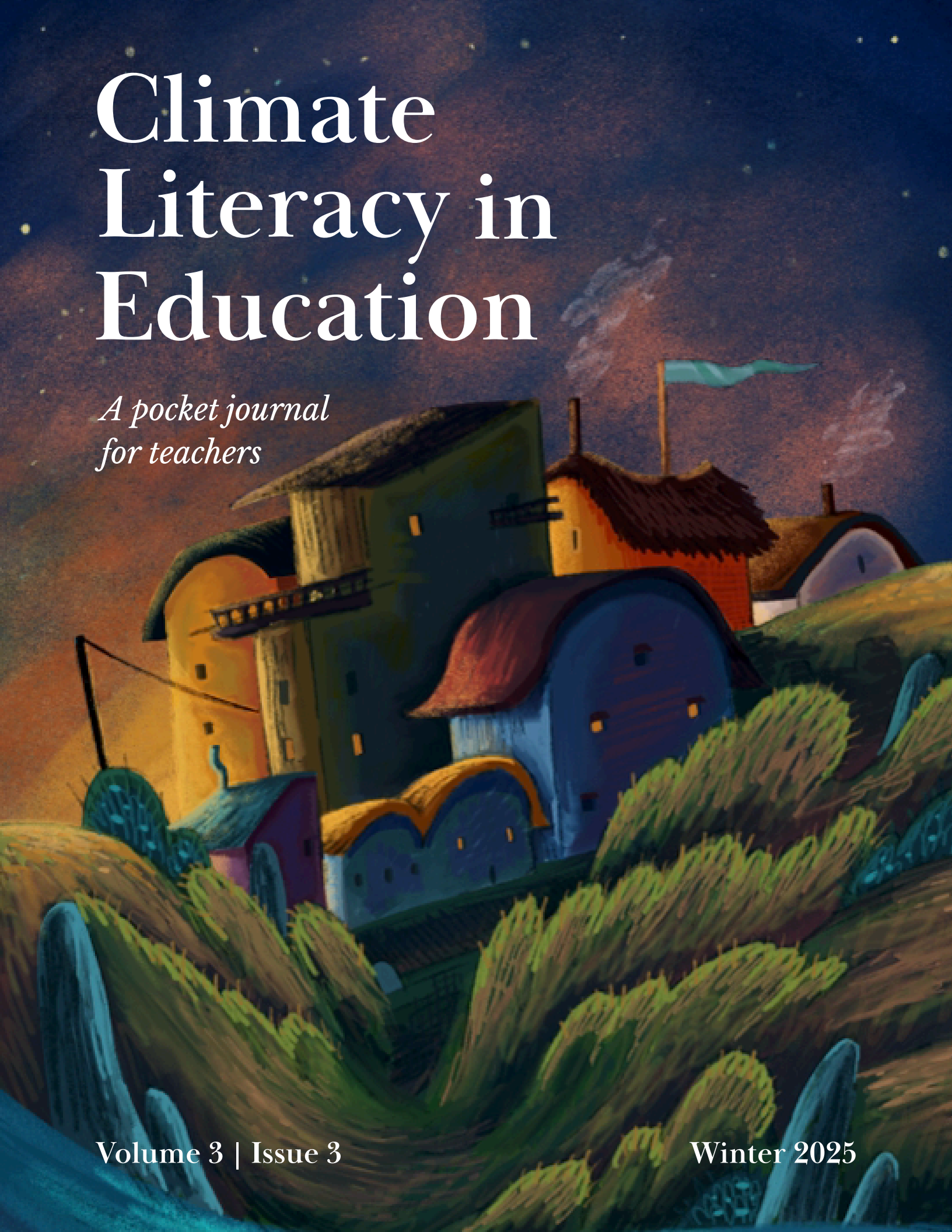


Climate Literacy in Education

*A pocket journal
for teachers*

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About CLE

Climate Literacy in Education (CLE) is an open-access, double-blind, peer reviewed journal sponsored by the [Center for Climate Literacy at the University of Minnesota](#) and published through University of Minnesota Libraries. *CLE* publishes practical, teacher-oriented content on all aspects of climate literacy education at all grade levels and across all subject areas (primarily K-16 but including teacher education and professional development). We are a pocket journal focused on classroom practice which is why the articles we publish are short: 2000 words or less. Our content is written in jargon-free prose accessible to the general audience. All submissions are peer-reviewed by two anonymous readers. Authors can expect to hear results within two weeks after submission. We publish on a rolling basis.

We welcome submissions in the following categories: Curriculum, Reflections, Critical Essays, and Creative & Multimedia. For detailed submission criteria pertaining to each category, [please visit our journal website](#).

We look forward to working with you!

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Introduction: The Path Forward

The “Curb-Cut Effect” for Climate Action

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Abstract

In this Introduction we look to justice movements of the past to reaffirm the work of the present. When the Disability Rights movement won widespread adoption of sidewalk curb-cuts, the effect increased accessibility for everyone—even beyond communities with limited mobility. Curb-cuts fundamentally changed the way people move through built infrastructure. What might be the curb-cut effect for the climate movement? What role might climate literacy education play?

Keywords

climate action, climate literacy education, societal transformation, egalitarianism, collective movements

As 2025 winds down, it may seem that meaningful climate action is further away than ever before. If this is how you feel, it is helpful to remember that we are in a long game for human and planetary wellbeing. This game is played with new ideas that go against the structural push of the forces—economic, political, technological, and ideological—that have created the current phase of the Anthropocene. These dominant forces are entangled with the legacies of colonialism, racism, extractionism, imperialism, and other modes of thinking that center power for the few at the expense of the many. These forces are not likely to give up—unless the alternative becomes easier, widespread, and effectively unavoidable.

The “[curb-cut effect](#)” refers to just such an alternative. The term was coined by attorney, civil rights advocate, and author Angela Glover Blackwell to describe the

introduction and widespread adoption of curb cuts in the built environment. What started as a step to accommodate one group became a force-multiplier that benefitted all and changed how everyone moves. “When the wall of exclusion came down,” Blackwell writes,

...everybody benefited—not only people in wheelchairs. Parents pushing strollers headed straight for curb cuts. So did workers pushing heavy carts, business travelers wheeling luggage, even runners and skateboarders. A study of pedestrian behavior at a Sarasota, Fla., shopping mall revealed that nine out of 10 “unencumbered pedestrians” go out of their way to use a curb cut (n.p).

The “curb-cut effect” is about creating access, opportunity, and ease. It is about changing the ways we think about what’s normal and expected. It is, effectively, about how lasting change happens. What might the “curb-cut effect” for climate action be then?

Most likely, it will be many things occurring at once. Many of them are already happening at threshold levels—which are impossible to suppress—and some of those processes are on the trajectory of exponential growth: the [solar revolution in Pakistan](#), [re-adoption of Native fire practices across the Midwest](#), and the widespread adoption of [cheap, sodium-ion batteries](#) that solve [the sustainable energy storage issue](#). COP30 in Belém provides another good example: although the final text of the deal is “[a faltering, inadequate step](#),” it does affirm the need for a phaseout of fossil fuels. The first-ever roadmap for this phaseout was backed by [almost 90 countries](#). Brazil announced it will develop its own national roadmap for winding down fossil fuels and Colombia said it will co-host (with the Netherlands) the [first International Conference on the Just Transition Away from Fossil Fuels](#) next year. Also, COP30 saw the largest Indigenous delegation in history—around 3,000 representatives. Their presence helped achieve a historic decision from Brazil to demarcate 10 Indigenous territories with land rights and Indigenous leadership. Are these victories enough? No. Are they meaningful? Yes.

We don’t know what the “curb-cut effect” for climate action will be. Will it be the [affordability of renewables](#)—As Bill McKibben wrote in his Nov 26 “[Crucial Years](#)” blog, the heart of the fight is now “less in diplomatic sphere than the economic one” (n.p)—contrasted with the sharply rising cost of [climate inaction](#) and [insurance premiums](#)? Will it be convenience—like [EVs](#), [plug-in solar](#) or [cheap geothermal energy](#)? Will it be of [habitat restoration](#), with its human benefits, or [grassroots, youth-led legal action](#)? Will it be yet something else or all of those things together? More

generally, what has to fall apart or come undone to make space for new, ecocentric arrangements?

Regardless of what the curb-cut effect for climate action may be, life afterwards will be increasingly and unavoidably aligned with the planetary wellbeing. Perhaps at some future point it will become hard to imagine how the past (which is our present) could have been so destructive, extractive, and wasteful.

Luke Kemp's new book *Goliath's Curse*—on the grammar and history of collapse—offers a surprisingly hopeful take on the topic of societal transformation. Kemp's overview of hundreds of historical examples of how certain templates of organizing societies dissolved and were replaced by new arrangements suggests that what is called collapse has often been "a blessing in disguise" (p. 10): one that helped societies address the root causes of their predicament. Even the word collapse, Kemp says, reveals "the 1 per cent view of history" (p. 11)—in which what is "bad" for the elites is actually liberating for the 99% of the society. In most cases "the collapse was largely an elite phenomenon driven by inequality" (p. 187) that provided an escape from an unsustainable system and new space for more democratic and egalitarian arrangements. Kemp's book offers important insights for our world too, given that we have reached the [levels of inequality](#) unprecedented in the entire human history. "In almost every region, the top 1% was wealthier than the bottom 90% combined, the report found, with wealth inequality increasing rapidly around the world" (Henley, n.p). Much of this wealth is built at the cost of the planet, its habitability, and the vast majority of its human and nonhuman beings.

If Kemp is right that "democracy is humanity's default political system" (p. 38), there may well come a time when the extractive, fossil-fuel centered system oriented at concentration of wealth will have been superseded by life-affirming, regenerative, ecocentric social arrangement that works for the vast majority of people. Universal climate literacy education will play a part in bringing about this change. Over the past two years, most of the non-billionaire owned media outlets have each established a newsletter or a regular column on climate: The Guardian's [Down to Earth](#) (since 2022), BBC [Future Earth](#) (since 2023), and the New York Times' [Climate Forward](#) (since 2024) are some of the most impactful. Activist blogs, like Bill McKibben's [The Crucial Years](#) (since 2021), seek to educate the general public; expert panels like the UK's [National Emergency Briefing](#) (2025) seek to educate politicians, business leaders, and policy makers (the [briefings](#) are also available online). All of this is climate education—except happening outside of the classroom space. Our work lies in the latter. It's not always flashy, but it's accretive for making a difference in ways that few other things can.

This grassroots, generative spirit animates the contributions to this issue of *Climate Literacy in Education*. In the Curriculum section, teachers and teacher educators share how they leverage the assets of their community to advance ecocentric learning. Emery, in “From Science to Stories”, describes how creating climate-themed picturebooks empowered her English learning students to 1) deepen their understanding of literary genre and academic English, and 2) draw on lived experience to shape their stories. Lived experience also threads through Lauren Fletcher and Erica Holyoke’s “Cultivating Critique, Hope, and Action”, in which they suggest that the DIY literary form known as the *cordel* offers writers young and old a meaningful, accessible, and politically salient vehicle for communicating about climate struggle and hope.

The Critical Essays in this issue also investigate the ways that climate literacy enables better, stronger relationships with both people and planet. Jonathan Klassen’s “Wild Idea” and Golam Rabbani’s “Shadows of Progress” critique petronormative and patriarchal values to illuminate alternatives: green transportation and feminist worldviews. Chang Hasheminezhad-Li, along with Rebekah Deneger and Sarah Jackson, face negative climate emotions straight on—and, in doing so, find generative openings for resilience and awe. Eric Nolan, Samantha Johnson, Kathryn Hayes, Emily Harris, and Karina Garbesi report on the outcomes from an embodied framework for climate education called Head, Heart, Hands. Last, Nick Kleese argues for a closer attention for the dangers—and opportunities—of representing and cultivating youth climate action.

Young people’s insights are also highlighted in a new section of the journal: Early Career Perspectives. The inaugural contributions come from students in two courses at the University of Wrocław, Poland: Selected Research Approaches in Literary Studies and Project Classes: Literary Studies. Magdalena Puczyńska, Urszula Żoczek, Martyna Obodyńska, and Jan Dudek offer astute analyses of stories from Shaun Tan’s *Tales from the Inner City*, which was a focal text for their instructor, Justyna Deszcz-Tryhubczak. Justyna’s article in the section provides an instructor-level overview of the theoretical and pedagogical frameworks that guided their collective study. We look forward to future Early Career Perspectives that showcase the ways that young people—and their teachers—are carving ecological alternatives out of the hardened status quo: one article, one lesson, one action at a time.

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Curriculum



From Science to Stories

Analyzing and Creating Picturebooks in an English Learner Classroom

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Abstract

English learners (ELs) arrive to the high school classroom with greatly varying experiences of learning about the climate crisis. If they have learned about the climate crisis in school, they have likely learned mostly about it via science. In an attempt to move towards a curriculum that includes ideas about the values, behaviors, and actions related to the climate emergency, I created a unit in my advanced EL Reading and Writing course that uses picturebooks to learn about the climate emergency and engage in a real-world writing task.

Keywords

Picturebooks, multimodal writing, school partnerships, English Learners, authentic writing tasks

Acknowledgments

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Context

The students in my secondary English Learner (EL) classroom have had a mixed experience learning about the climate crisis. Before I start our fourth-quarter unit on informative writing and the climate crisis, I always survey them. What do they know about this thing called “the climate crisis”? What does that mean to them? Have they learned about it before? If so, where and how?

Their responses were all over the place. Some were able to rattle off a series of facts about the science of the crisis or mention the ways humans have contributed to the problem. Many others, however, reply along the lines of: “I’ve heard of it, but I don’t really know what it means.” Given the range of my students’ responses, the task of designing a unit that tackles this issue—while also targeting academic reading and writing—seemed like a pretty intimidating job!

My students are English Learners. Although our program includes co-taught content classes, the class I teach independently is our Advanced Reading and Writing course for students who are orally proficient in English, close to exiting out of the EL program, and need a final boost in academic writing before they are mainstreamed in Language Arts. It is in this class that I committed, several years ago, to including a unit on climate. Given my learning targets, I have a lot of freedom in what we read and write about with no prescribed “curriculum” to follow.

Like many of us, I’d been feeling increasingly distraught about the vastness of the climate crisis. Yet I noticed that my students didn’t have a very strong working knowledge of it. After a little digging, I realized that my students, as ELs, may have missed specific teaching about climate within their content courses. Creating a unit to help them understand the issue felt like one way I could possibly affect some change, however small.

That first year, I did my best to cobble together a unit from the amazing—but overwhelming—number of online resources on climate science. There were plenty of teachers’ and schools’ ideas to draw from; I ended up focusing on climate science. It felt tricky to balance underscoring the gravity of the climate crisis and making sure I wasn’t losing students’ attention to a science-y rabbit hole (or the sheer magnitude of the issue). Eventually, I shifted the unit to be transdisciplinary, which has made a positive difference in how the students respond to the ideas.

Rather than focusing only on the science of the climate crisis, recent scholarship has advocated for a more transdisciplinary approach via an “understanding of the climate emergency that centers on developing values, attitudes, and behavioral change aligned with living well with one another in a climate changing world” (Oziewicz, p. 34, 2023). We’re going to need to move beyond knowledge of the science to

get people to change their way of doing things. Oziewicz's and others' work suggests that stories are especially helpful to engage young people in thinking about a future for our world. In asking myself how I could make my teaching reflect this change, I identified several changes for my revamped unit:

- Dial back the science-based content
- Include stories as an integral part of the unit
- Make a real-world writing task (rather than the essay I'd had them write previously)

I decided to spend some time addressing climate science—especially since I had students who didn't have much prior knowledge of it. However, I included picturebooks as an integral part of the unit, since these often address the social and emotional aspects of climate-related issues. By focusing on stories, we are able to bring human attitudes, traditions, and beliefs into the picture. I also created a writing task that reflects the readings: we created picturebooks about an aspect of the climate crisis that my students then read in-person to a group of younger students.

Part 1: Building Background

To open the unit, we spent two weeks on the basics of the climate crisis. Since the focus of my class is literacy, we did this primarily through reading and writing about what we read. This year, I chose the graphic anthology *Drawn to Change the World: 16 Youth Climate Activists, 16 Artists* as a primary text. It includes a brief but robust overview of the climate crisis before highlighting the stories of sixteen youth activists.

Sticking to this text as an introduction to climate science—rather than a mishmash of academic overviews as I'd done in the past—allowed me to limit the number of rabbit-holes we'd be tempted to go down. We read the introduction using our active reading protocol and supplemented the textual information by watching some of the explainer videos available online. We focused on specific topics, such as the carbon cycle and the greenhouse effect. In general, I kept the scientific information brief; I reiterated that students could do their own deep dive if they are particularly interested in a certain topic. I made one other notable shift too: I included picturebooks as part of the "building background" stage. I wanted students to be exposed to as many of these books as possible from the get-go, since they'd be creating their own books. I also wanted to emphasize the role of stories in learning and thinking about the climate crisis. Some days, we read these books as a warm-up followed by a short writing reflection; other days they were the center of the lesson.

Part 2: Analyzing Picturebooks

In the next phase, we looked closely at the picturebooks we'd read. Students knew that they'd be creating their own picturebooks, so we had that in mind as we analyzed the structure, theme, literary devices, and visual elements used in these books. In choosing texts, I considered cultural representation, which climate-related topics were covered, genre, and illustration style.

Together, we practiced analysis using *The Fate of Fausto* by Oliver Jeffers. Students then chose two to three titles to examine with a partner, using the form. After this activity (which took two to three class periods, depending on the group), students had been exposed to at least six texts. This had a double benefit: 1) getting them to think about issues related to the climate crisis, 2) sparking their interest in the way authors choose to present these issues in the picturebook medium.



