Cultural Studies of Science Education (2023) 18:195–204
https://doi.org/10.1007/s11422-023-10153-8

ORIGINAL PAPER

Exclosure (or what we risk losing)

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Received: 30 January 2023 / Accepted: 30 January 2023 / Published online: 19 February 2023
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Abstract

This is a story of becoming. In this creative non-fiction essay, I share a case study of an informal science program for high school aged youth that took place over 5-weeks one summer in an urban park in Pittsburgh, PA, USA. I conducted observations, interviews, and artifact analysis to explore how youth environmental interest and identity developed through relational processes between human and more-than-human beings. As a participant-observer, I tried to focus my attention on learning about learning. But I kept getting pulled from my research to something bigger, something messier. In my essay, I reflect on what it meant for our small group to become naturalists together, juxtaposing the diversity of our human cultures/histories/languages/selves with the diversity of the park, from the soil to the tree canopy. I then draw intimate connections between the twin losses of biological and cultural diversity. By using narrative storytelling, I invite the reader to come on a journey with me through the story of my own ideas, the ideas of the youth and educators I worked with, and the story of the land itself.

Keyword Science identity · Biodiversity · Cultural diversity · Informal science education · Refugia

D was our de-facto engineer. She had fiery red hair pulled into a high ponytail, porcelain skin, and big eyes that beamed out from behind her glasses. There was a confidence in her walk and talk that stood out for a five-foot-one, 15-year-old girl. She was hard of hearing, fluent in both English and American Sign Language, and forceful in her regular reminders that you look right at her when you talked so she could read your lips. D had that unusual ability to be bossy in a way that you didn't mind listening to.

Our group was building deer exclosures, fences made from logs and branches braided together in a circle around young trees. The exclosures looked like gigantic bird nests or sculptures Andy Goldsworthy would construct, photograph, and allow to decompose

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This manuscript is a part of the special issue Reflecting on Freire: A praxis of radical love and critical hope for science education, guest edited by Betzabe Torres Olave, Sara Tolbert, and Alejandra Frausto Aceves.

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slowly in the woods. They were beautiful and did their job, which was to protect the young trees from being nibbled down by the herds of deer roaming the Park whose excessive numbers and constant eating had led to a sparse understory that struggled to regenerate.

D stood next to the exclosure we were working on, directing each of us on where to lay down our branches and logs. We didn't easily fit together: 11 teenagers and four adults who acted like family but didn't look related.

Who we were (a sampling): Puerto Rican, Black, White, Jewish, Filipino, Chinese-American, Japanese-American, Mixed. This is how we described ourselves to each other. These were the racial and ethnic boundaries we carried. There were other boundaries too, things that separated us, made us different from one another. The schools we attend (ed), the neighborhoods that we bussed or drove or walked from to get to the Park each morning. The way that some of us grew up with just our mother in one apartment after another, while others were born and raised in solid brick, 3-story, 5-bedroom houses with a bathroom on each floor, a living room, and a dining room where both parents sat down together each night. The fact that some of us could hear the high, clear song of the wood thrush flowing through the woods like water, while others could make sense of words spilling from our moving lips just by looking.

This was the Young Naturalist program, a 5-week paid summer internship offered by the Pittsburgh Parks Conservancy for high school aged youth who were interested in science and the environment. There's something about immersive youth programs. Time is compressed. Relationships root, unfurl, blossom, and go to seed in a matter of weeks, instead of years. This was our third week together and we had fallen into that teasing rhythm that comes when you spend all day sweating and laughing and playing and learning with folks who started off as complete strangers and now felt like you'd known them for years. You end up sharing things that you've never told anyone before.

I had co-founded the program six years earlier and had returned that summer as a doctoral student in education, studying how adolescent environmental interest and identity developed. I conducted observations, interviews, and artifact analysis to explore how environmental interest and identity developed through relational processes between humans and more-than-human beings, lands, and waters. (For more about this project see Hecht and Nelson 2021; 2022). My role was as a researcher and participant-observer, taking fieldnotes, conducting interviews, answering questions about insects or plants when the youth were curious to ask, and trying to focus my attention on learning about learning.

