t have a Hmong word for science. I said that I didn’t either in my German dialect. “Well, what’s going on here?” I asked. I said, “Maybe people like you and me, we had a way of growing up, where we didn’t have this kind of background experience of people doing science like these other kids. Their parents studied science and experiments. They at least know about it. But you and me, we don’t really know about it.”

I said, “Let me tell you about my dad. My dad was a farmer. And, boy, he knew all kinds of things about plants and animals, irrigation and soil, and all that. This one time I had to do a science project, and

I was totally stuck. I had to classify trees, and it was winter. I couldn’t do it, and I was so frustrated. And my dad asks if he can help me. And I wondered how my dad could help me. He only had a 7th-grade education. What does he know about classifying trees? He said that, sure, he knew kinds of trees. So we got a gunnysack, a handsaw, and a hatchet, and we went walking off in the woods.

“We’d come to a tree, and he asked if I wanted this one. Sure. So, we would cut off a piece that I’ve got to display later on for the assignment. ‘What kind is this?’ So, he’d tell me, ‘This is hickory.’ ‘So, what’s hickory good for?’ ‘Well it’s good for spokes of a hay wagon wheel, which we made when I was a boy.’ Then he’d ask, ‘Do you want this one?’ It was a smaller tree. ‘Well, what’s that?’ He said, ‘Wild cherry. The bark is good... you can make a tea for a cough.’”

“My dad knew all these trees. I never knew before how much my dad knew about trees! He knew which one was good for the tongue of a hay wagon, and which was good for a handle for an axe.” And I said, “I know this about Hmong people in the mountains of Laos, and they know so much. And they knew plants that none of us know anything about. They knew plants for healing, plants for thatching.... Your parents know all kinds of things about nature, but you don’t have a Hmong word for experiment.” Well, by the next lab day, all of the Hmong boys had projects that were approved, and they were off doing science.

T: I’ve long considered science to be a cultural practice. The kinds of questions we ask, the methods we use, the conclusions we draw as we interpret data, they express the nature of the relationships we have with the so-called objects of the study. They express how authority can be constructed through certain types of knowledge. They express how we perceive separation between disciplines that seldom exists in real life. Reframing “science” as “nature” seems to open up a lot of possibilities.

M: I might mention another type of homework we did, called their Places-in-Nature, or PINs. I had them choose a natural place close to home that has a maximum number of different plants. So, a lawn would be less interesting than an environment that is at the edge of another, for instance, a place where native flowers meet a garden. There are more species to observe in these kinds of

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Student sketches from biweekly Mornings-in-the-Marsh.

M: I totally do. We did the same types of projects in our “Kid-to-Kid” notebook, where they’d record all their cultural fieldwork. We made studies of culture at home. We’d start with the very simple, like mapping outdoor and indoor spaces, or documenting the processes of doing the laundry, or setting the table. But then we’d get far more complex: objects in their home that are meaningful, their own family’s foodways, their gardens. Then we’d expand outward, looking toward their neighbors, their neighborhoods, and our communities.

M: In the 1990s when we were doing this work, the downtown science coordinator (for the Madison Metropolitan School District) really loved our inquiry science projects. He'd come to conferences with us—not just me, but with everyone from the Heron Network (the local network

of teachers interested in locally based, inquiry-driven education). There was so much excitement. We'd be asked to do workshops, to talk to new teachers. We were respected for doing this kind of work. By the time I stopped teaching in 2006, I was never asked to do anything by the downtown administrators. Nothing that we did was of interest anymore. Sure, it was at the university, but no longer in the school district.

I remember, one time in the 1990s I had a principal who was doing classroom observations, as he did every few years. He'd write up an evaluation, you know. I said, "I realize I must be a bit challenging for you, since I keep asking you to do things differently." He said, "Actually, I think that what you're doing"—this is not personally about me but the kinds of things teachers in our network were doing—"that's where I expect us all to be in 20 years."

I had several supportive principals at Randall. But with my last principal, I was in tears. I was so worn out, because she took away multi-aging in my classroom. It was a physical and emotional gauntlet. She belittled my teaching, not by saying it but by constantly distorting and disrupting it. The Heron Network is now done. A bunch of the core teachers are retired. It's extremely difficult now to use real-world, inquiry-based learning. For example, one of my former student teachers has to fight so hard to do anything outside the mainstream.

The good teachers keep doing it nonetheless, at least in little ways. But to do it in this large systematic way, I think that it happens mostly right now in places like tribal schools—because they care so much about their local land, and they take care of their local culture. I think that's the absolute best that we have in Wisconsin right now. There's way more support for environmental education today than for cultural inquiry. It gets harder when the curriculum gets tighter or broken apart into pieces. It gets harder to show that it's one world that's an amazing place to be learning in. And still, I continue to have a great commitment to this practice, and I still have hope.

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