Part 3: Conducting Research and the Book-Writing Process

To begin our book-writing process, students worked independently to brainstorm topics that interested them. They each chose a sub-topic and practiced summarizing the video or short text about that sub-topic (see [Slide 16](#)). For this class, I provided their sub-topic text, as I wanted students to focus on summarizing and reflecting rather than searching for available titles. This way, I was able to model the type of summarizing and reflecting I wanted them to accomplish ([see Slides 17-23 in the deck](#)). Students then followed the same methods on their own. After this, they worked with a partner to ideate ways of turning those topics into a picturebook script. Every day during this part of the unit, we read at least one picturebook together as a warm-up, so we had many different examples to reference. We also learned from a class visit by our fabulous librarian, who presented on the writing process particular to picturebooks.

As students worked on their own, I began class periods with mini-lessons and warm-ups designed to address some of the writing challenges and objectives I wanted to address (see “Additional Resources” at the end of the Slides deck, [Slides 68-93](#)). This part of the unit will sound familiar to any teacher of writing: the challenge is to keep those who are dragging their feet moving along while providing enough feedback for those who are flying. The two-week period was both challenging and hopeful. Students wrote drafts, found ways to illustrate, scrapped ideas that weren’t working, revised with peers, sat with me to work through drafts, sometimes got frustrated, sometimes felt success, and generally experienced what all writers do: the messy process of writing. To let students experience this process, teachers need to devote enough time for it to unfold.

Students found particular motivation in knowing that their writing would be turned into an actual book that other people would read. I made it clear that no work will be “published” unless it’s gone through lots of revision, is thoughtful and high-quality, and is finished in time. My students understood this and found it to be fair.

Part 5: Reading Books to Younger Students

After publishing the books (a task that fell to me during prep time and after school, and involved using the school color printer, book-binding machine, and materials I’d purchased with grant funds), we were ready to put ourselves out into the real world. We practiced by reading the books aloud in class to one other. We then took a bus to our elementary school for a visit I’d arranged with my EL colleague. It was a success. There was a wow-factor with the super-cool teenagers and snacks I’d brought, but the act of reading youth-written books engaged both high school and elementary students. We

split into pairs, and the attention of the elementary students was rapt. As far as my often-apathetic students: I'd never seen this level of engagement. They took it seriously, and it made me commit to including more real-world writing tasks in my curriculum. Even the students who didn't have their own published books were engaged; we brought several picturebooks we'd read in class for them to read instead. I watched them go through three to four books each, rotating texts because the first graders didn't want the reading date to be over.



At a Glance

Title	Climate Literacy: Analyzing and Creating Picturebooks
Unit Time	4 - 5 weeks
Grade Level(s)	9 - 12
Core Text	<i>Drawn to Change the World: 16 Youth Climate Activists, 16 Artists</i> by Emma Reynolds (ed).
Supporting Texts	• <i>Black Beach: A Community, and Oil Spill, and the Origin of Earth Day</i> by Shauna and John Stitch • <i>Eco Girl</i> by Ken Wilson-Max • <i>Farmer Will Allen and the Growing Table</i> by Jaqueline Briggs Martin • <i>Greta and the Giants</i> by Zoe Tucker

	• Our House is on Fire by Jeanette Winter • If Bees Disappeared by Lily Williams • The Fate of Fausto by Oliver Jeffers • We Are Water Protectors by Carole Lindstrom • Zonia's Rainforest by Juana Martinez-Neal
Climate Literacy Terms	Varied depending on student topic
Objectives	Students will build on their understanding of the climate crisis through reading and analyzing various illustrated texts, experiencing the ideas through a framework that includes human attitudes, practices, and motivations around the issue. Students will engage in creating their own text and sharing it with a real-world audience.
Materials and Resources	• Slides deck of entire unit • Fate of Fausto Slides (w/ analyzing practice) • Children's Book Assignment Planning Guide (for students) • Children's Book Analysis Form

Reflection

While I found this unit successful, I am already planning several changes for next year: adding more picturebooks, more robust summarizing activities, a requirement for a “summarize the issue” page in the finished books, and more time spent on writing and editing. I was happy with the shifts I made in teaching about the background of the climate crisis. Students’ questions and reflections were thoughtful and more nuanced than in previous years. Most important, however, students shared that the reading experience was meaningful to them— words I think most teachers are desperate to hear, especially now.

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Sacred Relatives

Learning About Interconnectedness Within the Local Watershed

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Abstract

This article describes an online module developed and offered as part of a professional development program for elementary teachers in grades 3 - 5 from rural and Tribal schools in North Dakota. This module, Sacred Relatives, one of the North Dakota Native American Essential Understandings, focuses on the interconnectedness of all living and nonliving elements in our natural world. In the module, teachers engage as learners in place-based, outdoor activities and learn how to integrate the understanding of Sacred Relatives into their own classroom instruction and grade-level curriculum, with a focus on the local Red River watershed.

Keywords

watersheds, place-based education, Indigenous Science, professional development, online learning

Overview

STEM education is often presented as disconnected from community, culture, or place, excluding many students from seeing its relevance (AISES Literature Review, 2020; Luecke, 2025; Cajete, 2020). The Next Generation Science Standards (NGSS) highlight place-based science as culturally relevant by connecting learning meaningfully to students' experiences and awareness of local phenomena (NGSS Lead States, 2013). Yet teachers rarely receive professional development (PD) in culturally relevant, place-based STEM (Bowman et al., 2024). To address this gap, we developed a two-year PD model, Project CuURRENT (Culturally Relevant River Education for Nature-based Teaching) engaging elementary teachers from rural and Tribal schools in North Dakota (ND) in integrated, place-based, and culturally relevant STEM focused on the Red River Watershed. We situated PD activities within the North Dakota Native American Essential Understandings (NDNAEU, ND DPI, 2015), a framework developed collaboratively by ND Tribal Elders for integrating Indigenous pedagogies for all learners. Infusing storytelling throughout, we began with teachers sharing water stories and listening to a read-aloud of *We Are Water Protectors* by Carole Lindstrom, enrolled member of the Turtle Mountain Band of Ojibwe.

Our PD was offered to teachers in school districts around the Red River Watershed, where the Red River flows northward through ND and Minnesota, into Manitoba, Canada, emptying into Lake Winnipeg. This PD included two in-person summer workshops and seven asynchronous online modules for teachers to complete during the academic year, one for each NDNAEU. Modules were released monthly (October through April), to be completed on teachers' own time. While these teachers were all located within the same watershed region, in future iterations of the PD, the online format would allow teachers in different watersheds to compare the geography, ecology, and historical/cultural contexts of their regions, deepening their understandings.

This article describes our first module, focusing on the NDNAEU of Sacred Relatives, which describes how we relate to everything: the interconnectedness Indigenous people practice with all living and nonliving elements within the world and their stewardship of the land and its human and other-than-human inhabitants. We focused on watersheds because of the interconnected relationships and relevant illustration of Sacred Relatives they promote. Watersheds are intertwined with social and ecological community histories, providing many ways to connect people and place. By investigating watersheds, teachers and students can experience hands-on learning that is culturally and ecologically restorative, aligning with Sacred Relatives.

Narrative Framing

We developed each online module to follow a consistent flow that teachers could complete independently in about four hours. Modules included three stages: learning about a specific NDNAEU, connecting it to oneself, and integrating it into classroom instruction. Components included reflection activities, Dakota and Ojibwe language, outdoor engagement, videos of Elder interviews, collaborative discussion boards, art activities, and lesson resources for teachers to apply their learning to their classrooms. This sequence allowed teachers to experience the content as learners, reflect on their relationship with place and watersheds, consider how each NDNAEU could guide lesson design and pedagogy, and embed module components into instruction.

Introduction to Sacred Relatives

Sacred Relatives, our introductory module, began with a video on the Lakota Virtue of Wowahwala (gentleness and peace) in which Lakota Elders describe the cultural and relational meaning of this virtue. We used the video to help teachers center themselves, reflect on their connection to their surroundings, and be present in the moment.

Next, teachers explored Sacred Relatives through a reading from the guiding framework (below) and by watching an interview with Gladys Hawk, Dakota Elder from Standing Rock Nation, entitled "[Reciprocity with the Land](#)", allowing teachers to learn about this NDNAEU from an Elder's voice. To accompany the Elder interviews, teachers were provided an Elder Wisdom Journal, which included links to various videos, discussion prompts, and guiding questions to deepen teachers' reflection of the Elders' stories.

Connecting to Sacred Relatives

After exploring Sacred Relatives, teachers engaged in nature-based activities to connect directly to the concept. These activities included sit spots and observation labs (see module below), where teachers selected an outdoor location to revisit regularly. Over time, they observed environmental changes, cultivated curiosity, and deepened their connection with the natural world and its kin. Teachers received readings, instructions, and reflective prompts to guide their observation lab. They also received resources about Dakota and Ojibwe uses of native plants and a plant identification app, enabling them to identify these plants in their local environments. Through this process, teachers explored their own interconnectedness with the natural world, aligning with Sacred Relatives.

Integrating Sacred Relatives into the Classroom

Finally, teachers applied their learning about Sacred Relatives to classroom practice and curriculum. Using lesson resources developed for the [Teaching of Our Elders](#) project and aligned with Sacred Relatives and science concepts, teachers explored ways to incorporate students' connection to place meaningfully into classroom instruction. By reviewing sample lesson materials and standards and enhancing their own culturally relevant curriculum and instruction, teachers applied prior module learning into practice. To culminate, teachers listened to the Anishinaabe Nibi Water Song, allowing them to recenter, reflect on their learning, and honor water as a Sacred Relative.

While completing the seven modules asynchronously, teachers periodically gathered over Zoom to share their experiences as learners engaging with the NDNAEUs and as educators discussing impacts of the NDNAEUs on their teaching and student outcomes. Consistently, teachers reported the joy and engagement they noted in their students when they aligned practice to Indigenous pedagogies, such as storytelling, as they had experienced while reading *We Are Water Protectors* and sharing their water stories. Teachers also described a growing relationship with place, more mindfulness toward their environment, and an increased sense of reciprocity with the natural world.

At a Glance

Title	The North Dakota Native American Essential Understanding: Sacred Relatives
Unit Time	approx. 4 hours
Grade Level(s)	3-5
Core Text	<i>We Are Water Protectors</i> by Carole Lindstrom
Climate Literacy Terms	watershed, place-based education, interconnectedness
Objectives	To explore how the Essential Understanding of Sacred Relatives can shape learning around watersheds, ecology, and our relationship with our place. To explain how observation labs and sit spots can help students engage with place and grade-level science

	concepts. To identify grade-level standards and learning experiences that are aligned with Sacred Relatives.
Materials and Resources	Project CuRRENT Sacred Relatives Module North Dakota Native American Essential Understandings: Teachings of Our Elders

Going Forward

Our Sacred Relatives module and full PD provided teachers with connection to their watershed, sense of place, and ways to integrate NDNAEUs into teaching and curriculum. The transformative impact on teachers' identities, instruction, and on students suggests that this place-based, Indigenized approach benefits the entire learning community. We plan to share these materials broadly and are working with local Tribal Elders, teachers, and community members to refine all modules for open access. We highlight the importance of working collaboratively and reciprocally with Tribal partners to co-develop materials and then return them to the community. We also suggest impactful practices for STEM PD, including explicit place-based, cultural connections to ground educator's learning. Such opportunities should provide teachers with outdoor experiences, collaborative learning with community members, an introduction to local Indigenous Understandings and learning standards, and the chance to enhance curriculum and embed such pedagogical shifts. Providing scaffolded, practical opportunities for educators to experience place-based education, develop their relationship with their environment, and unpack key curriculum design qualities, is a transformative approach that can inform methods for pre- and in-service teacher learning, ultimately offering authentic and engaging learning for students.

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Cultivating Critique, Hope, and Action

The Cordel as a Multimodal Invitation to Environmental Education Topics

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Abstract

The *cordel* is a multimodal, interactive instructional strategy that invites students to engage with environmental education topics by exploring a variety of curated artifacts displayed along a string. Rooted in a traditional Brazilian practice, the *cordel* has been adapted for use in classrooms to activate students' background knowledge and foster critical thinking. It offers multiple entry points to ecological justice and collectively builds background knowledge. The *cordel* invites a critical and intersectional view of environmentalism and justice, fostering stances of reciprocity, shared knowledge building, and action.

Keywords

Environmental education, multimodality, community reflection, critical literacy, environmental action

Introduction

The *cordel* is a multimodal instructional strategy that invites students into a topic, such as environmental justice or water rights. This approach activates and builds students' individual and collective background knowledge by presenting a variety of related artifacts along a string or *cordel*. The roots of this practice trace back to northeastern Brazil, where vendors would hang chapters or passages from books in marketplaces to attract potential buyers. These vendors often drew crowds by performing these snippets. The *cordel* allowed artists to directly work with the community, bypassing traditional gatekeepers like publishers and reviewers. Over time, this simple yet effective method of displaying narratives and artifacts has been adapted for use in the classroom (Landay & Wootton, 2012; Slater, 1982).

In the classroom, the *cordel* serves as a powerful tool to frame a unit. Before beginning a topic, educators curate a collection of materials related to the subject such as photographs, maps, timelines, infographics, book excerpts, artwork, and even QR codes linking to songs. These artifacts are hung along a string, allowing students to explore them at their own pace and in any order. As Whitmore and colleagues (2020) noted, this creates a museum-like experience that encourages curiosity and personal engagement. Students then reflect on the artifacts, sharing their insights, personal connections, or questions, either in small groups or as a class. An extension to the *cordel* can be once students have explored a topic over a number of days or weeks; the *cordel* can be rehung, this time showcasing students' own work (i.e. artifacts, ideas, and reflections) alongside the original materials. This second iteration positions students' contributions within the broader field of study, fostering a sense of ownership and accomplishment. The *cordel* can be shared with the class or even extended to the broader school community, such as other grades, administrators, or local community members, creating an opportunity to celebrate and share students' learning.

As educators and researchers working outside of Brazil, we approach the *cordel* with deep respect for its cultural and historical roots in northeastern Brazil, where it has long served as a grassroots medium for sharing stories, poetry, and political commentary. We recognize that *cordel literatura* is not simply a teaching tool, but a rich social and cultural practice with deep ties to community identity, resistance, and oral tradition (Slater, 1982). While we are not part of the communities that created or sustained this tradition, we engage with the *cordel* as a model of community-centered storytelling and multimodal expression. In adapting it for classroom use, we do so with care, aiming to honor its participatory spirit and to invite students into similarly reflective, justice-oriented engagements with text, image, and voice.



Figure 1. An image of the *cordel* set up in Erica's literacy methods course.

Instructional Sequence

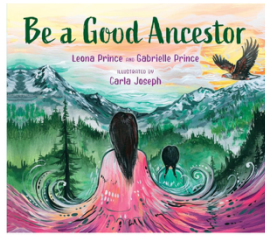
Over the past four years, Lauren and Erica have used the *cordel* to introduce preservice teachers to the concept of being a good ancestor, encouraging them to explore literacy learning through the lens of environmental justice and land stewardship. In addition to using this practice with preservice teachers, Lauren has also applied it with elementary students on a variety of topics related to environmental education. The image below (Figure 2) provides an overview of how Lauren has used the *cordel* in her course to introduce the topic of being a good ancestor.

Instructional Sequence: The Launch



Start with Student Stories

Quick Write:
Students reflect on a core memory about being in, thinking about, or engaging with nature or the environment. Students then share their personal narratives in small groups.



Interactive Read Aloud

Introduce Unit Theme:
Using the story *Be A Good Ancestor* (Prince & Prince, 2022), Lauren introduces the unit's main inquiry how how can we be good ancestors to our earth, pulling on Indigenous perspectives of stewardship.



Cordel

Build Background:
Students then view the cordel at their own pace. Local newspaper articles, book excerpts (previews of what they'll read) and infographics are hung along a string for students to explore and find connections.



Class or Small Group Discussion

Connect:
In small groups, students discuss artifacts that stuck out to them or surprised them. At times, students go up to the cordel and removes pieces to look at more closely with their peers. This discussion adds to building communal understanding.

Figure 2. An illustrated diagram of Lauren's instructional sequence in her Reading Methods course.

Creating A Cordel

When creating the *cordel*, there is no formula or one way of selecting artifacts. As we have curated materials over the years, we have always considered which pieces will invite critique, hope, and action. We aim for a balanced selection, ensuring that students leave feeling hopeful while also recognizing opportunities for real change. The process of creating a *cordel* is both creative and investigative. Figure 3 provides tips and a QR code that links to a handout to help you curate your *cordel*.

Tips For Your Creation of a Cordel

Brainstorm. Make a web or list of various themes, perspectives, voices, items, and places.

Get Local. Investigate local connections

Hope. Ensure there is a mix of optimism & hope in addition to places that foster critique.

Read & Select Passages from your larger text set.

Investigate Supplemental Materials. Look for primary sources, statistics, maps, headlines, photographs, ect.

Lay It Out. look at the artifacts collectively.

Scan Me For A Handout



Figure 3. Tips for how to create the cordel

In a time marked by digital misinformation, algorithm-driven content, and the erasure of climate truths from public discourse, the tactile, community-oriented nature of the *cordel* offers learners an analogue form of storytelling grounded in relationality, care, and critical engagement. Returning to print-based, participatory texts like the *cordel* invites students to slow down, reflect, and co-construct meaning in ways that resist the speed and disposability of much digital content.