But I kept getting pulled from my research to something bigger, something messier. I kept getting pulled toward a deep wondering and wandering into ideas about community and what makes community thrive; ideas about refugia and what gets protected and why and how and by whom; ideas about what it means to name something, to recognize an individual as a vital part of the whole; ideas about what diversity signifies, what it offers, how it is nested at different scales and how these scalar relationships matter.

What we risk losing (a sampling): green turtle (*Chelonia mydas*), reindeer (*Rangifer tarandus*), salt-marsh harvest mouse (*Reithrodontomys raviventris*); Nassau grouper (*Epinephelus striatus*); saguaro cactus (*Carnegiea gigantean*); Gunnison grouse (*Centrocercus minimus*); giant garter snake (*Thamnophis gigas*); snowy owl (*Bubo scandiacus*); nail fungus (*Poronia punctata*).

[I am writing about creatures with names using the European tradition of a Latin binomial. I am using names drawn from the age of exploration, from the age of colonization. I am using names drawn from violence. I use these names as a tool to communicate a set of knowns, to make sure we are speaking about the very same creatures. I don't know another way to do this. This is the language I know.]

Also: the purple skimmer dragonfly (*Libellula jesseana*), a subtle beauty with orange veined wings and an iridescent abdomen. And the towering giant sequoia (*Sequoiadendron giganteum*), the world's largest tree species that stands as tall as 275 feet and can grow to more than 25 feet in diameter. It has a trunk you could live inside of.

These are just species we might lose in the United States.

The International Union for Conservation of Nature and Natural Resources has a 'red list' of threatened species around the globe (IUCN Red List, n.d.). They keep all manner of beautiful and painful images of species we have lost/are losing here. It includes more than 31,000 species – 27% of all species they've evaluated. This doesn't even account for all the species that we don't yet know about.

In 2014, the Natural History Museum of Los Angeles County embarked on a project to better understand biodiversity in that city (Brown and Hartop 2017). I heard a researcher who worked on this project speak at the International Committee for Museums and Collections of Natural History conference one year. They described how they set up backyard traps in 26 locations around the city to look at fly populations. They ended up finding 99 species of flies in just one genus, *Phoridae*. These tiny flies often go unnoticed, so unnoticed that 43 of the species they identified were new to science altogether. Forty-three species of flies buzzing around Los Angeles backyards, previously invisible to us. They had not yet been named. I became transfixed by the idea that right here, right where I live, there are so many unseen species that are unknown to us. Unseen, unknown, unnamed.

When we talk about biodiversity with the Young Naturalists, we talk about the different types of diversity we need in a forest. In school they had mostly learned about the benefits of species diversity – this idea that if you have a mix of species, the woods will be resilient when some disturbance comes through, say, an invasive insect or fungus that targets a certain host. If one species is wiped out, the surviving species will fill that niche and buffer the damage to the system overall.

But there are other types of diversity that matter too, diversity at different scales. Ideally, within each species there will be genetic diversity, which you'd think is baked into the system. Except for the fact that tree nurseries, as with other agricultural industries, have limited genetic variation in favor of uniformity. Mostly, the trees we buy from a nursery are clones of one another, their forms as neat and predictable as red delicious apples in the supermarket.

There's also a need for structural diversity in woodlands. Different birds and mammals and insects prefer different habitats. Some creatures eat the leaves littering the forest floor, others nest high in the crook of a branching tree. The Park was being managed to create habitat at all levels with low growing plants on the forest floor, shrubs and small trees filling up the understory, and then, ideally, tall trees forming the canopy layer. The exclosure we were building was part of a larger effort to better steward this land and support forest diversity at all scales – from invisible genetic diversity to more evident diversity of species and structure.