At a Glance

Title	<i>Cordel</i> as a Multimodal Launch for Environmental Action
Unit Time	30 - 45 minutes
Grade Level(s)	ECE to adult
Core Text	<i>Be A Good Ancestor</i> , by Gabriella & Leona Prince
Supporting Texts	Other multimodal texts that support the goals of the unit (linked to climate literacy)
Climate Literacy Terms	Will be based on the subject of the <i>cordel</i>
Objectives	Build and activate prior knowledge through an arts-based shared experience around environmental stewardship.

	• Offer a breadth of knowledge and entry points and foster rich discussions and future collective action.
Materials and Resources	• a clothesline cord (15–25 feet); • clothespins (about two per artifact) • selected artifacts printed on lightweight paper for easy hanging (~20-50)

Adaptations for Different Spaces

The *cordel* is a highly engaging experience that supports students in learning expansively about a topic in an interactive way. The above steps were delineated in planning and implementing a *cordel*. We also provide a frame for considering how to make a *cordel* work in various learning contexts and learning spaces, such as online and hybrid learning, as well as adaptations for young learners (Figure 4).

Digital Adaptations

The *cordel* is a highly interactive experience. However, depending on learning spaces, it can also be adapted for online and hybrid classrooms to ensure high engagement and participation while accommodating the learning environment. We have done this in higher education with hybrid and asynchronous learning formats. The figure below provides initial guidance on how to make this work in a digital space. One key to highlight in any adaptations is how learners are encouraged to engage with one another in the learning and how they are invited to connect with and talk with and to the content in the *cordel*. The emphasis on multimodality can be elevated in the digital learning space. The interactions can and should also be multimodal and include audio responses, annotations, digital stickies, and the utilization of various digital tools and platforms.

Adapting Cordel for Digital Learning

- **Accessibility and Preparation:**
 - Provide multimodal resources from the Cordel in both print and digital formats to support learners' engagement with the learning structure.
 - Record a short video for online or asynchronous students and highlight what Cordel looks like in person. This is also beneficial for envisioning the collaborative nature and prompting their experience with the digital Cordel as a collective resource.
- **Utilize Interactive Digital Tools:**
 - Use platforms like Padlet and/or Canva for a collaborative cordel across contexts, promoting real-time engagement and inclusivity across modalities.
 - Promote multiple ways to engage with the digital data during viewing.
 - As learners make comments and asides while viewing, creating space for easy notes/annotations while viewing online is also helpful in promoting community.
- **Facilitate Structured Breakout Sessions:**
 - Dependent on the connectivity and sound, connect both in-person and online students in breakout groups to encourage blended collaboration, with clear instructions to guide group work.
 - This allows learners to focus on their multimodal experiences and blend the learning community.
- **Offer Multimodal Feedback Options:**
 - Incorporate live feedback and asynchronous discussions to accommodate different participation styles and enhance reflective learning.
- **Encourage Real-World Reflection:**
 - Use digital journals or discussion boards for students to reflect on how the cordel can be applied to teaching critical topics like environmental justice.

Figure 4. Tips for using a cordel in a digital or hybrid learning environment

Adaptations for Young Learners

Young learners may not yet access conventional print and require adaptations for the *cordel* content and interactive responses. Before you begin, consider the purpose and focus of your *cordel*. What responses do you hope to elicit? Plan with these in mind. In planning for young children, you can begin by reflecting on their strengths and drawing on genres/modes that suit their strengths. For example, if young children are highly engaged in songs and rhymes, have audio experiences playing while they engage in the *cordel* print materials. Or, if students are drawn to art, seek out representations of art across modalities that can be shown in images to communicate various perspectives and voices. It is also strongly encouraged to use text formats familiar to young people, such as picturebooks and environmental print. It is also highly recommended that young learners have interactive elements of the *cordel*. For example, use sensory resources, lift the flap content, and other strategies that help children engage holistically and across their senses with the content. The engagement should also be more scaffolded and be broken into multiple passes. For responses, have students pick their favorite piece and why, use stickers to ‘annotate’ the various pieces, and follow up by creating their class *cordel* with multimodal materials, oral stories, and drama.

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Critical Essays



The Wild Idea of Riding a Bike

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Abstract

While the depiction of automobiles remains ubiquitous in popular media, one of the few places bicycles are celebrated is within the pages of many children's picturebooks. These stories demonstrate ways in which bicycles can help facilitate an approach to living that is good for both people and the environment. The picturebooks introduced in this article demonstrate many convivial features of bicycles including their benefits for community building, personal empowerment, and defying social norms. They are also shown as easy to operate, versatile, and practically beneficial in various cultural contexts. By celebrating cycling's conviviality, these picturebooks encourage young readers to embrace an orientation toward life that values human connection, creativity, and sustainability over industrial efficiency.

Keywords

Conviviality, bicycles, picturebooks, autonomy, lifestyle

Acknowledgements

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Introduction

David Shannon's *Duck on a Bike* (2002) begins when Duck gets a wild idea: "'I bet I could ride a bike!' he thought." This inspiration may be even better than Duck imagines. According to the World Health Organization, cycling combats several global problems, including physical inactivity, air pollution, and global temperature increase (2022). In contrast, automobiles, despite being identified as the leading net contributor to global climate change (Unger et al., 2010), remain ubiquitous in popular media, while cycling is rarely shown as viable transport. Zack Furness laments, "One of the major obstacles preventing a more rigorous analysis of the future of transportation is the virtual invisibility of non-motorized technologies as a real alternative among even the most critical thinkers who write on the politics of oil, environmentalism, and/or climate change (2010, p. 205). One site where bicycles are not just visible but actively celebrated is within the pages of many children's picturebooks. These stories demonstrate ways in which bicycles help facilitate an approach to living that is good for both people and the planet.

Conviviality

The idea of bicycles as convivial tools as theorized by Ivan Illich in *Tools for Conviviality* (1973) and *Energy and Equity* (1974) reveals many benefits of cycling for individuals and society. Rather than valuing a technology according to its apparent convenience, Illich believed tools should be judged according to how well they support living well or conviviality, a way of life that emphasizes human connection, creativity, equality, and self-determination. Illich distinguishes convivial tools from industrial tools which he believes dehumanize society. Industrial tools (like cars) dictate how they are to be used, hamper creativity, increase inequality, and are unsustainable. Convivial tools (like bicycles) do exactly the opposite.

Tools foster conviviality to the extent to which they can be easily used, by anybody, as often or as seldom as desired, for the accomplishment of a purpose chosen by the user. The use of such tools by one person does not restrain another from using them equally. They do not require previous certification of the user. Their existence does not impose any obligation to use them. They allow the user to express his [or her] meaning in action (Illich, 1973, p. 34). For Illich, bicycles are a kind of tool that helps individuals and communities thrive by extending the power of individuals instead of replacing it with other, potentially harmful, energy sources.

The selected picturebooks demonstrate several ways in which bicycle conviviality is portrayed for young readers. These stories adhere to three trends that

parallel three approaches to representing childhood in picturebooks described by Nina Christiansen (2017):

- 1) prescriptive, showing bicycling as the kind of activity children are encouraged to do
- 2) generally retrospective, depicting cycling in protected environments with other forms of technology and transport nearly or completely absent, and
- 3) often parodic, humorous, or absurd in ways that temporarily empower the protagonists (pp. 365-66).

This final mode of representation also relates to the tendency for cycling to be portrayed as transgressive and defiant.

Bicycling Joy

Duck on a Bike exposes common attitudes toward cycling while celebrating it as unsanctioned, convivial transgression. At first, Cow thinks Duck looks silly riding a bike. Sheep views the activity as dangerous. Dog sees it as a neat trick, while Cat finds it to be a waste of time. Horse's competitive spirit is pricked by the bike's speed. Chicken is afraid of being run over. Goat wants to consume the bike. Pig considers Duck a showoff, and Mouse envies Duck's ability. However, when the farm animals encounter several unattended bikes, they seize the opportunity and are won over: "Now all the animals had bikes! They rode around and around the barnyard. 'This is fun!' They all said. 'Good idea, Duck!'" (n.p.). They discover that Duck's wild idea is a GOOD idea. The diverse and previously alienated animals unite around their new shared experience. Each animal rides a bike appropriate to their size, shape, and ability. They go nowhere, but experience their familiar barnyard creatively, allowing for individual differences and excluding no one.

In the final scene after the bikes have been returned to their places, Duck smirks with satisfaction knowing the illicit escapade has been undetected. The animals' ridiculous and bold behavior champions conviviality through absurd humor, a practice Illich encouraged. "Poets and clowns have always risen up against the oppression of creative thought by dogma," Illich wrote. "They expose literal-mindedness with metaphor. They demonstrate the follies of seriousness in a framework of humor. Their intimate wonder dissolves certainties, banishes fears, and undoes paralysis" (1993, p. 83). The joy the barnyard animals find in their self-propelled movement exposes the folly of their former fears. In the sequel, however, *Duck on a Tractor* (Shannon, 2016), Duck drives a much less sustainable tractor. The animals must adapt to the machine,

rather than the machine (which runs out of gas) working for them. The absurd humor remains, but the animals are more constrained and feel less joy.

Bicycling also gives Astrid Lindgren's Lotta, in *Lotta's Bike* (1980) the opportunity to transgress and enjoy cycling with others. In this case, Lotta's defiance combined with her naivety leads to both humour and success. After not receiving a bicycle for her fifth birthday, she follows Duck's example to surreptitiously borrow another's bike. Unlike Duck, she is not able to control the bike, which is too large, and she crashes, gets hurt, and feels humiliated. Later in the day, however, after her father breaks his own rule by giving her a bicycle one year earlier than planned, she gets the hang of this appropriately sized bicycle quickly and cycles happily on the street in front of her house with her siblings. Her defiant attitude has been rewarded, and it continues. Upon seeing her brother, Jonas, ride with no hands, she tries to do the same, falls, and hurts her elbow. Although she loudly blames Jonas for doing what is forbidden, she simultaneously aspires to do the same. Lotta's transgression is discovered and rewarded. She is comforted instead of corrected, given her own bike, and demonstrates that she is more capable than expected.

Bicycle Versatility

H. A. Rey's *Curious George Rides a Bike* (1952) demonstrates bicycling conviviality by showing a wide variety of bicycle uses. The man with the yellow hat gives George a new bicycle and naively tells him to stay close to home. Of course, George disobeys, and he subsequently uses the bike to do tricks, work, explore, meditate, crash, problem-solve, make new friends, become a hero, and star in the big animal show. Without adult approval and against orders, George has used the bicycle to expand his horizons, develop his autonomy, and increase his social network. But his cycling agency, like Duck's, is short-lived.

George's final, climactic act on the bicycle is a performance staged for others' amusement under adult supervision, reducing the bicycle to a mere trick machine and obscuring its more practical purposes. Sadder still, after the show, George surrenders his independence and joins the Man with the Yellow Hat in a fossil-fuel powered car. He moves from autonomous energy producer to dependent energy consumer, complicit with the waste the car generates.

The story follows the familiar pattern of ending with a return to home and apparent security. As a child, George is defined by his ignorance and therefore in need of adult protection (Nodelman, 2008, p. 35). But whereas George under his own power travels by bicycle, the supposedly wiser and protective adult relies on a car to cover the same distance thereby contributing to future (climate) insecurity.

Bicycle Competency

Neither George, Duck, nor the barnyard animals have any trouble learning to ride, and even Lotta catches on quickly. An aspect of bicycles' conviviality is that they can be ridden by nearly anyone. Furthermore, as Lotta shows, simply learning to ride can be an act of liberating defiance. Journalist Jody Rosen describes it like this: "The first ride enacts the flight from the clutches of adult caretakers, when the kid pedals away from the grown-up who has been steadying the bike with a grip on the underside of the saddle" (2022, p. 252). Developing cycling skills is one of the most common topics in bicycling picturebooks and can reflect growth with other competencies, often in defiance of societal norm or expectations.

In Born to Ride: A Story about Bicycle Face (Theule, 2019), set at the end of the 19th century, Louisa Belinda Bellflower's struggle to ride a bike parallels her mother's toils on behalf of female suffrage. She also contends with opposition to female cycling. Contrary to her family doctor's assertion that cycling will cause her physical harm, she finds the experience, once mastered, both joyful and liberating.

The bicycle in *Joseph's Big Ride* (Farish, 2016) facilitates Joseph's transition from a Kenyan refugee camp to an American city. He had been wanting to bike since he was in the camp, so his learning to ride in America, with the help of a new friend and much effort, connects his past with his future as he learns to fit in. The fact that convivial mobility is key to this immigrant's ability to establish a new home is significant, especially given the major role industrial transport and technology play in mass migration, displacement, and alienation (Kivisto, 2011, p. 146).

Practical Use

Not only are bicycles accessible to children through their ease of operation and simplicity, but they can also offer practical value to whoever rides one. A person on a bike "can go three or four times faster than the pedestrian but uses five times less energy in the process" (Illich, 1974, p. 44). Despite the value of bicycles for transport, this is seldom on display in North American bicycling picturebooks. An exception is Dav Pilkey's *Paperboy* (1996) in which the protagonist delivers newspapers in the early morning. The bicycle facilitates the paperboy's autonomy, allowing him to work on his own, in the safety of car-less streets and at a speed with which his dog can keep him company. His connection to the landscape, the weather, and the moment are visceral and personal.

Picturebooks that feature bicycles as tools for work or transport are often set in other countries. *The Red Bicycle: The Extraordinary Story of One Ordinary Bicycle*

(Isabella, 2020), follows a donated bicycle sent to Burkina Faso. For a time, a teenage girl uses it to transport Sorghum, and later another owner adds a trailer and operates it as an ambulance. *In a Cloud of Dust* (Fullerton, 2015), set in Tanzania, shows children appreciatively borrowing bicycles from a “bicycle library” to travel long distances to school. In both stories the increased but moderately paced mobility helps foster social interaction while dramatically increasing efficiency. Supplementary pages expound on the benefits bicycles offer in these settings due to such convivial features as their versatility, affordability, and durability.

Conclusion: A Convivial Orientation to Life

In these stories, the bicycle has been a positive force for creative self-expression and agency. They demonstrate ways in which bicycles benefit their young riders while continuing to quietly protest against authoritarian control. These stories can encourage readers to consider not just bicycles, but other ways in which living according to principles of conviviality can lead to personal agency and satisfaction in everyday life. If riding a bicycle supports lifestyles that privilege human connection, creativity, equality, and self-determination over speed, convenience, and presumed efficiency, then maybe Duck’s wild idea really is worth considering; not just riding a bike, but the orientation toward living that riding a bike embodies.

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Post-apocalyptic Narratives for Climate Change Education

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Abstract

This article examines the challenges of incorporating post-apocalyptic narratives into Climate Change Education (CCE). Drawing on current critiques, I identify the three major concerns: the potential to induce learner disempowerment and fatalism, the risk of narrative simplification that weakens critical impact, and the cultural specificity of predominantly Western works. Using Simon Stålenhag's graphic novel *The Electric State* (2018) as a case study, this article demonstrates how carefully selected post-apocalyptic texts can address these challenges.

Keywords

Post-apocalyptic narratives, Climate Change Education, hope education, agency, retro-futurism

Introduction

Post-apocalyptic narratives have become valuable tools for ecological education. By describing worlds, survival, and adaptation following social, environmental or technological collapse, they can help learners grapple with the complexities of climate crisis and their own role in responding to it (Peters & Besley, 2023; D'Orto & Tasquier, 2025). In Climate Change Education (CCE), such narratives have been used in diverse formats and media, from picturebooks that foster tactile and collaborative engagement (Campagnaro & Goga, 2022), to drama-based approaches (Gallagher & Balt, 2024) and participatory scenarios or sensory experiments (Doyle, 2020), all aiming to combine emotional resonance with critical thinking.

However, post-apocalyptic narratives also face critiques. Two concerns are especially relevant for teachers: first, that these stories advance fatalism and a loss of learners' sense of agency; second, that they sacrifice emotional complexity to a simplistic emotional framing of despair or hope. Addressing these critiques, this article examines Simon Stålenhag's *The Electric State* to show how this work 1) presents agency as a daily, concrete practice, 2) resists the emotional binary between hopelessness and optimism, and 3) offers strategies to make cultural specificity a productive subject of classroom discussion.

Post-apocalyptic Narratives in CCE

Critiques of using post-apocalyptic narratives in CCE focus on two main concerns: first, that they foster climate fatalism; second, that they simplify actual challenges and solutions. The first concern is that urgent emotional tones and catastrophic imagery can amplify despair and diminish learners' perceived ability to take meaningful environmental action. As Hulme observes, "The counterintuitive outcome of such language is that it frequently leads to disempowerment, apathy and skepticism among its audience" (2009, p. 348). Without supportive spaces to process these emotions (Houghton et al., 2024), learners risk developing climate fatalism (Flannery, 2024), adopting a mindset that "whatever we do, we're doomed."

The second concern is that, within current CCE trends emphasizing hope, resilience, and optimism (Mochizuki & Bryan, 2024), apocalyptic narratives may be reshaped into overly positive stories, often with unrealistic endings or a focus on exceptional individuals, which obscures the complexity of the climate crisis. A further concern focuses on cultural universality. For many communities, collapse is an ongoing reality rather than a speculative future (Swyngedouw, 2013). Texts rooted in Western contexts may carry assumptions that limit their applicability as global tools for climate education. In short, the challenge is to balance emotional intensity with supportive processing and to retain narrative complexity without reducing stories to simplified emotional binaries or unrealistic optimism.

***The Electric State*: Agency in Daily Action and Emotional Complexity**

Stålenhag's graphic novel *The Electric State* offers a good case study to help students understand agency through daily action and engage with complex ecological emotions. Set in the American West in 1997, after the collapse of technological civilization, the story follows a teenager, Michelle, and her robot companion, Skip, as they travel along an abandoned highway in search of her missing brother. Their journey uncovers a picture of societal disintegration caused by an out-of-control neural network system.

The novel's visual style blends retro-futurism with post-apocalyptic imagery, juxtaposing 1990s American landscapes with advanced technological structures, and interweaving first-person memory fragments from Michelle. Past memories, present journeys, and future ruins coexist, producing a sense of temporal dislocation. *The Electric State* also presents a complex web of interactions among humans, technology, and nature: humans, robots, techno-human hybrids, and natural elements meet, conflict, and cooperate. In today's world, where environmental experiences are often mediated by technology, such depictions offer opportunities to reflect on technology's role in shaping ecological perception and action (Park, 2022).

The Electric State combines strong visual appeal with conceptual depth, making it a valuable resource for educators seeking to connect literary engagement with climate action practice. Its narrative world provides concrete situations for discussing agency in daily action and for guiding students to experience ecological emotions beyond simple despair or uncritical optimism.

To understand how *The Electric State* situates these forms of agency within a broader symbolic framework, it is also necessary to consider the significance of its title. Throughout the book, visual motifs of electricity—power lines stretching across empty skies, glowing circuits, and dimly flickering machines—form a connective structure between human and technological worlds. Electricity operates both as a literal energy source and as a metaphor for interdependence, memory, and control. In the context of post-fossil-fuel ecologies, it represents a paradoxical condition: a technological force that sustains life while revealing the environmental costs of that sustenance. Rather than depicting electricity as external to ecology, Stålenhag visualizes it as part of the same energetic continuum that binds organic and artificial systems. Recognizing this symbolic dimension allows educators to frame discussions of energy dependence and ecological responsibility as intertwined and mutually constitutive processes.

This pedagogical potential becomes clearer when we examine two core elements of this novel: agency as a daily, concrete practice and understanding that resists emotional simplification.

Reconstructing Agency

The Electric State creates space for reader agency on three levels: everyday practices, continuous forward movement, and relational action.

Everyday details, central to characters' agency, are abundant. While Stålenhag's images depict the silence and emptiness of post-apocalyptic wastelands, the actual plot concentrates on Michelle's daily activities. Scenes such as stopping to rest under a pale sky (pp. 20-21), packing her belongings on the roadside (pp. 52-55), bathing and restocking at a dimly-lit gas station (pp. 22-25) draw attention to the rhythms of ordinary life in extraordinary conditions. These small, mundane actions maintain order and humanity in a highly uncertain environment.

At one point Michelle and Skip pause beneath an overpass beside the colossal remains of a collapsed robot. Against the desert horizon glowing beyond, the narrator reflects: *"I managed to get a lot of things done in Mojave. I washed my clothes, bought food, put gas in the car and washed it, and even managed to find some comic books and Kid Kosmo action figures for Skip"* (p. 23). In this juxtaposition of domestic routine and monumental ruin, the act of washing, buying, and refueling becomes a form of quiet endurance. These gestures perform continuity and care in a world that has otherwise disintegrated, exemplifying how *The Electric State* translates agency into the persistence of ordinary maintenance.

These everyday behaviors provide an agency mode that learners can understand. I define agency here as the ability to maintain autonomy and purpose through ordinary, everyday actions in the face of uncertainty. This aligns closely with the concept of "incremental climate action" (Wise et al., 2014), which emphasizes that climate responses exist in daily decisions rather than being limited to major policies or technological breakthroughs. In the classroom, such scenes could be used to invite students to discuss how small, sustained efforts contribute to environmental resilience.

The story likewise emphasizes a forward-moving dynamism. Stålenhag constructs an anti-climactic narrative that avoids dramatic turning points or heroic victories common in traditional disaster stories, replacing them with the protagonist's persistent forward movement. The journey is an open-ended road trip, where sequences of driving dominate the visual field: roads stretch endlessly toward the horizon, perspectives shift between the view from inside the vehicle and a trailing third-person vantage, and the blurred treatment of distance creates a tangible sense of the unknown future.

This dynamic of motion unfolds across several sequences where the car appears repeatedly in transition between deserted towns and monumental ruins (pp. 25-70).

The reader alternates between seeing the road ahead from inside the car and viewing the vehicle as a small, solitary point within vast landscapes. In one such scene, the narration begins with the restrained line, “We had left the town behind and traveled out into the desert” (p. 30). The combination of this minimal statement and the panoramic stillness turns movement itself into a meditative act. The alternation of interior and exterior viewpoints also shifts the reader’s position, sometimes aligning it with Michelle’s vision and sometimes withdrawing it into reflective distance. In this rhythm, *The Electric State* reframes progress as the endurance of orientation toward an uncertain future. In fact, through this dynamic of continuous forward movement, *The Electric State* suggests that action itself, regardless of immediate results, has meaning. These scenes can be used to prompt students to reflect on how perseverance, even without guaranteed outcomes, can counter climate fatalism and reinforce the value of sustained engagement.

The third way in which the novel supports the reader’s agency is through presenting a relational action mode. The robot Skip is not merely a tool; it plays multiple roles: guarding Michelle’s safety while she sleeps (p. 21), standing sentinel in dangerous moments (p. 118), and sharing the burden of luggage and supplies (pp. 22-23). Their bond is conveyed almost entirely without dialogue, through parallel postures, coordinated movements, and the shared occupation of space. Images often depict the two side by side in the frame, as if visually affirming their interdependence. This quiet partnership transcends human-nonhuman boundaries, presenting a model of cooperation with “the other,” whether technological, biological, or environmental.

Across the book’s recurring paired compositions, Michelle and Skip are consistently positioned on the same horizontal plane. Whether walking, resting, or entering new spaces, they move parallel to each other rather than hierarchically. The visual rhythm alternates between wide shots that place them together against expansive landscapes and closer views where their gestures subtly mirror one another. Even in moments of tension, such as the scene with the deer inside the abandoned house (p. 119), this spatial symmetry remains intact. This recurring balance invites a reflection on how equality, care, and interdependence are expressed through posture and framing, linking visual structure to ethical relation.

The visual relationship between Michelle and Skip also illustrates how relational agency is enacted through coordination and mutual attention. Their companionship models cooperation across human and nonhuman boundaries, emphasizing that agency emerges from interdependence rather than individual assertion. Within Climate Change Education, this perspective supports collaborative classroom practices that foreground collective responsibility and shared maintenance as central to ecological

understanding, embedding ecological action in networks that include humans, nonhumans, technology, and environment.

Through these three dimensions—everyday practices, continuous forward movement, and relational action—*The Electric State* demonstrates that post-apocalyptic narratives can be instructional and empowering. By presenting multidimensional, concrete forms of action, such stories can provide educators with a framework for helping students imagine their own roles in climate response.

Resisting Simplification

Stålenhag's novel is likewise a good example of how post-apocalyptic works can avoid simplistic emotional arcs. The novel's image-text structure, in particular, its carefully varied visual-textual rhythm, are primary means by which the book maintains narrative criticality and depth. Page layouts shift between symmetrical image-text pairings, full-spread images with embedded prose, and stretches of image-only sequences. This produces a rhythm that mirrors the non-linear narrative. Within that rhythm, when content alternates between tender, nostalgic memories, unsettling portrayals of technological addiction, and moments of fear toward the unknown, readers are required to navigate multiple emotional registers.

One striking example is the sharp contrast between pages 12-13 and 14-15: the bright yet desolate dust storm scene gives way to a low-saturation nighttime flashback, producing a rupture in tone and time. This abrupt shift forces readers to reconcile conflicting emotions, beyond a simple trajectory toward either despair or hope. Similarly, the silent, image-only sequence on pages 95-100 stretches time, creating space for readers to fill in narrative and emotional gaps. These sequences can be used to invite students to articulate their emotional responses and strengthen their capacity to engage with complex climate emotions.

By combining these visual-textual strategies with its multi-dimensional portrayal of agency, *The Electric State* offers educators a resource that resists simplification while supporting nuanced, emotionally engaged learning about climate crisis.

Conclusion

The reading of *The Electric State* proposed in this shows that post-apocalyptic narratives can be useful in Climate Change Education. By combining a layered visual and textual structure with multidimensional portrayals of agency, post-apocalyptic storytelling can help learners see agency as a concrete, ongoing practice, engage with climate emotions in nuanced ways, and critically interrogate the cultural positioning of climate narratives. Future work could explore alternative texts or adaptations that

reflect a wider range of climate experiences worldwide and further refine strategies for integrating post-apocalyptic storytelling into Climate Change Education.

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Shadows of Progress

Hydrofeminism and Environmental Injustice in Aravind Adiga's The White Tiger

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Abstract

This essay explores environmental injustice in Aravind Adiga's *The White Tiger* (2008) through the lens of hydrofeminism, a framework developed by Astrida Neimanis that connects water politics to feminist ethics and ecological critique. While Adiga's novel is well-known for its criticism on class and corruption in modern India, it also highlights how ecological degradation intensifies gender-based inequalities under urbanization, caste oppression, and capitalist development. However, focusing on the rivers: Ganga and Yamuna, the polluted city and rural spaces, and the silent suffering of female characters like Balram's mother, Kusum, and Pinky Madam, this paper argues how water becomes a medium for expressing structural inequality. Additionally, by situating this analysis within a pedagogical framework, it offers strategies for teaching climate justice and gender sensitivity through literature.

Keywords

hydrofeminism, environmental degradation, feminist ecology, water justice, climate literature

Introduction

In the age of rapid climate change, literature has become a vital medium for reflecting on and responding to ecological challenges. Climate literature—also known as “cli-fi,” a term defined by Adam Trexler (2015) and further developed by Lykke Guanio-Uluru (2019)—urges us to examine how environmental destruction is entangled with politics, economics, and social inequality. Aravind Adiga’s *The White Tiger* (2008), though it is read as a critique of India’s class system, also contains powerful insights into the environmental costs of modernization. One early scene of the novel depicts Balram, the male protagonist of the novel, observing that, “The river Ganga... black and brackish with industrial sewage; the banks were lined with feces; the water was full of chemicals” (Adiga, 2008, p. 15). This vivid image of sacred waters reduced to sludge embodies the ecological degradation shaping the novel’s ethical landscape. This paper explores how water—particularly the Ganga and Yamuna rivers—symbolizes structural inequality in *The White Tiger*. By examining the contrast between polluted urban spaces and neglected rural areas, and by highlighting the silent suffering of female characters such as Balram’s mother, Kusum, and Pinky Madam, it argues that water functions as a powerful medium for exposing social and gender-based injustices.

To interpret such environmental violence, this essay unfolds Astrida Neimanis’ (2017) concept of hydrofeminism, which views all beings as “bodies of water”, emphasizing the shared vulnerability and interdependence of human and non-human life through water systems. It criticizes patriarchal and capitalist structures that commodify nature while disproportionately burdening women, particularly in marginalized communities. Hydrofeminism challenges us to recognize water not just as a natural resource but as a relational, political, and ethical force—shaping who gets to live, labor, and lead in an ecologically unequal world. As Neimanis (2017) explains, “hydrofeminism reveals how bodies are always more than human, more than individual, and more than sovereign” (p. 61), inviting readers to see gendered and environmental oppression as intertwined. Thus, in highlighting hydrofeminism, this essay exhibits how water and gender intersect with caste, corruption, and capitalism in the novel, helping educators and students approach climate literacy through stories grounded in local and global justice (Chakrabarty, 2009).

Water, Class, and Capitalism

In this novel, water transcends its literal presence to become a vehicle for representing entrenched class divisions. Balram's village, located in the "Darkness," is a place where poor people suffer from chronic scarcity and contamination because they must rely on unsafe sources. He describes how villagers "fetch water from the pond every morning, even when it's dry and full of green scum" (Adiga, 2008, pp. 24-26). The portrayal of a filthy, unreliable, and potentially deadly pond underscores how this scarcity becomes a visible form of environmental degradation. Balram also frequently contrasts rural deprivation with the luxury of urban centers. His amazement at his employer's access to bottled water reinforces how fluid resources reflect class hierarchies: "They even brushed their teeth with mineral water" (p. 78). This highlights water as both a literal and symbolic boundary between classes—dirty rivers as markers of marginality, and bottled purity as a symbol of control. The division mirrors Vandana Shiva's (2002) argument that the neoliberal model of privatization in India has transformed a basic necessity into a corporate product, thereby deepening ecological injustice (p. 42). In hydrofeminist terms, those who labor to sustain life—often rural women—are excluded from the very systems that govern access. Kusum, for instance, is one of these unseen household managers who, despite bearing the burden of securing and managing daily supply, has no voice in village or household decisions. Her labor is taken for granted, and she remains excluded from formal discussions or infrastructural planning that determines availability of safe sources.

Balram's transformation from a poor villager to a wealthy entrepreneur is also an environmental journey—from polluted communal rivers to filtered dispensers in private offices. His migration is not just socioeconomic but ecological. Neimanis (2017) reminds us that water flows through every body and institution, but not all bodies have equal access or control (p. 2). Balram's narrative shows the disparity as he rises, he becomes more detached from the polluted environments of his past. Thus, Adiga uses water to map India's class structure, making visible the everyday violence of inequality. Water, a basic necessity, becomes a litmus test of privilege—who drinks safely and who gets sick, who controls the taps and who bends to fill buckets.

Moreover, the novel suggests that even the wealthy cannot escape moral contamination. Balram reflects, "There's so much smog in the air that I couldn't see the road... But I could see the buildings" (Adiga, 2008, p. 123), highlighting the contradiction of shining skyscrapers emerging from toxic air. Delhi and Bangalore—the cities of India's economic prosperity—are not spaces of opportunity but ecological catastrophes disguised by neoliberal aspirations. As Rob Nixon (2011) argues, such growth depends on "unseen casualties"—the dispossessed, the displaced, and the

diseased. Adiga dismantles the myth of urban progress by exposing how elite comfort rests on environmental decay.

According to this perspective, Delhi and Bangalore emerge not as centers of hope but as dystopias in disguise. Adiga reveals that urbanization under neoliberal capitalism is less a cure for rural suffering and more a reorganization of exploitation—where environmental ruin is rebranded as economic success.

Rivers and Riverbanks as Risky Gendered Landscapes

The Yamuna River, like the Ganga, is portrayed as a space of environmental devastation and lost sanctity. Balram describes Delhi's rivers as "black... not water, but thick, black sewage" (Adiga, 2008, p. 112), marking a stark transformation from spiritual purity to chemical ruin. This symbolic death signifies not only ecological neglect but also a spiritual and cultural disconnection—a severing of communal bonds once sustained by clean water. Riverbanks, once spaces for purification, now evoke toxicity, disease, and danger. From a hydrofeminist perspective, these polluted spaces become risky gendered landscapes, as women—primarily responsible for securing household water and maintaining hygiene—must navigate hazardous environments daily. Although centered on Balram's male perspective, the novel reveals that women, especially those in slums or migrant settlements, bear the burdens of sanitation and caregiving without safe resources. They undertake the arduous tasks of fetching water from distant pumps and boiling contaminated supplies, exposing them to physical danger, health risks, and social vulnerability.

Balram's grandmother, Kusum, is one such figure whose survival is entangled with ecological hardship. Despite holding authority within the household, she performs unpaid environmental labor—rising early to collect water from unreliable sources that often cause illness: "Every morning she went to fetch water before the sun was up... her hands red from the cold, her feet cracked" (Adiga, 2008, pp. 25-28). This image of physical deterioration underscores how rural women disproportionately shoulder the effects of scarcity, aligning with Vandana Shiva's (2002) view that women are frontline victims of privatization and pollution. Yet these injustices stem not from natural disasters but from systemic inequality, corruption, and rural neglect.

While Pinky Madam, Balram's employer's wife, is not directly affected by environmental degradation, her psychological unraveling after a hit-and-run incident reveals the emotional toll of living within corrupt systems: "She ran over a child and didn't say a word. Just drove on" (Adiga, 2008, p. 167). Her silent withdrawal reflects a rupture in moral consciousness, echoing Neelam Srivastava's (2010) claim that global capitalism fragments identity (p. 45). Sara Ahmed's (2014) concept of the "willful

woman” helps interpret Pinky’s retreat as a form of resistance to patriarchal norms (p. 59). Though not a traditional environmental subject, her character illustrates how systemic violence—ecological, emotional, or social—also affects the privileged, reinforcing Sharae Deckard’s (2015) claim that elite detachment is an illusion (p. 211).

Characters like Kusum, with her cracked hands and predawn labor, embodies these gendered risks (Adiga, 2008, pp. 25-28). Thus, even without direct narrative emphasis, the novel’s backdrop affirms that ecological degradation exacerbates gendered vulnerability in subtle but pervasive ways.

In this novel, women—though fewer in number—illuminate the gendered dimensions of environmental injustice. Their experiences reveal how ecological decline disproportionately affects women, especially in rural and marginalized areas of India. Balram’s mother, though unnamed and briefly mentioned, serves as a powerful symbol of gendered suffering. Her death is linked to contaminated water: “My mother’s body was laid out on the banks of the river... priests poured water over her head” (Adiga, 2008, p. 30). The cruel irony of this ritual purification—performed with polluted river water—underscores the dissonance between spiritual tradition and ecological reality. Her death exemplifies what Neimanis (2017) calls a “leaky body”—one that absorbs systemic neglect and whose suffering remains largely invisible. In hydrofeminist terms, polluted water does not merely flow around the body; it infiltrates and transforms it, rendering women’s bodies literal sites of environmental violence. Balram’s mother thus represents how systemic environmental neglect penetrates bodily boundaries, creating embodied forms of ecological injustice that often remain unnoticed.