What we did together (a sampling): cut down vines choking young trees; hauled logs to build erosion and deer protection structures; learned names of birds and trees and insects; held moths gently in our hands; talked and listened to each other, a group of people that might never connect in other circumstances; discovered that these people were our people.

Our group had drifted into small teams. Some were sawing branches off a large tree that had fallen recently, others were carrying the branches to the exclosure where D would tell us how to lay them down. It was brutally hot and humid in that way that reminds you that Pittsburgh would be a rain forest if we would just let it alone. Instead, we were trying to engineer and protect the biodiversity of this patch of land. There was some art to looking at

the undulations of each branch and figuring out just where to place it so that it would nestle against the branch below it tightly enough to prevent the deer from pushing the whole thing over. D was a natural.

At the exclosure's base were thick, heavy logs that took two to three people to carry. The logs formed a rough circle about 25 feet in diameter around a group of saplings that had been planted the year before. There was a small white pine, some cherry trees, and a tulip poplar whose softly lobed leaves looked outsized on its narrow sapling trunk. Our goal was to build the exclosure high enough to deter deer from jumping in for a snack. We hoped that eventually, in a hundred years or so, the tulip poplar would reach 150 feet or more, its straight trunk extending up into the woodland canopy. Still, this was a lot of effort for a few small saplings.

B was just off the trail sawing fallen branches into smaller pieces for the exclosure. He was a tall, lanky 15-year-old boy with a mass of thick black hair worn in a high top that was slightly wild, his loose curls springing this way and that when he spoke. It was July and the heat was crushing. I found myself, field notebook in hand, furiously scribbling as B began talking about race with N, another youth, and S, one of the program educators. As B spoke, his golden skin reflected the sunlight beaming down on us from ninety-four-and-a-half million miles away.

[The distance between this earth and its sun is a distance that I return to again and again, a source of wonder for me. How can something so impossibly far away drive warmth and light into my flesh every day? Despite my fascination with this distance, my mind cannot hold its numerical value, so I routinely have to look it up. This time I visited a blog considering astronomical units (Sharp 2021).]

B was describing his parents—his father was a Black South African who had come to the USA for college and his mother was a White American with southern roots. He was sharing how he felt about being Mixed, which was how he described his race. That he often felt that he wasn't accepted by any community and that the rejection felt the worst from what he called his *own people*, the Black community. We four weren't working anymore, the closeness of the air and the conversation pulling us in toward the brush pile as the rest of the group faded away.

S, an educator just a few years older than the youth, broke in to affirm B's struggle, but reflected that even though she was also Mixed—her father White and her mother Black—her background was totally different from Bs. The frustration crept into her voice as she talked about how people assume that, because she and B both look Mixed, they are the same even though they're not. She was pushing around the edges of an idea that continued to grow that summer, about the diversity within our diversity, about the layers that unfolded as we named our identities.

Up until this point me and N were just listening. We were both White and were holding back the way you do when you're White and people of color are talking about race and you have so many thoughts running through your mind and you're terrified that something you say will come out as racist or ignorant or insensitive. So, you stay mute, saying nothing as a defensive mechanism even though you're not exactly sure what you're trying to protect yourself from.

N, slowly, cautiously, began to speak. She was short with straight brown hair, a round, open face with cheeks that flushed to pink, and a ready smile that suggested she was eager to like and be liked. She started with the standard bit of White armature—an *I don't really understand what you are going through, but…*statement. B cut her off, saying, *Nah, but you're Jewish so you kind of understand what it's like to be rejected*. With his encouragement, she continued. When she was younger at her all-Jewish elementary school,

she told us that she got accused of *not looking Jewish* and being called *the Christian girl*. There was hurt in her voice, the deep hurt that comes with rejection from your own people. She was different, even in a community that was meant to be all the same.

How diversity gets misappropriated (a sampling): *We are looking for a diverse candidate; this is a program for diverse youth; she was diverse.* What White people really mean is Black and brown people with black and brown faces. What we really mean is we are afraid to name our own whiteness.