Teaching *The White Tiger* through Hydrofeminism

Teaching *The White Tiger* through a hydrofeminist framework provides a meaningful opportunity to connect literature with contemporary ecological and gender justice concerns. This approach encourages students to interrogate not only the novel’s social inequalities but also its environmental undercurrents, especially those tied to water scarcity, pollution, and the gendered burden of ecological neglect.

By applying Astrida Neimanis’s concept of hydrofeminism in the classroom, educators can guide students to view water not as a neutral resource but as an ethical and political agent—shaping who has access, who labors, and who suffers. For instance, a class discussion can begin with the polluted imagery of the Ganga and Yamuna rivers and ask students: “Who in the novel is responsible for fetching water? Who controls it? Who suffers the consequences of its contamination?” This line of inquiry brings forth the gendered, caste-based, and class-specific dimensions of water justice.

To foster critical thinking and empathy, students might undertake creative exercises such as writing interior monologues from the perspective of Kusum or Balram's mother, imagining their daily routines, frustrations, and resilience in a polluted and patriarchal environment. Another activity could include comparative media analysis, where students examine real-life water crises in India (e.g., Yamuna pollution, Delhi water shortages) alongside the novel's depictions. These interdisciplinary practices bring literature into dialogue with environmental studies, sociology, and gender theory.

Role-playing debates—such as one between government officials, environmental activists, and rural women—can help students simulate real-world power dynamics over water rights and understand the unequal burdens placed on marginalized communities. Teachers may also ask students to identify metaphors of water in the text and relate them to hydrofeminist ideas like “leaky bodies” and “watery ethics,” promoting deeper literary analysis.

Ultimately, *The White Tiger* becomes more than a critique of ambition and corruption—it evolves into a tool for developing what Paulo Freire (1970) terms critical consciousness. Through hydrofeminist pedagogy, students not only interpret texts but also begin to see their connections to broader struggles for environmental and social equity. In this way, literature becomes an act of activism—enabling learners to imagine more inclusive, sustainable futures where clean water and human dignity are rights, not luxuries.

Conclusion

Although *The White Tiger* is not typically categorized as climate fiction, it offers profound insights into the intersections of environmental degradation, urban decay, and systemic inequality. Balram's journey—from a village plagued by toxic rivers to a city where clean water is a luxury commodity—reveals that so-called “progress” often rests on the suffering of the poor and the invisible labor of women. His rise to success is built on the backs of those left voiceless. Adiga's vivid depiction of urban spaces, shrouded in smog and sewage, embodies what Rob Nixon (2011) describes as “slow violence”—the gradual, largely invisible harm inflicted by environmental neglect. By bringing these issues into the classroom, educators can help students move beyond literary analysis to develop a critical consciousness about real-world environmental and social justice challenges. Ultimately, *The White Tiger* invites readers to imagine a future where sustainability and justice are inseparable—a world where clean air, safe water, and human dignity are rights shared by all, not privileges reserved for a few.

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Interdisciplinary Learning Goals for 21st-Century Climate Education

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Abstract

Amid intensifying climate disruptions, states across the U.S. are beginning to require K–12 schools to include climate education. Yet, teachers face challenges in designing meaningful and interdisciplinary learning experiences. This article introduces a set of climate justice learning goals developed through collaboration among teachers, administrators, students, and researchers as part of the Climate Solutionaries Community (CSC) Project. We ground our goals in the Head-Heart-Hands (HHH) framework by emphasizing: 1) scientific and social knowledge (Head); 2) socio-emotional competencies, hope, and agency (Heart); and 3) applied skills for action and community solutions (Hands). By integrating these attributes, secondary educators are able to develop student understanding of climate phenomena and justice issues, while cultivating resilience and empowerment.

Keywords

Climate education; secondary student learning; Head-Heart-Hands framework; community projects; climate justice

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Introduction

Young people today face a lifetime of environmental and social disruption due to the global climate crisis. Educating them on the full scope of this issue can be challenging. States like [California](#), [Connecticut](#), [Oregon](#), and [Illinois](#) have recently required climate education in public K-12 curriculum. However, knowing how to implement this curriculum poses challenges for teachers as they seek guidance on designing meaningful, cross-disciplinary content for their classrooms.

One of these challenges is conceptualizing learning goals that go beyond students practicing rote memorization of scientific language and concepts toward a connection to personal, local, and global aspects of climate phenomena. Relatedly, climate educators have called for pedagogies that emphasize community building, peer motivation, and genuine hope for the future (Hargis, McKenzie, & LeVert-Chiasson, 2021). It is increasingly recognized that the climate crisis encompasses many dimensions of understanding beyond scientific interpretation alone. Addressing this emergency should also include interdisciplinary approaches that integrate content, skills, deep understanding, and empathy help to increase students' awareness of scientific and justice perspectives as they address impending climate emergencies with fortitude and genuine hope to find solutions (Jagers et al., 2019; Ojala 2012). Therefore, we pose this critical question: What climate learning goals can guide secondary teachers in providing middle and high school students with meaningful classroom experiences?

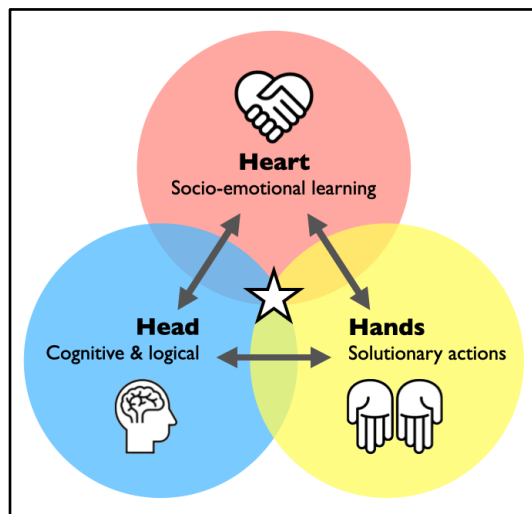
Climate Solutionaries Community Project (CSC) (a pseudonym), teachers, students, site administrators, and university researchers co-created a set of climate justice learning goals. These goals became the foundations for crafting, implementing, and evaluating a climate curriculum that was integrated into and across the curriculum at a high school and one of its feeder middle schools (e.g., Harris et al., 2025). The

purpose of this article is to showcase the goals themselves, the principles that directed their creation, and guidance for applying them in classroom settings.

An interdisciplinary product: Climate justice learning goals

The learning goals were developed utilizing a co-design method that included an extensive brainstorming, design, and revision process (Penuel, 2019; Roschelle, Penuel, and Shechtman, 2006). The diverse, multi-subject and multi-grade level team that engaged in this process is part of the reason the resulting goals are applicable to a range of classes: science, math, English, social studies, PE, and electives. In order to provide an underlying structure for the learning goals, we used the Head-Heart-Hands (HHH) framework from Sipos, Battisti, and Grimm (2008). The HHH framework points to the need for students' understanding of natural and social sciences associated with the climate crisis (Head), support and growth of socio-emotional capacity, empowerment, and agency (Heart), and development of skills necessary for action and community-based solutions (Hands; see Figure 1 below).

Figure 1 HHH model integrating various learning experiences to increase student understanding of ecological, social, and economic justice with regard to the climate change emergency.



Using the HHH framework, the learning goals in the figure below were developed as the team engaged in iterative discussions regarding priorities, wording, and implementation challenges. While there can always be overlap within and between goals, in Figure 2 below, we showcase the learning goals by their Head-Heart-Hands affiliation, and through implementation of these learning goals, we found the heart piece served as a driver for participation.

Figure 2: Climate education learning goals reflecting the Heart-Head-Hands framework. For the full table of learning goals and initial research results from our project, please see Hayes et al. (2024).

HHH	Goal
HEAD	Student knowledge and understanding of climate crisis causes, effects, and solutions. <i>Students understand...</i> <i>(physically- and socially-oriented attributes)</i> 1. Interconnectedness of systems 2a. Physical causes of climate emergencies 2b. Physical effects of climate emergencies 2c. Physical solutions 2d. Protection and regeneration of ecosystems 3a. Social causes of the climate crisis 3b. Social impacts of the climate crisis 3c. Socially-oriented actions to end the climate crisis
HEART	Student orientation toward climate justice issues and solutions. <i>Students feel...</i> 4. Radical hope in the face of climate challenge 5. The climate emergency is an important issue 6. Cope with agency 7. Generate empathy, take perspectives of others 8. Build relationships and take actions towards others that lead to reconciliation and healing 9. Recognize their own strengths and existing resilience
HANDS	Skills and competencies. <i>Students are able to...</i> 10. Critically consume and generate information, critique environmentally unjust systems 11. Carry out socially just actions to mitigate climate crises through both civic engagement and iterative design

Head

To address climate justice and mitigate the climate crisis, students need knowledge and understanding. We drew on Hawken's (2021) framework from [Regeneration: Ending the Climate Crisis in One Generation](#) to design content-oriented learning goals that illustrate the interconnectedness of causes, effects, and solutions in both the physical and social realms. In the physical realm, students need to understand the primary causes and effects of the crisis and its disruption to global habitats. For example, students might learn how greenhouse gas emissions drive up average surface temperature, which in turn increases extreme weather events such as drought and fires, precipitation and flooding. In the social/political realm, students would demonstrate how political and social factors can drive or constrain emissions through policies, laws,

and consumer action. Addressing not only the physical and the social, but also the interactions between them emphasizes to students and educators the multi-dimensional nature of the climate emergency and provides teachers with a roadmap for developing student learning.

Heart

The learning goals in the Heart category are designed to create spaces where students express how they feel about the climate crisis. Because of the imperative to work together to fix large-scale societal problems like climate emergencies, these goals emphasize the development of relationships and other social-emotional competencies. The Heart learning goals also center students maintaining hope and a sense of agency in the face of the climate crisis. To meet these learning goals, students might practice concrete skills such as building relationships and taking alternative perspectives, as well as more abstract skills such as empathy. They may also need practice processing complex feelings like despair. For example, Heart approaches might involve discussions about the impacts of extreme heat on different professions and demographics (ex., farm workers or the elderly), and projects where students might work with different community members to construct solutions in a respectful and sustainable manner. Each of the Heart goals is written from an assets-based perspective, encouraging students to recognize their strengths and resilience when addressing climate crises and climate justice.

Hands

Students will need skills to enact changes in the real world through planning, engineering, and evaluating various social and physical solutions to the climate emergency. These skills include critical analysis of climate information and solutions, as well as engaging in collaborative, hands-on work to create socially just mitigations for climate disasters. These learning goals are an applied way to develop an understanding of climate crises (Head) and taking solutions-based actions (Hands). For example, CSC students built We Share Solar Suitcases, planted trees for Arbor Day, and wrote letters to their state governor on policy change to address the impacts of extreme heat on farm workers. By combining these skills and competencies, we see a pathway for students to bolster their identities as climate problem-solvers and recognize their own agency and positive impact in behaviorally confronting the issue.

Interdisciplinary Heart Head Hands example

Here we offer an example of how CSC teachers designed interdisciplinary, solutions-focused climate learning (Harris et al., 2025). The unit focused on sea-level rise as an overarching phenomenon and involved teachers from English language arts (ELA), science, social studies, physical education (PE), art, and technology to help students grapple with a set of essential questions aligned with the Head, Heart, Hands model. For example, in ELA lessons, students learned about a coastal community dealing with sea-level rise, developing empathy as they acknowledge vulnerable and displaced populations directly affected by climate change (Heart). In science lessons, students engaged in evidence-based reasoning and discourse on topics like melting ice and thermal expansion (Head). This included students given large translucent tubs they were asked to fill with ice, balls of clay formed to mimic land mass, and toy animals to show what happens when the ice melts and water levels rise, potentially drowning out their animals. In social studies lessons, students were asked to identify local sea-level rise risks and examine how their local government is responding to this challenge (Head and Hands). Art and PE followed up by showing students how to use painting and riding bikes to school as forms of activism (Heart and Hands). What makes all of this interdisciplinary is not just the exploration of ideas within separate subjects, but the anchoring of the unit in a particular phenomenon that shows connections across disciplines and relevance to students' lives.

Conclusion

What we have observed from our co-design team is an extraordinary motivation to collaborate and educate future generations about the reality of the climate emergency, paired with a sense of urgency to ensure solutions provide students with hope for a brighter future. Our efforts have led to increased student understanding, empathy, and actionable skills. Additionally, the learning goals supported a local movement where teachers, working alongside their students and peers, created climate community events such as citizen-science focused school field trips and museum exhibits showcasing student's perspectives on the climate crisis through art. Since CSC teachers embraced and taught toward the same set of learning goals, students were consistently exposed to common concepts and frameworks throughout their educational journey. These learning goals can serve as a guide for schools and teachers seeking to offer students transformational, interdisciplinary, and justice-oriented learning experiences centered on the climate emergency and its impacts.

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An Antidote to Ecophobia

Opportunities for Awe through Books for Young Readers

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Abstract

Children's ecophobia—a sense of overwhelm and fear regarding environmental issues and climate change—is on the rise. To counter this trend, fostering a sense of awe grounded in Indigenous perspectives on the environment is essential not only for children's emotional health, but for the longevity of humans and the earth. This article provides practical strategies for early childhood and elementary teachers to help children experience awe about nature as they read picturebooks. We examine two texts grounded in Indigenous perspectives and we describe hands-on strategies teachers can use to enable students to gain tangible experiences in *reciprocal relationship* with nature.

Keywords

environmental education, picturebooks, awe, nature education

Introduction

As children increasingly encounter information about climate change, they paradoxically spend less time connected to the natural world. Ecophobia among young people is on the rise: a growing awareness of the climate emergency can lead to “fearful, cynical, and pessimistic” feelings toward the earth (Strife, 2011, p. 37). An antidote to ecophobia, crucial for the planet’s health and longevity (Pearsall, 2007), is awe. This “feeling of being in the presence of something vast that transcends your current understanding of the world”—is one emerging tenet of environmental education (Keltner, 2023, p. 7).

Ng et al. (2023) found that learning about nature can promote awe and a sense of connection. Too often, however, students read about ecosystems, weather patterns, or animal adaptations without having ever felt the chill of early morning air in a forest or having ever heard the call of a bird echo through the trees. Keltner (2023) argues that our experiences of awe don’t have to be limited to infrequent breathtaking events such as seeing an astonishing mountaintop vista. They can be experienced in our everyday lives. We argue that educators can foster awe about the environment in their daily practices, even when opportunities for immersive field trips are limited. Importantly, all experiences with nature, even seemingly negative ones, can foster awe as long as people can reflect on them (Hicks & Stewart, 2020). Therefore, educators should focus on creating reflective opportunities rather than curating only positive experiences with nature.

Indigenous perspectives on the natural world foreground awe as foundational to humanity’s ecological belonging (Celidwen, 2024). Specifically, as Celidwen & Keltner (2023) note, “within Indigenous conceptualizations of kin relationality, experiences of [...] awe are extended to all living forms within interdependent relations” (p. 7); Indigenous perspectives on awe come from an understanding of oneself as being in a relationship with larger collectives of other living beings.

We offer recommendations for elementary educators to use picturebooks in tandem with outdoor learning experiences to foster students’ awe and counter ecophobia. We analyze two recently published picturebooks that rely on Indigenous environmental perspectives and offer entry points for educators to orient children to the environment with a sense of awe: [Zonia’s Rain Forest](#) by Juana Martinez-Neal (2021) and *Little Land* by Diana Sudyka (2023). *Zonia’s Rain Forest* is set in the Peruvian Amazon, and the main character is Asháninka. While not written by an Indigenous creator, Sudyka details how *Little Land* was informed by Robin Wall Kimmerer’s Indigenous ecological perspectives.

Strategies for Promoting Awe

Embody Awe

When learning about unfamiliar environments, children need to gain concrete understandings of nature through play. Inspiring students to change their daily choices to preserve a distant environment can be challenging; through play, children make abstract places real to them. In response to the evocative words and images in *Zonia's Rain Forest*, teachers can create immersive Amazonian rainforest classroom environments. When students play by acting as animals or plants, they get a chance to experience awe-filled connections with a distant environment before we ask them to save it (Sobel, 1996).

Find Awe in the Dirt

Oftentimes, educators inadvertently suggest that nature should be left alone by humans to preserve it. Additionally, children might get the message that parts of nature can be harmful (poisonous bugs, poisonous plants, etc.) and so should be avoided. Young children learn through tactile experiences, so providing opportunities for them to touch and play with tangible natural elements in safe and respectful ways, such as getting their hands dirty while planting seeds, can help them understand humanity's reciprocal relationship with nature. Rather than viewing humans as earth's saviors, these activities promote the perspective that our participation with nature is fundamental to the earth's longevity, a relationship of reciprocity (Kimmerer, 2013). With all children, and especially with children who have limited access to nature, this hands-on approach can combat one of the primary characteristics of ecophobia. It helps students appreciate that nature gives them much, and they are also part of nature.

Many environmental picturebooks present opportunities for students to consider how they might be in a reciprocal and restorative relationship through tactile experiences. In *Little Land*, after the environmental destruction which literally turns the fictional world upside down, a few child characters dig in the dirt, restoring the land by planting a tree. The next page zooms out to show how this sparks a community-wide effort where people's tangible interactions with their environment contribute to nature's regeneration. Even more impactful are books where people are immersed in a playful relationship with nature. Images in *Zonia's Rain Forest*, such as when many butterflies land on her, demonstrate how children can physically interact with nature respectfully rather than simply avoiding it out of fear, either of harming it or of being

harmed. Texts such as *Zonia's Rain Forest* can promote a reciprocal, hands-on relationship between children and their environment.