My old Second Edition Unabridged Random House Dictionary of the English Language says that diversity means 1. *of a different kind, form, character,* etc.*; unlike. Syn. 1. varied, manifold, divergent. 2. dissimilar, separate.* The word's etymological roots suggest more complexity. The word is drawn from the Latin verb divertere, which means *to turn* or *to turn aside*, as in to divert.

Diversity is both heralded as a panacea to repair our world and maligned for its inadequacy to do just that. Businesses, governments, and universities hire Chief Diversity Officers to demonstrate their commitment to the liberal ideals of multiculturalism and inclusion. We say we want to celebrate our differences. Instead, they are often subsumed. My own whiteness reflects this back to me.

In 1921, my Jewish family made Christmas cards, their vain attempt to claim the mantle of American whiteness. One hundred years later, holding the letterpress cards in my hand, I feel the weight of my family's effort to racialize ourselves. With those cards we fashioned ourselves less Jewish, less ethnic, more American, more White. My family aimed to gain power and privilege by becoming part of the White race in America. Which we did, which we got.

Just like N, my body held a combination of histories that forever allowed and condemned us to be both insiders and outsiders in White America. We passed, until we didn't.

To complete the morph, my family turned aside from our people's native tongue. I still use some Yiddish words regularly, like *mensch* and *schmuck*, for example, which reflect the range of humanity, our ability to be both honorable and foolish, integrous and contemptible. But, still, I had to double check how to spell the words in English. And I have no idea how to write the characters that make up Yiddish, a language my family spoke only one hundred years ago, the braiding of Hebrew and German forming sounds I've never heard.

[A question I struggle with: Did my family become "white" or "White"? This is contested ground. I recognize arguments for using lowercase "w" to maintain distance from White Supremacist ideology. However, I've chosen to capitalize "W" to call attention to the racialization of whiteness as a dominant force. To call myself lowercase "white" maintains the persistent illusion that Other Races Exist and that whiteness is the melting pot we all ought to aspire to and assimilate within. I capitalize White, therefore, to call attention to White as a race that us White folks have chosen, or that has been foisted upon us by the choices of our forebearers. For a rich exploration of this style choice see Ewing 2020).]

What we talked about that summer (a sampling): how scary it feels when we are the only person of our race entering a room; what it means to finally go to a school with other d/Deaf & hard of hearing people instead of struggling with teachers who don't know how to meet our needs; how much we love the food our mother makes, the spiciness so much deeper than any American food; how alone we feel being the only immigrant in our whole entire grade; how guilty we feel having so much more stuff, more privilege than other people. These conversations popped up spontaneously, when we were having lunch or removing vines from young trees or flipping rocks in the stream looking for salamanders.

We exposed ourselves, interrogated our own identities and how we thought people saw us and how we wanted to be seen.

In exploring the contours of our individual experiences, we had come closer, the exclosure around us growing taller. We didn't have abstract conversations about how we think society is or ought to be. No, these conversations were personal and fearless. And they emerged precisely because of our differences.

[Gadotti and Torres (2009) reflect on Freire's emphasis on the value of fearless discussions between and among teacher-student—or what I prefer to frame as educator-learner in order to position learning as a thing that can, and often does, occur outside of schooling. Throughout this program, our discussions were often fearless and allowed for development of not only the youth participants, but also the educators and me.]

Our diversity illuminated our identities and allowed us to become a community. Our community was a refuge, a refugia, a protected place that allowed us to grow. Refugia is a concept that has driven much of my thinking since the start of the COVID-19 pandemic in March 2020. I adopt the notion of refugia from climate science, where refugia are described as protected areas where species can thrive despite unfavorable conditions outside these protected spaces (Bennet and Provan 2008). Akin to landscape scale refugia for organisms, our community in this program served as sanctuary for our intimate conversations (Akiva, Carey, Cross, Delale-O'Connor and Brown 2017), creating what I call *learning refugia* (see Hecht 2021; Hecht, King and Williams 2022). Enveloped in this refugia, we were able to interrogate our own identities and how we might each take up the mantle of loaded words, such as scientist or naturalist.