Find Awe in Relationship

While one-off environmental field trips can provide students meaningful place-based learning opportunities, more sustained experiences can help students develop deeper and longer-term relationships with nature. In *Little Land*, readers see the same piece of land over a long period of time, demonstrating what it looks like to get to know a particular place over time. Teaching children to find sit spots allows them to return to the exact same place to witness the same environmental setting across many different times and seasons (Hu, 2022). When people spend extended time in a particular place or element, they develop the deep, reciprocal relationship Kimmerer (2013) promotes. Similarly, Sudkya dedicates the book to “the blue gentians of the Linne Prairie,” specific flowers that she loves. Included next to this note is the image of the blue flower that grows in alpine areas worldwide and is found commonly in the author’s location. In her dedication, Sudyka elevates this specific relationship to such a degree that the flowers take a spot in the book typically reserved for humans. Bringing students’ attention to this note can lead us to ask children: “What natural element do you know and love? How can you show that love?” Children might rely on *Little Land* as a mentor text to write a love letter/story to/about the element of nature they love. We might model and encourage students to consider ways that their actions in and out of the classroom are motivated by awe for specific aspects of the natural environment in their local area.

Even in areas without extensive access to nature, teachers can promote prolonged relationship between children and nature by having a classroom pet or watching a natural process unfold like tadpoles turning into frogs. Awe can help us love our immediate environment, but it can also break us out of the familiar. It can bridge the gap between our immediate environment and faraway places that are at risk in some way. Webcams are one way to connect students and distant elements of nature, returning to the same animals throughout the year to observe, listen, and learn from them (Fokides & Arvaniti, 2020). Teachers using webcams can attest to the excited, collective awe experienced when, for example, a clutch of eagle eggs that the class has been following finally hatch and the slick, curled eaglets emerge from their shells. Teachers can search for webcams relating to natural aspects depicted in the books they read, enabling their students to experience awe about faraway places through continuous observation. Strategies that promote ongoing connections with particular

animals, plants, or natural spaces can help students experience ever-deepening awe as the relationship develops.

Model Awe

Before, during, and after reading books with children, teachers can model a sense of awe at the environment they are exploring. Preparing to read with children, teachers can give themselves space and time to let real awe grow, dwelling on specific words and images that inspire awe and then highlight these before, during, and after sharing the book with students. In *Zonia's Rain Forest*, teachers can model both positive and negative emotions as they read. For instance, Zonia spends the first part of the book interacting with a dazzling array of plants and animals, which educators might respond to with exuberant exclamations of, "Oh, wow!" However, Zonia then reaches a part of the forest that has been clear-cut. After the abundance and joy featured earlier, this stark image of destruction is shocking. An educator reading this book with children might pause when they get to those pages, perhaps slumping a bit in their seat and letting out a quiet, "Oh, wow." Letting children see genuine physical indicators of awe, whether in response to positive or negative events, invites them into this crucial emotion as they read.

Teachers can consider how to demonstrate awe outside the classroom and rely on these behaviors as they read. Just as they might pause while outdoors to marvel with students at the brilliance of an owl's nest, during reading, educators can gasp in real wonder when they turn the page and something marvelous is revealed. Using a range of vocal dynamics helps convey a range of wonder, modeling everything from loud, wholehearted amazement to reverent, whispered astonishment. Teachers might include occasional pauses, showing that it is okay to sit in silent contemplation of the world in the book. In short, slowing down to prioritize reading that builds children's inner worlds helps deepen young people's connections to the physical worlds around them.

Strategies such as the ones offered here can foster students' relationships to the environment as they read about nearby and faraway places. Grounding our reading of environmental children's literature in Indigenous perspectives about nature can help us recognize that the planetary health is dependent on us being in a respectful and reciprocal relationship with the earth's web of life. Using hands-on activities alongside picturebooks can develop students' awe-filled sense of ecological belonging, positioning them not as saviors of the environment but as kin and inherently embedded in nature.

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Adultism, Intergenerational Solidarity, and *The Tantrum that Saved the World*

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Abstract

Climate literacy education endeavors to prepare young people to live well in a climate changing world. Presumably this is also the aim of literature for young people *about* the climate crisis, especially of books including depictions of youth activists. What interests drive these narratives? How adult perceptions of young people shape our relationship with both the texts and the young people with whom we work? Drawing examples from actual youth activists and *The Tantrum that Saved the World*, I suggest that checking our own potential adultism will help educators work more effectively with young people.

Keywords

Adultism, intergenerational solidarity, youth climate movement, coalition-building

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Framing

Climate literacy education endeavors to prepare young people to live well in a climate changing world. This also appears to be the aim of many stories, particularly literature in what one might call the “changemaker” sub-genre: portraits of young climate activists, real and fictional, promising young readers that they, too, are “old enough to save the planet” (Kirby, 2020). Collectively, these narratives reinforce a dictum: in young people we trust.

There’s power in these narratives. Their abundance, however, has transformed the idea of the young activist into a trope. Something tricky is at work here—what drives adult interest in the trope? What do we imagine when we invoke *young* people? How does this imagination shape our work, as adults, in climate literacy education?

The answer has something to do with the ways in which adultist biases frame our sense of the world. By interrogating our adult perspective, we might be better positioned to work *with* young people (cf. Gubar, 2016) towards an ecological future. The first step, I propose, is to grapple with adultism.

Adultism

Adultism—also called aetonormativity—is the bias that values adult ways of knowing and being in the world over those of young people. Scholars writing in English trace the origin of the concept to youth work (Flasher, 1978), which spread to political science (Lau, 2012; Moosa-Mitha, 2005; Olsson, 2008), education (Bertrand, Brooks, and Domínguez, 2023), and other social sciences (Biswas and Wall, 2023). My sense is that the study of adultism is more established beyond the United States, not merely because ours is only one of two nations to not ratify the United Nations’ Convention Rights of the Child (Blanchfield, 2015). As such, I offer this overview with humility.

Adultism exists in part because humans are socialized into particular social practices and values deemed “adult” or “mature”. These practices and values are myriad (cf. Wall, 2025), so here I propose five that I find particularly relevant:

- 1) respecting procedures, which demands patience
- 2) overvaluing logic, which demands “regulating” emotions
- 3) separating public and private life, which demands dissonance
- 4) accepting “the way things are”, which demands forfeiting agency, and
- 5) championing “realism” over “idealism”, which demands sacrificing creativity and imagination.

Note that these practices and values are also aligned with several other dominant ways of being in the world: white, male, able-bodied, middle-class, etc. When these dominant values are equated with “maturity,” the notion of “youth” can be weaponized to “depriv[e] others of political agency on the basis of their emotional or civilizational immaturity” (Devji, 2021, p. 222; Bernstein, 2011).

Adulthood as a Structural Bias

Like other biases, adulthood is structural in that our shared social institutions are *structured* to discriminate against young people. The most obvious example is the political system (Wall, 2023). While nearly all political decisions impact young people, no person below a specific threshold age has an official say in those decisions. In the United States, young people cannot vote until they are eighteen. Why eighteen? It is not as if, at midnight on their eighteenth birthday, teens are magically endowed with the capacities to vote (Olsson, 2008). Moreover, any other criteria used to determine eligibility—such as ill-defined notions of capacity, knowledge, or reason—cannot be applied to young people, as a bloc, without also disenfranchising a significant portion of the adult population (ibid).

The institution of education is adultist too. Scholars occasionally address this by calling to involve young people more directly in curriculum-making processes (Steinberg & Down, 2020). That’s said, American classroom teachers are *required* to teach particular content via learning or content area standards. Their jobs depend on it. While educators can involve students in some decisions, these inevitably fall short of the structural realignment that adult allies would like to see.

Still, we can resist adulthood in other ways. We can learn to identify the bias, and we can do so in tandem with young people. Reading critically and intentionally is one avenue for doing so. *The Tantrum that Saved the World* (2022) is a particularly generative text for such an analysis. The narrative depicts Sophia, whose life is upended with the arrival of interspecies climate refugees. Her initial consternation eventually turns into activism, but adultist bureaucrats stymie her advocacy. Eventually, Sophia embraces her anger and builds a movement, ultimately visiting the White House. While the narrative lends itself to considering structural adulthood, it is even more generative for considering interpersonal aspects of the bias.

Adulthood as Interpersonal Bias: Four Manifestations

Denying Youth the Capacity for Action

The most flagrant form of adulthood is the refusal to see young people as capable of contributing to society. This tends to be a conservative position, evident in the right-wing backlash against youth climate protests (Zraick, 2021), but this isn't limited to the right. As California Democratic Senator Diane Feinstein infamously told youth climate activists: "I know what I'm doing," she scolded. "You come in here, and you say, 'It has to be my way or the highway.' I don't respond to that" (Democracy Now!, 2019, n.p.). Still, adultist denial isn't always so militant. Greta Thunberg faced a more paternal version of this when she met with politicians during her 2019 trip to the United States. "I urge [the politicians] to listen to the science and act now before it's too late," she wrote in the diary she kept at the time. "They say that they think it's so amazing that I'm so active and committed, and that when I grow up I too can become a politician and make a real difference in the world" (2020, n.p.)—an example of adult proceduralism *par excellence*.

This dynamic is a key plot element in *Tantrum*. Determined to help her recently arrived friends, Sophia drafts a petition and marches to city hall. There, a middle-aged man in a suit cautions her to be patient: "Take a number and wait, if you please" (opening 10). Later, when she returns with more aggressive messaging, the same man tells her that she's too "sentimental" and "too young to grasp all the issues at hand" (opening 14). This second denial proves to be the catalyst for Sophia's anger, which ultimately leads to successful action (Osgood & de Rijke, 2022).

Protecting "Innocence"

The second common adulthood is the desire to protect the "innocence" of youth. While well-intentioned, this stance sequesters young people, preventing them from practicing the holistic responses required to effectively navigate the world (García-González, 2025). Moreover, "innocence" is often used as a political Trojan Horse for nefarious ends. Amid the increasing frequency and mortality of school shootings, for example, the Gun Owners of America have argued that because "our children need protection—the real solution is to arm teachers" (2023, n.p.). Educators know this debate better than most. Political calls to "protect children" via book bans and curriculum debates have never been more intense.

In *Tantrum*, notions of childhood innocence are less immediately evident than outright rejection of youth capacity. Still, readers might conceptualize Sophia's change of heart, early in the narrative, as a result of her exposure to climate crisis impacts. In an

attempt to maintain her sheltered life, Sophia self-sequesters in her own room (opening 7), before realizing the need to act. This arc would seem to critique notions of innocence, but the narrative's dynamic is more complicated than that. Despite Sophia's rejection of innocence, the book does not show the floods or heatwaves that brought the refugees to Sophia's door. The "challenging" aspects are left to the imagination. In this omission, the narrative *insists* on innocence by opting not to depict the actual impacts, despite the ubiquity of these depictions in the news and on social media—all of which are readily available to children themselves.

Tokenizing Youth Voice

Educators are also privy to calls to "hear children's voices" (cf. Popoola, Sivers, and McDonagh, 2026). Of course, young people should have opportunities to express themselves; the trouble is that (2020) decries "the privileging of voice as the definitive form of political agency" has sidelined other possibilities for agency (Steinberg and Down, 2020, p. 4). Nor is "voice" socioculturally neutral. Not all young people are equally practiced at expressing themselves verbally, let alone practiced at the particular modalities of expression that adults value (e.g. calm, logical, "polite"). These discriminatory values become all the more pronounced when they are considered intersectionally.

Herein is the most complicated element of *Tantrum's* narrative. The narrative's faith in youth voice is of a particular kind of youth voice: in this case, shaped by middle-class notions of propriety. Even Sophia's anger, which boils over in the climactic full page spread, is rendered in beautiful colors (opening 16). On one hand, the narrative makes clear that communication is a central component of coalition building. At the same time, the narrative suggests that knowing the facts of the crisis is, alone, enough. We know better by now.

Abdicating Adult Responsibility

The fourth form of adultism is the sneakiest. It is also the most relevant for this journal's audience. In rejecting adultist biases, we risk overcorrection and investing young people with all our hope for the future. In doing so, adult allies ignore three key considerations: 1) their own adult responsibility to contribute to change, 2) the diversity of positions within youth as a political bloc, including power differentials, and 3) that they, too, have capacities that compliment young peoples' (Deszcz-Tryhubczak and Jaques, 2021). Adult educators have years of training in pedagogy, deep knowledge of developmentally aligned curriculum, and years of experience navigating education's administrative bureaucracy.

Although *Tantrum* grants young people the capacities to make change, it does not afford opportunities to consider how young people might work *with* adults to leverage their sociopolitical power as a form of intergenerational solidarity. The adults depicted in the story are passive (Sophia's adult students), refugees (whose depicted passivity problematic in and of itself), or bureaucrats who hinder action. Responding well to the crisis requires all of us, and so I wonder: how would Sophia's movement change if, say, a supportive teacher was included in the plot?

Intergenerational Collectivism

Tantrum offers readers a chance to see how one might adopt a child-oriented, or childist position (Biswas and Wall, 2023) to counter adultist biases—and for the sake of the planet. Yet *Tantrum*'s emphasis remains on an individual. At best, and despite glimpses at depicting collectivism, *Tantrum* falls short of imagining the processes of coalition-building required to make substantive change; at worst, it balkanizes the movement into charismatic leaders who are in the know, and followers who are to be led. If the ecological future we want is to be egalitarian and just—including intra- and intergenerationally—then we will need to learn to see protagonists, real or fictional, no matter their age, as agents within a larger collective of agents, learning from and regarding one another as capable kin.

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Early Career Perspectives

A note from the Editorial Collective: "Early Career" is the newest section of Climate Literacy in Education. The articles it contains include insights from early career scholars in the fields of literary studies and education, as well as other related fields. The intention for this section is to ensure that the knowledge young professionals generate as part of their coursework and training can reach the audiences that knowledge deserves. In their contributions to the discipline, these young scholars also gain valuable experience in the realm of academic publishing.



Lessons about Animal-Human Relations

Shaun Tan's Tales from the Inner City in Education about the Climate Crisis and Animal Welfare

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Abstract

This article introduces the course work with undergraduate students at the University of Wrocław, Poland, that involved discussing theoretical frameworks from human-animal studies and posthumanist thought while creatively engaging with Shaun Tan's collection *Tales from the Inner City*. I propose that Tan's stories can be used in education to address the deeply interconnected issues of the climate crisis, biodiversity loss, and animal welfare. Recognizing that climate change and biodiversity loss are deeply linked, I draw on research to argue that tackling these crises requires integrated strategies and a transformation of societal values toward care and accountability. Fostering awareness of animal welfare is seen as a crucial step in this shift. I then introduce the students' contributions, which all show how Tan's depictions of a range of human-animal relationships encourage reflection on both hopeful and uncomfortable aspects of these bonds.

Keywords

animal welfare, biodiversity loss, climate crisis, human-animal studies, Shaun Tan

Climate Crisis and Biodiversity

Biodiversity loss and climate crisis are often seen as separate phenomena and addressed as distinct issues (Shin et al. 2022). And yet, they are both drivers and consequences of one another, closely linked to human activities and resulting in negative impacts on the planetary well-being. Just as climate crisis is partly an effect of the loss of biomass and biodiversity, rising temperatures result in further losses of biomass and biodiversity. On one hand, climate crisis is increasingly affecting animal species, causing them to seek more hospitable habitats for example due to extreme events, such as heat waves, severe droughts, and floods, thereby endangering chances for their survival. On the other hand, biodiversity loss reduces carbon stocks and sink capacity in natural and managed ecosystems, increasing emissions. Following a joint meeting of members of the International Panels on Climate Change and Biodiversity and Ecosystem Services, Pörtner et al. explain that interdependencies of biodiversity loss and climate change “include temperature-induced changes in photosynthetic capacity and carbon storage, modified reflectivity of the land surface, altered formation of clouds and atmospheric dust, and shifted biogeochemical cycling of nutrients and carbon, which in turn influence the concentration of greenhouse gases in the atmosphere” (2023, p. 1). As they further propose, we need integrated and coordinated strategies that address both crises together: “Strengthening the biosphere on land, in freshwater, and in the ocean will support climate change mitigation, adaptation, biodiversity, human well-being, and livelihoods” (ibid). They also conclude that such interventions require a transformation in both personal and collective values, which will enable moving away from individualism and materialism towards accountability, care, and justice (ibid).

An important step in this transformation of values is fostering interest in animal welfare, as animals are “being swept along” with humans in the changing world in “farms, zoos and game parks as companion animals” or “through the effects of human activity on the environment and the wild” (Butterworth, 2018, p. 1). Some human-driven changes are so significant that they profoundly impact entire animal populations, often in ways that cannot be undone. Deborah Bird Rose (2004) describes this demise of regenerative potential as double death, a process that amplifies death to such an extent that not only individuals but also entire groups, species, and ways of life are being eradicated. Double death thus involves the death of future continuities, which will affect the lives of the current young generations. Bearing this prospect in mind, should we not agree, as Andy Butterworth proposes in *Animal Welfare in a Changing World* (2018), that animals

(i) probably have complex experiential worlds, and mental needs and natures; (ii) can probably experience pain [...] as evidenced through their response to aversive conditions; (iii) are probably aware of their own surroundings; (iv) probably have an emotional dimension; (v) are probably aware of what is happening to them; (vi) probably have the ability to learn from experience; (vii) are probably aware of bodily sensations – hunger, heat, cold; (viii) are probably aware of their relationships with other animals; (ix) have the ability to choose between different objects and situations; and (x) probably have the capacity to ‘suffer’? (p. 1).