The conversation between me and B and N and S lasted only a few minutes. We slid back into sawing and organizing branches as other folks rematerialized, coming down the trail looking for more building material for the growing exclosure.

We were working in a Dry Red Oak-Mixed Hardwood Forest. A forest is often named for what we see and perceive as dominant. But from where we stood, we could find other subtler parts of the forest, smaller creatures like sedges and mosses and lichens. We could spot the remains of faded ephemeral wildflowers: trillium and twinleaf and trout lilies whose blooms had peaked before the trees leafed out. We found value in the fallen branches we were using to build our exclosure, their slow decay providing nutrients to the soil for future growth. With just a little more effort, we could learn to see beyond what we call dominant, we could find what is often ignored. The diversity within the diversity.

It is the often-overlooked soil that possesses as much power within the forest ecosystem as any canopy tree. Within that soil, mycorrhizae move nutrients and water between soil and tree roots. Mycorrhizae are invisible and powerful. They support the structure and function of forest ecosystems in ways that are still becoming understood (Ferlian, Cesarz, Craven, Hines, Barry, Bruelheide, Buscot, Haider, Heklau, Herrmann, Kühn, Pruschitzki, Schädler, Wagg, Weigelt, Wubet and Eisenhauer 2018). These microscopic fungal organisms connect trees to one another, connect trees to other flora. Each part not only relies on other parts of the system, they are part of one another, making up the whole of the thing we call forest. There are no individuals here. The value of diversity is for the collective, for the community.

[There are no individuals anywhere. Ideas of interconnectedness and a rejection of individualism are central in many Indigenous philosophies and approaches to science education (e.g., Cajete 1994, Kawagley 2006, Bang, Curley, Kessel, Marin, Suzukovich and Strack 2014). These ideas are also developed in new materialist philosophies (e.g., Barad 2007) and post humanist philosophies (e.g., Haraway 2016). Here, I call attention

to this phenomenon as expressed in biological systems and sciences (Gilbert, Sapp and Tauber 2012).]

When we don't attend to diversity in our natural and cultural communities, we lose it. Too often, we demand or cajole or embrace assimilation, erasing our variation in favor of the dominant culture, the clones. We make Christmas cards even though we aren't Christian. We anglicize our names. It seems easier this way. If every tree has the same form, then we know just how they will grow. But there is no resilience there. A uniform woodlot is not a healthy forest ecosystem, but a plantation.

Where assimilation forces conformity to the norm, diversity diverts toward uniqueness. But diversity is more than the uniqueness of one. One person cannot be diverse. Diversity is the collective force of our unique bodies coming together in community with one another. Diversity is one part of what supports community resilience, what gives communities strength to withstand unfavorable conditions, what gives individuals in communities strength when we must move beyond the bounds of our exclosures. Community is what allows us to thrive.

In our human community in the Park that summer, we were enclosing ourselves inside the circle, our figured world stretching and enlarging ever so slightly to accommodate all of the identities we carried with us.

Our varied, dissimilar, divergent, and separate bodies made up this new community we were forming, a whole entity unto itself. At home, our group spoke English and Spanish and American Sign Language. Our forebears spoke Yiddish and Tagalog and Gullah. In the Park, more and more, we spoke *science-talk*, the language of scientists.

We started to casually throw around words and phrases like canopy and understory and genetic diversity. We all understood their meaning now. Our differences remained, but we were also claiming a new collective identity. We were becoming naturalists together.

[Our becoming was co-constructed within the communal space that we created, an identity that is ephemeral within what Holland and others have termed a *figured world* (Holland, Lachicotte, Skinner and Cain 1998.) This program, this community, this figured world, was one of care. We met every day in this wooded urban park with our more-than-human kin that we cared for and that cared for us. This was multispecies caring, a practice of care through the relationships we built with each other and with the more-than-human beings of the land we inhabited together (Puig de la Bellacasa 2017).]