Butterworth further explains that his repeated use of the word “probably” is deliberate, as “the accumulation of ‘probables’” is needed in a world where practical action is delayed “until there is ultimate proof,” and in the context of animal welfare, “this has been the cause of much diversion, delay and distress – the animals continue to be used (and abused) while more proof for example of whether ‘these animals really feel pain?’ or ‘these animals really need so much space’ is “collated, analysed and debated” (p. 1). As he suggests, “a welfare positive position could be the default position, rather than the position towards which man and animals move after divisive confrontation” (p. 1). It seems that to be able to make this perspectival flip, we would do well to follow the postulates of posthumanist scholars such as Donna Haraway (2016), Anna Tsing et al. (2024), or Vinciane Despret (2021), who all argue for developing an attitude of attentiveness, curiosity, care and readiness for complex and often uneasy relations and entanglements with real and imaginary animals around us. This attitude in turn may perhaps inspire fully embodied participation in and responsibility for a more-than-human community, enabling ecological restoration.

Thinking with Shaun Tan’s *Tales from the Inner City*

These questions and concerns guided me in the academic year 2023/2024, during my meetings with a group of undergraduate students in two of the Global English Cultures and Languages specialization courses at the Institute of English Studies, at the University of Wrocław, Poland: Selected Research Approaches in Literary Studies and Project Classes: Literary Studies. In the first course, we discussed, among other things, issues concerning literary research in the Anthropocene, including human-animal studies. During the second course, we attempted to apply these theoretical approaches to a collaborative project on *Tales from the Inner City* by Australian writer and illustrator Shaun Tan. This collection of 25 stories in words and images that explore relationships between humans and animals in urban environments and beyond can be

seen as encouraging various speculative engagements with animal welfare. It has usually been praised for its hopefulness about a posthuman future effected through redefined human-more-than-human relationalities. Chengcheng You (2023) for example proposes that Tan's depictions of "human-animal assemblages" move away from "positioning animals and humans as adversaries" towards "cultivating our 'animal nature'—which includes traits such as sensitivity, instinct, and interdependence with the more-than-human world" (p. 7). Kirsten Hunt (2023) emphasizes how the book's invitation to speculate on human-animal companionships awakens hopeful imagination about "what we could be if we let go of anthropocentrism and embraced otherness in all its forms" (p. 92). Lorraine Kerslake's (2022) discussion of the collection concludes on an optimistic tone: "[d]espite Tan's haunting lament [...], warning about the failures of human beings and our perverse attitude toward the environment, there is also room for optimism and wonder" (p. 46). Hence, as she argues, the collection may encourage the reader "to go beyond the text and remind us that we stand fully embedded within the natural world" (ibid).

To me, the extraordinary phenomenon of Tan's book is its emotional diversity that boldly encompasses a range of responses and attitudes we may have to our relations with animals. Importantly, these responses may exist at the same time even if they seem irreconcilable. They do not exclude each other but coexist side by side, if not commingle, in our affective repertoires. While some of the tales indeed project hope for more just human-animal connectivities, some stories emphasize instead humans' inability and reluctance to mend their ways. Humans are sometimes presented as persevering in brutalities against animals and nature, as is the case in "The Lungfish", "The Shark", "The Bears", "The Orca", "The Rhino", "The Sheep" or "The Pigeons." A poem about the extinction of the last rhino on the earth that happens as if by accident or an account of the shark culling that turns into a symbolic extermination of future generations of sharks are not easy reads and will for sure disturb, if not horrify, readers regardless of their age. But perhaps we need to experience this discomfort as a motivation to reflect and act. Embracing these difficult responses instead of overcoming and suppressing them through pursuing only more positive emotions may turn out to be an effective form of educating our desire for a transformation of human-animal relations as a complex and non-innocent process fraught with tensions and conflicting interests. The mechanism of how such an exposure may lead to a change in perspective is reflected in the apprehension that the narrator in "The Shark" begins to feel as the culling progresses. This is a hopeful omen of awakening and of the potential for developing a deeper ethical awareness, one that acknowledges the shared

vulnerabilities of all species and the need to reimagine human-animal relations as grounded in mutual respect and coexistence.

With my students, our joint responses to selected tales focused both on close reading that resulted in literary interpretations and on more elusive and ineffable affective responses that, we thought, would sometimes be best rendered through art as “central to thinking with and feeling through the Anthropocene” (Davis and Turpin, 2015, p. 3), as it offers “a range of discursive, visual, and sensual strategies that are not confined by the regimes of scientific objectivity, political moralism, or psychological depression” (p. 4). In our readings of Tan’s animals, we also relied on Matthew Stewart and Kate Cole’s conceptual map of the social construction of “other” animals (2014, p. 21), which generates a framework for understanding how humans categorize and relate to non-human animals according to the cultural, ethical, and functional dimensions of these interactions. Some animals can thus be tools or commodities for human use, while some are “dead ‘meat’” or pets and companions, often anthropomorphized and integrated into human families. The map is divided into four general areas: “Friends”, “Nature”, “Things” and “Killing zone.” Usually, one animal can be seen in terms of several constructs, depending on whether and how it is objectified. These constructs also elicit various responses, from sensibility at one end, as is the case with pets and cultural representations of animals to non-sensibility, as is the case with vermin. Tan’s *Tales from the Inner City* invite readers to examine how humans create the constructs defining animals and how these constructs shape human-animal relationships, often neglecting the status of animals as beings with intrinsic value. Using Stewart and Cole’s conceptual map alongside *Tales from the Inner City* provides rich opportunities for helping us all to critically analyze how human-animal relations are socially constructed and culturally encoded, which in turn may result in further explorations of the complexities of human-animal relationships both in culture and in real life, including care for animal welfare.

The three student-authored articles that follow below suggest some ways in which these explorations could be implemented in school settings with the help of Tan’s stories and their potential to make young readers rethink their relationships with animals for a more connected present and future. While they include possible interpretations of selected stories, their primary goal is proposing discussions and other activities that can be implemented across a broad age range to foster ethical, philosophical, and practical discussions about human-animal relationships. In the first one, responding to the story about the moonfish, Jan Dudek asks what happens if we accept that fishes feel pain and experience negative emotional responses to inhospitable conditions. Martyna Obodyńska then shares her affective response to the

story about the horses and proposes creative activities that may challenge students to explore both past and current forms of animal exploitation alongside their love for individual animals in their lives. Finally, Magdalena Puciłowska and Urszula Żoczek offer ideas for creative classroom engagements with “Crocodiles” and “Butterflies” as ways for nurturing curiosity and wonder in students.

We realize that we can only begin to touch upon the vast and complex topics surrounding animal welfare. Today, we are witnessing unprecedented changes in the world of animals—changes that are deeply intertwined with the unfolding climate crisis. The accelerating degradation of ecosystems affects not only animal habitats and survival but also reshapes our ethical responsibilities toward other species. Developing climate literacy—an understanding of how human actions impact planetary systems—is essential to making informed, compassionate decisions in the face of environmental uncertainty. The choices we make under these pressures will have profound implications for the future of animals and humanity alike. We hope that these articles can support teachers and students in exploring these interconnected issues, sparking curiosity, encouraging critical thinking, and perhaps even challenging long-held assumptions. Finally, I would like to sincerely thank Jan, Martyna, Magdalena, and Urszula for generously sharing their insights throughout our course and for putting in the effort to transform our discussions into thoughtful articles—their dedication has truly been inspiring. I would also like to acknowledge the contributions of two colleagues, Aliona Yarova (Malmö University) and Agata Alicja Zelachowska (University of Salamanca), who visited our classes and kindly shared their insights with us. Last but not least, I would also like to thank the University of Wrocław for supporting the students’ work through the funding allocated to extracurricular activities.

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Play-ifying Shaun Tan's *Tales from the Inner City*

Facilitating Elementary-aged Children's Understanding of and Emotional Interaction with Tan's Stories

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Abstract

This article explores the use of play-based learning to foster children's emotional engagement with Shaun Tan's *Tales from the Inner City* to promote empathy toward animals and reflection on environmental issues. Building on research highlighting the cognitive and emotional benefits of interactive, multisensory activities for children, we propose two creative classroom activities connected to Tan's stories "Crocodiles" and "Butterflies." Both activities are designed to strengthen emotional intelligence, empathy, and discussion skills, while also providing sensory engagement particularly beneficial for neurodivergent learners. We argue that integrating literary discussions with arts and crafts provides a rich, inclusive learning environment that supports emotional and intellectual development.

Keywords

multisensory arts and crafts, ecological community, animal welfare, empathy

Play-based learning is a technique held in high regard by many experts in the field of education for its capability to create strong and lasting connections in the developing brains of children. When the activity is well-thought-out and fitted to the individual needs of the classroom and the topic being discussed, it can influence the way children interact with and perceive the subject at hand and encourage them to delve deeper into it. According to Havziu-Ismaili (2023), when children learn through play, different spheres of their lives, such as home, school and the world at large are brought together instead of standing in isolation from one another. For children, play is a natural way of learning and understanding the world, as well as developing creativity by engaging with different materials and objects. These objects shape the meaning, form and technique of the activity, and this is why it is so important to construct each activity with the materials that will best serve the intended learning goals. The author poses that for a game to serve its function, it “must fulfill a multitude of pedagogical requirements, must respond to the educational purpose with content and form, must be accessible to children, must stimulate children’s interest, influence the development of creativity, personality, etc.” (pp. 311-312).

We propose a way of cultivating children’s empathy and emotional intelligence by encouraging them to empathize with the experiences of animals and consider perspectives different from human-centered ones. By making choices and facing the consequences within an interactive narrative, children are encouraged to develop a deeper understanding of the impact of their actions. Through providing a series of interactive illustrations to the stories from Shaun Tan’s *Tales from the Inner City*, our method aims to enable children to experience the stories through multisensory engagement. Using interactive illustration to involve children in storytelling creates immersive experiences that transcend traditional narrative boundaries and may foster young readers’ active engagement, promote comprehension and creativity, and enhance empathy toward animal suffering.

“Crocodiles”

The narrative paints an image of crocodiles living in an urban setting: a floor in an office building. The animals live between the floors, with the office workers being blissfully unaware of their existence. Their floor has been adapted into a jungle-like environment in which the crocodiles seem to be fairly content.

The story highlights the intrusion of urban areas into natural habitats and its consequent impact on wildlife. The presence of crocodiles in a city setting serves as a stark reminder of how urban expansion can displace animals from their natural environments, forcing them to adapt to human-dominated landscapes. The narrative

touches on the consequences of environmental degradation. The theme of crocodiles in the city could be seen as a metaphor for the broader issues of habitat destruction and pollution, which highlights the urgency of conservation efforts to protect natural habitats and ensure the survival of various species. Because Tan's story "critically contests anthropocentrism and human exceptionalism" (Kern, 2021, p. 461), we propose an activity focused on creating the environment for the crocodiles as a way to prompt children to consider their responsibilities towards the environment and identify how human actions affect the natural world. Creating personalized crocodile cutouts aims to make children more emotionally invested in the activity and to encourage them to form a deeper connection with nature, which in turn might be helpful in bridging a divide between familiar urban life and the strangeness of the wildlife.

Crocodiles: Environment building exercise

Supplies

- strip magnets
- A4/letter size paper for printing and a color printer (or print at a printing shop)
- scissors
- (optional) laminating machine and pouches (will make the assets survive more sessions)
- (optional) blank crocodile cutouts (wooden ones can be bought online, or you can make your own out of posterboard)

Preparation before class

- Print out the printables attached.
- (optional) Laminate the materials.
- Cut them out.
- (optional) Cut up and glue the magnets on the back of the assets.
- Lay the background on the whiteboard/desk. Arrange the items around the background. If the group is larger than five to ten students, you might opt for the cardboard version instead of the magnetic one, make multiple copies of the pictures, and separate the students into smaller groups so that they have equal access to the items.

In class

1. Distribute copies of the text to the class and read the story aloud to the students (or ask them to take turns reading aloud if their reading level allows for it).
2. (optional) Distribute the crocodile cutouts and encourage the students to decorate them however they want to. This will create an emotional connection between the student and their crocodile and facilitate compassion. While the children are painting, talk about crocodiles. What do the students know about them?
3. Encourage the students to put their crocodiles in the middle of the background. Ask them what environment the crocodiles would want to live in. Is this room (point to the background) a good environment for a crocodile?
4. After a brief exchange of ideas, ask the students to work together and pick the best items for the environment. It is good if the students have debates over which items would be the best while doing this activity, as this encourages broader thinking and listening to feedback.
5. After the students are done, discuss their work. Questions you might want to ask are as follows:
 - a. Do you think your crocodiles are happy in the environment you created? Why/why not?
 - b. Is there something that's not in your inventory (of items) that you think would also fit in this environment?
 - c. How should we live/or change the way we live so that animals live better lives?
 - d. Optionally, if you find that some students in your class have trouble paying attention to stories being read aloud, you might want to read the story aloud to them while they are playing with the assets instead of before the activity. The sensory input from the assets might help them listen more attentively.

"Butterflies"

In this vignette-like narrative, a moment in time is captured when the day-to-day busy urban life is interrupted by a swarm of butterflies that seem to come out of nowhere and vanish into nothingness just as quickly as they showed up. The swarm fills the city with color just for a moment, sparking a sense of wonder in the passers-by.

"Butterflies" explores themes of creativity and childlike wonder through its depiction of a collective reaction to a natural phenomenon. The descent of

uncountable numbers of butterflies, described as “beyond even the concept of counting” (Tan, 2018, p. 17), transcends ordinary life and invokes a sense of infinite possibilities, reflecting the essence of creativity. The inexplicable nature and universal impact of this event—drawing everyone away from their routines—highlight a shared spontaneous joy reminiscent of a child’s reaction to magic. This contrasts starkly with the adult world’s need for rationality and quantification, allowing for a pure, uncalculating appreciation of the moment. Kari-Anne Jørgensen writes that “wonder and the development of environmental consciousness are mutually connected. The sense of ‘wonder’ as a driving force in children’s curiosity and emotional involvement requires an openness to the environment” (2015, p. 17). Children’s inherent curiosity, amplified by wonder at the animal world, directly fuels reflection on animal welfare. Observing animals’ behaviors and characteristics sparks questions about their needs and experiences. This inquisitive state fosters empathy, prompting children to consider animal perspectives. Consequently, this natural curiosity nurtured by wonder lays a crucial foundation for developing pro-animal welfare attitudes and ethical considerations. Introducing this story to children aged seven to nine might encourage them not to let go of their child-like wonder and enable them to think about other things in the world that they think are wondrous, thus resulting in a bigger awareness of the preciousness of the natural environment.

The activity we propose below meant to encourage children to explore their creativity and wonder through arts and crafts. Children’s inherent curiosity, amplified by wonder at the animal world, directly fuels reflection on animal welfare. Observing animal behaviors and characteristics sparks questions about their needs and experiences. This inquisitive state fosters empathy, prompting children to consider animal perspectives. Consequently, this natural curiosity, nurtured by wonder, lays a crucial foundation for developing pro-animal welfare attitudes and ethical considerations. Creating a personalized snow globe lets the child express their current fascinations with the world. The act of encapsulating the child’s wonder in a jar may prove to have a lasting impact on their confidence and fearlessness in freely expressing themselves, since the encouragement of creative expression makes the child feel seen and understood.

The proposed discussion following the activity aims to enable children to share their interests and thoughts with their peers. It is important to moderate this discussion and act if any child tries to put their peer’s ideas down. By witnessing mutual curiosity and respect, children are taught that even though they might not understand why someone might be interested in something, this does not mean that they can ridicule

it. This is, apart from exploring the concept of wonder, primarily an exercise in empathy and discussion skills as well as mutual respect.

Butterflies - snow globes

Supplies

- One jar of any size per student (you may ask the students to bring their own)
- butterfly-shaped glitter or sequins (biodegradable)
- kids' non-toxic glass paints and brushes
- water
- glycerin
- waterproof glue

In class

1. Distribute the paints and show the children how to paint a cityscape along the rim of the jar. Encourage them to be creative and paint whatever kind of landscape they want.
2. Help the children pour the butterfly glitter into their jars.
3. Fill up the jars with water and glycerin (3 tbsp of glycerin per 1 cup of water)
4. Seal the jars with glue. Do not let the children play with the snow globes until the glue is completely set.
5. While the children are playing with their snow globes, discuss their work. The questions you might want to ask are as follows:
 - a. What are some things in the natural world that you think are magical/wonderful/inspiring?
 - b. What can we do to invite more wonder into our lives?

Ending Thoughts

While we propose activities for only two of Shaun Tan's stories, we believe that it is possible and beneficial to construct age-appropriate activities to go along with any of the tales (or any story of any author, for that matter). We encourage educators working especially with children under the age of twelve to engage their students in frequent manual activities in conjunction with insightful discussion and mindfulness exercises, as they have been proven to be highly conducive to healthy development of motor skills and emotions. The discussion of literary works combined with arts and crafts projects may suit many classrooms, but we especially hope that neurodivergent children may

benefit immensely from the sensory input of the activities. Tan's works encourage compassion for and the mindfulness of the world around us. They can teach both children and adults that humankind is only a small part of this planet, and other non-human beings should also be considered in our daily lives.

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Friends or Tools?

The Duality of Horses in Shaun Tan's Tales from the Inner City

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Abstract

This article explores the complex relationship between humans and horses in Shaun Tan's short story about horses included in *Tales from the Inner City*, focusing on the blurred line between viewing animals as tools or as companions. The article highlights how Tan evokes empathy by presenting the horses' historical suffering through a non-verbal, emotional connection. The concept of "wit(h)nessing," introduced by Bracha Ettinger, is used to frame the child's role—not as a passive observer, but as someone who shares and acknowledges the horses' suffering. To deepen this engagement, the article presents my poetic response to the story and discusses their personal experiences with horses, illustrating how direct interaction with animal suffering can inspire artistic expression and emotional growth. Real-life examples emphasize the importance of acknowledging animal pain as the first step toward compassion and change. Finally, the article argues for the pedagogical value of integrating creative practices into education to nurture empathy towards animals, which may enable humans to move beyond instrumental views of animals and embrace relationships based on empathy, respect, and mutual presence.