We have lost—we are losing—more than we even know exists. We aren't even sure how many flies there are in our cities, let alone insects in the world. Maybe 1.3 million species of insects, maybe more. If we lose 30% of them, which is the current estimated loss, that's more than 400,000 thousand species gone. Without names.

Sometimes, when I see a murmuration of starlings flying, twisting and dancing all together, forming shapes in the sky as if they were all one creature, I squint and imagine the entire sky darkened by thousands upon thousands of passenger pigeons. They've been extinct now for over 100 years. What it must have been like to witness them flying overhead for hours! I ache to see that sky.

Angela Y. Davis has said that *naming produces power* (Davis and Giovanni 2020).

A name helps distinguish one from another, defines differences and boundaries between things. Our names are our unique identifiers. To call a human, a tree, a mountain by their name is to see them as complete and worthy; to see them as entities unto themselves. In our names are held our identities. In recognizing another's name, we recognize that identity.

One of D's gifts to us was giving each of us our own sign name. Those of us who began the summer knowing little to no American Sign Language had been learning the letters

of the alphabet that would allow us to spell out our names. But D told us that she and her friends used sign names with one another.

She gathered us in a circle. As the leader of this impromptu ceremony, D went clockwise around the circle carefully bestowing on us our new sign names. Each name was made up of the first letter of our English names combined with a motion to represent us, a moving character that captured the essence of our individuality drawn with D's hands: a letter made with her fingers and brushed across a dimpled cheek, an armful of tattoos, a curl in the hair. We had been named.

We finished the exclosure, enclosing the tulip poplar and white pine and cherry trees in the circle's center, just a little more protected from the deer. We were more protected too—our vulnerable conversations helped build a community where our unique selves could thrive. We had built refugia. We stepped back to admire our work and pledged to visit later, to see how the saplings were coming along.

Becoming: In Pedagogy of the Oppressed, Paulo Freire writes that we are all "beings in the process of becoming—as unfinished, uncompleted beings in and with a likewise unfinished reality" (1970/1993, p. 57). Throughout this essay I have invited you to listen with me to the rhythms and the confusion that comes with exploration/research/writing about becoming. In her book Dear Science and Other Stories Kathryn McKittrick writes, "I want to be as honest as I can about my intellectual history while also recognizing my dishonest memory." (2021, p.15). This story reflects my dishonest memory.

This story is the story of my own ideas, the story of the youth and educators I worked with, and the story of land itself. I've explored the layers of what becoming looks like in one specific place and at one specific time. The "we are all" in this story includes myself: a middle-aged mother, part of the European Jewish diaspora in the United States, making a home in a post-industrial Appalachian city that I was not raised in, exploring my own onto-epistemology by returning to graduate school late in life and now, unexpectedly, finding myself working in academia. The "we are all" also includes a remarkable group of youth and educators that came together one summer, that I came together with, to learn about the world and ourselves.

I've offered you, dear reader, a jumble of vignettes from different time periods and references to scholarly ideas I am influenced by and wonderings that reoccur for me. My writing (the product and the process) is a meditation to explore both thinking and practice (praxis) of the ecopedagogical approach used in this informal science education program that was designed to address both social and environmental issues. This ecopedagogy is what Misiaszek and Torres (2019) call "the missing chapter of Pedagogy of the Oppressed." Central to my thinking is a question of how the assimilation and obliteration of diverse cultures mirrors the obliteration of biodiversity.

This is not a manuscript that provides a blueprint for action, any recommendations for practice or research, or a conclusion. Instead, I challenge us to embrace what Todd and Kanngieser (2021) so beautifully frame as the wonder that can accompany a lack of clarity. Not everything is explained. Because I am still trying to figure things out.

Acknowledgements Thank you to the program educators, youth participants, and the lands and waters for welcoming me. Thanks also to the editors for supporting this unorthodox piece, and to Christie Byers, Katie Booth, and the 2020 Science as Story workshop participants for valuable feedback on earlier drafts.

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