Keywords

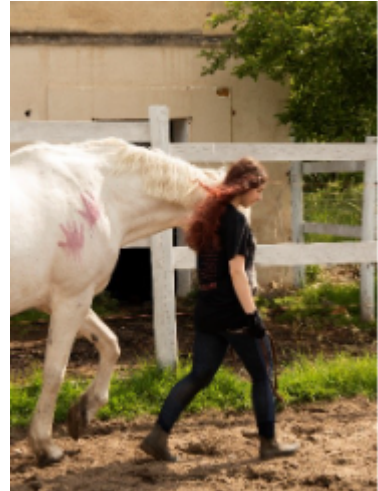
horses, art, animal suffering, wit(h)nessing

That animals were present in humans' lives since the very beginning of the humankind is a fact. However, the question is what exactly they are to humans? Sometimes it is hard to draw the clear line between barnyard animals as tools needed for work and them being pets, friends or family. Furthermore, we should ask whether it is really necessary to draw this line. Shaun Tan addresses this problem in his collection of stories *Tales from the Inner City*. One of the untitled stories in the volume is about horses told from the perspective of a two-year-old child. It may provide some kind of answer to the above questions.

The little child in the story sees and understands souls of all the horses who have died in the city and are now running wild, seeking "some green and grassy ancestral plain" (Tan, 2018, n.p.). The horses tell her their whole history using language of understanding without words, only the language of feelings and a mystical connection. The horses recall how they have been exploited by humans for ages and how people treated them as tools and materials without appreciation for animals' devotion and loyalty. The child hears this story directly from horses through a kind of telepathic connection. This motif may lead us to the idea of wit(h)nessing. The term is a neologism coined by Bracha Ettinger and according to Nike Romano it means "being with and bearing witness to the trauma of the other" (2020, p. 75). People are not able to feel exactly the same things that animals feel but can live through the same events seeing them from their own perspective and experience similar emotions. The girl is a wit(h)ness who both sees the suffering of the horses and also experiences it in her own way. Tan's story does not provide the full answer how it influences the girl's future life, apart from a quote from the last paragraph: "Later you'll come to love horses with a depth you can't explain and many horses will love you back" (ibid) The rest is left to readers' imaginations.

According to Suvilehto and Latomaa, creative writing "has been largely studied and considered among other elements as a vehicle for self-knowledge and is commonly used for education and well-being among different age groups" (2018, p. 225). Suvilehto and Latomaa describe in detail the very process of creative writing, especially in relation to horses. They highlight the therapeutic aspect of poetry and other forms of art and suggest that horses may function as a mirror to people's well-being because of their high sensitivity to emotions. The role of understanding opposed to instrumentalizing is emphasized. Following that, I have created a poetic response to this tale, which explores this topic and presents a possible scenario of the child's future attitude to horses.

I could tell from your first trot
 The breeder was very proud of you
 Your saddle was ready
 From the start
 You were destined to accept it
 Too early
 Bending your bones
 Permanently
 I have seen every stumble
 Every fall
 Every bullet
 You have taken for us
 It was never for you
 Nothing ever was for you
 I have heard your bones snapping
 It was even on the news
 "The famous race-horse
 Euthanized"
 Everyone thought it was sad
 I wonder what you have thought
 When you died watched by thousands
 I was there when they were waging your fate
 You were supposed to become
 Someone's meal
 Because you were no longer needed
 Your presence was redundant
 Was it really?



Figs. 1 and 2: The author and Kredka



Fig. 3: The author and United Melody

In the proposed scenario, the child—now older and with more experience—tries to understand horses' burden and is present in their lives regardless of how those lives look like. The important thing to mention is that the lyrical "I" does not speak on the horses' behalf and does not guess their thoughts but rather wonders what they think and feel at particular moments, including the moment of tragic death.

Personal experience may be helpful in understanding the pain of others. Most of the events described in the forementioned poem are events I have witnessed myself. I have encountered many horses forced to accept the saddle at the age of two, whereas the proper age for starting the training under the saddle is at least three years old. Many horses need even more time to mature enough not to bend their bones under the weight of a human. I have also seen a racehorse being euthanized on a racetrack after breaking several bones in his hind leg. This horse named Reki died after an accident during a race on 4 September 2022 being only ten years old.

However, one of the most prominent events in my life was helping to rescue an ill horse. Kredka was diagnosed with stomach ulcers and anemia with a possibility of skin cancer as well. Her previous owner did not want to pay for her treatment and considered selling her to a butcher. Her current owner and I decided to purchase Kredka and give her the treatment she needed. Now, after three months of taking necessary medicaments and food



Fig. 4: The author and Kredka

supplements, she is as energetic as she has never been before. In honor of all those horses who had suffered from humans, the author held a photoshoot starring Kredka, United Melody (a two-year-old pony), and myself. The photographs focus on suffering the of horses and yet they also give some hope. None of those pictures present the horse alone; in all of them there is a human who may be concerned with the horse's wellbeing. The human who is a wit(h)ness of their pain. The person may not understand or feel those feelings, but they are there with the animal to see and acknowledge the horse's suffering. Both Shaun Tan and the poem emphasize that it is the acknowledgement that is the first step to real understanding, and therefore, help.

This essay has already established the role of people in horses' lives. Still, this relationship is not one-sided. Horses, as well as any other animals, can substantially influence a person's worldview; they may teach patience, sensitivity and sensibility. It might be beneficial for people to construct art based on this connection, similarly to the poem, the photographs or Tan's stories. This brings us back to Suvilehto and Latomaa's creative writing.

Such a practice may be transferred to the classroom reality and used for pedagogical purposes. In fact, any form of art and creativity may be used in this way. Teachers may encourage their students to express emotions towards various animals in

a creative way, thereby strengthening the connection between humans and animals and raising children's sensitivity towards nature.

What are horses to humans? Should the line be drawn between friends and tools? Every person is different and the same applies to animals, but there are possibilities of developing the emotional connection between people and horses. Some people are just like the child from Tan's story. With certain amount of sensibility and the ability to listen, not only hear, but people can also wit(h)ness what animals experience and feel deep connection (often mutual). The only condition that has to be fulfilled is for people to be sensitive to the suffering of the other and be attentive to it across species. It is important not to be a passive witness, but to wit(h)ness and experience certain events together with the animals.

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“Moonfish” from *Tales from The Inner City* and the Problem of Pain in Fish

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Abstract

“Moonfish” by Shaun Tan is a story about children who, living in a modern, polluted city, practice skyward angling from the rooftops of the skyscrapers and end up catching an immensely rare fish. This article’s purpose is to suggest a pedagogical application of Tan’s story for a lesson promoting fish welfare along with a reading of the story that could be used for such a lesson. As a framework, the article also introduces the debate concerning pain in fish. Education on the subject becomes all the more important in recent times, as this discussion remains quite heated and many anglers raise objections to the very notion that fish feel pain. A lesson utilizing the story is to challenge these views and encourage an empathetic approach to fish.

Keywords

fish pain, climate education, children’s literature, ecocriticism

Overview: The Debate Concerning Pain in Fish

Teaching children about fish pain is undoubtedly a difficult task, not least because the scholarly debate remains heated and generates a great deal of controversy. While more and more scholars affirm the capability of pain in fish, strong objections are regularly raised to the view. For an entry point to the discussion, a book *Do Fish Feel Pain?* by Victoria Braithwaite can be suggested. Braithwaite refers to a study co-

conducted with Mike Gentle and Lynne Sneddon titled “Do fishes have nociceptors”, which included injecting small amounts of bee venom or vinegar into trout (Braithwaite, 2010, p. 46-65). The results showed the breathing rate of the fish increasing and their appetite lessening (Braithwaite, 2010, p. 62-64). Furthermore, a subsequent study found that trout treated with vinegar or venom paid less attention to their surroundings and were less avoidant of unknown things, unless treated with a pain-relieving drug (Braithwaite, 2010, p. 65-68). These findings point strongly towards fish being capable of pain, and some researchers are of the opinion that it would be increasingly difficult to argue against fish pain (Sneddon et al., 2018, qtd. in Franks et al., 2018, p. 1). Others are skeptical and raise objections to the quality of the evidence. Paul J. B. Hart writes that words such as “pain,” “suffering,” or “consciousness” are used to describe human mental states and thus are not applicable to animals, as we do not understand their cognitive processes (2023, p. 1273-74). Additionally, he demands more precision in our understanding of what consciousness is before we can determine pain in animals (p. 1274-75).

“The Moonfish”

Tan’s story focuses on an adventure of five siblings who catch a rare, beautiful fish. They practice “urban fishing” (Tan, 2019, p. 91) on the rooftops of skyscrapers as the only fish in the city can be found in the sky. This pastime has cultural significance. It is suggested that many people engage in angling in the sky and that they tend to exchange their experiences, which leads to the circulation of rumours and creation of urban legends, like those surrounding the moonfish. This legendary status among “sky angler[s]” (but also among the rich and the elite) is especially important in the case of the moonfish, as its rarity leads to it becoming very desirable (Tan, 2018, p. 92) and makes the prospect of selling it all the more tempting. Since the family sells the fish, their actions can be effectively seen as poaching for gain.

The children themselves might not have material gain on their minds and seem more concerned with the achievement of catching the fish itself. Yet they are not completely free of the materialistic approach, which shows when the narrator compares the smell of the fish to the smell of money (Tan, 2018, p. 95). Their parents, on the other hand, fully embrace the financial opportunity. Both adults and children only acknowledge their wrongdoings after the attempt at selling the fish, only a half-successful one as they find out that moonfish’s parts rot away when close to Earth’s surface, and the amount of money they are worth is less than satisfactory. Only then do they realize that they had killed and destroyed innocent creature.

One must note that the process of catching the fish must have been extremely painful to it. It was angled, wounded and made to struggle for its life while slowly suffocating in the atmosphere closer to the Earth's surface. It is undeniably a moral failure on the part of the family. Pim, one of the siblings, is the first to realize their wrongs and makes at least partial redemption possible by releasing the fish's eggs and helping to protect the species as a whole. Refusing to bait the hooks hereafter is another step in the right direction, which, however, does not make up for the harm done to the individual fish. The story can be seen as advocating for combining the protection of the species and care for individual fish welfare.

The story closes with an illustration portraying a child standing on a rooftop at night, holding a giant, mirror-like fish that reflects the light of the city. It is contrasted with a dark human figure with a knife at their belt, perhaps suggesting the violence and cruelty that human beings are capable of. The fish can be seen as reflecting the moral state of humanity in that moment, both its beauty and corruption. The city, however, might also reflect the fish in a mutual relation, which may evoke a more hopeful message of a possible coexistence of the human and non-human worlds. The illustration and the story both portray the point at which two worlds (urban and natural) meet and alter each other. Humans are shown as capable both of causing great harm if they act irresponsibly and inconsiderately and of care for and appreciation of more-than-human beings if they approach them with empathy, attentiveness, and a willingness to recognize their intrinsic value.

Possible Teaching Application

The story and its reading incorporating the perspective of fish pain could be used to conduct a lesson promoting fish welfare. Since it would inevitably deal with graphic and disturbing content, it would be most suitable for children over twelve years old. It might be beneficial to start with a warm-up activity and ask students for their opinions on fishing or angling. This should be followed by presenting the students with various voices present in the debate around fish pain. Afterwards, a fragment of the story dealing with the catching of the fish (paragraphs 1-10 could be suggested) would be read. Finally, after a short discussion of the text checking its understanding and gathering the students' ideas, they would be invited to write a short story (around 250 words) presenting the events through the perspective of the fish. Such an approach would enable them to empathize with the creature to a greater degree and realize the importance of fish welfare.

Developing care for animal welfare appears especially important in the light of evidence that children are being socialized into attributing different value to different

animals. Matthew Cole and Kate Stewart have observed a tendency to divide animals into four categories: friends (subjectified and treated with higher sensibility), nature (subjectified but approached with lesser sensibility), things (objectified but looked at with high sensibility) and killing zone (objectified with a lack of sensibility) (2018, p. 4). It can be argued that fish often fall under the category of 'things,' and a task like the one proposed herein could help children apply greater subjectification to fish, along with a less anthropocentric approach in their future interactions with animals at large.

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Reflection



Watersheds as Place

Integrating Biocultural Awareness and Experiential Place-based Professional Development

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Abstract

Project CuURRENT (Culturally Relevant River Education for Nature-based Teaching) established a professional development program that offers experiences and resources to assist educators with integrating interdisciplinary STEAM curriculum and Indigenized instruction with place-based, culturally relevant, local watershed education. By highlighting the significance of arts-based and hands-on immersive experiences within science learning and exploring the reciprocal relationship we have with nature, this project aims to increase teachers' knowledge of and self-efficacy with connecting to biocultural place and embedding place-based and Indigenous Knowledge into STEAM.

Keywords

STEAM education, Arts-Based Education, place-based education, watersheds, Indigenized learning, Biocultural Relationships, [North Dakota Native American Essential Understandings \(NDNAEU\)](#)

Framing

Project CuURRENT professional development, as our colleagues have [described elsewhere in this issue](#), focuses on building teachers' biocultural knowledge and strengthening their self-efficacy with implementing culturally relevant, place-based pedagogical approaches within science education. Connecting culturally relevant pedagogy with curricula focused on identity, presence, and intentionality makes science education engaging, empowering, and personally relevant (Walker, 2019). In this approach, both teacher and student develop greater awareness of their own identity, identities of others, and the connections between them. So, too, for the non-human world. Place-and nature-based learning encourages us to consider how biocultural diversity—that is, the relationship between biological and human communities—influences connections among humans and their environment (Cocks, 2010). Nature-based learning boosts academic learning, personal development, and environmental stewardship, while fostering an emotional connection to place (Kuo, Barnes, & Jordan, 2019). Our work with teachers in Project CuURRENT supports these assertions.

Project CuURRENT's three-year study included seven online learning modules facilitated through the University of North Dakota's (UND) Blackboard learning site. Each module centered on one of the seven [North Dakota Native American Essential Understandings \(NDNAEU\)](#) and contained instructional tools to Indigenize the [Next Generation Science Standards \(NGSS\)](#). The modules incorporated a diversity of learning resources with content that accommodated different learning styles and encouraged self-reflection and interaction among participants. To support teachers' learning experience, we offered four online synchronous debrief sessions over Zoom to allow opportunity to ask questions face-to-face. We held in-person interactions at UND. We also offered two summer workshops, one each summer, each consisting of two full-day agendas focused on place-based integrated STEAM and the International Water Institute's River of Dreams program, which reinforced the learning modules.

The workshops allowed teachers to experience hands-on learning in activities that they could use in their own classrooms. This created a collaborative learning environment for teachers across different grade levels and vastly different school demographics. Building on the content provided in the modules and at the workshops, teachers created lesson plans by personalizing the material to relate it to their grade level, geographic location, and different educational concepts linked to local biocultural history. These lessons were later implemented in their own classrooms and observed by a project member.

Arts-based Experiences Within Science Learning

We all see the world from a unique perspective. Our own meaning of things is influenced by our cultural backgrounds, personal attributes, and past experiences. Acknowledging this is fundamental to pluralistic and arts-based forms of science learning that honor diverse forms of awareness. As one participant stated, “artwork is one way for us to communicate how we feel and what we want to say.” Others discussed how they perceived their own emplaced story, why they felt drawn to using certain materials, and how their identity influenced their experience and became embedded into the materials from nature. This same idea pertains to all learning experiences. Through workshops, we found that teachers tied their identities and lived experiences to place and materials found in the watershed. This deepened their awareness of biocultural relationships and prompted them to learn and share with others. Science education is often perceived as objective, without cultural or subjective context, but our experience accentuates the opposite. Through the expression of personal and cultural funds of knowledge, teachers in our program developed a stronger sense of self-efficacy in teaching across STEAM fields, employing an expressive, relational framework.

Participants used found natural objects in the creation of unique pieces of art. As one person shared, “the artwork that we made ... is one way for us to really communicate what we feel, communicate what we want to say, because when you look at a picture, when you look at the whole picture alone, it’s not just the outside, there is something inside the art... a story that you want to tell.” Making the connection between nature-based art and their own stories extended to their notions of working with students. Such projects, another participant explained “let your students find ways to tell stories and get to know them more... for me, my artwork was a connection to my hometown.”

When exposed to lesson content revolving around the topic of the beaver, some participants pointed out how they had never seen a beaver before in real life. This prompted discussion about how lessons can include more concrete, locally situated content, or learning experiences that require more abstract thinking if there is limited possibility of exposure to a certain topic in one’s immediate environment. Both scenarios can involve engaging material that will aid in a deeper understanding of the content, such as in the classroom setting at one of our summer workshops, teachers worked together to create miniature beaver dams using materials from nature. Learning from these different lenses stimulated awareness of oneself, other beings, and the natural world. It also increased appreciation for the similarities and differences that were discovered in those cultural exchanges.

The lack of ecological awareness was a unique challenge for workshop facilitators. We had a strong cohort of international teachers working in rural schools who had no experience with wildlife, though they had tremendous knowledge of their own biocultural history. This forced us to reckon with what funds of knowledge teachers bring to their lessons and how we might foster a greater level of engagement by providing deeper accounts of local biocultural history.

The Importance of Hands-on Immersive Experiences

Hands-on, immersive experiences in the outdoors allows for intimate exposure that deepens understanding of the biocultural context in which it is being taught. What is learned from a book is just an approximation of the natural world. There is significant importance in being emplaced outside of the classroom; direct relationships stimulate our emotions and observational skills and therefore strengthen our ability to learn and remember. As stated by a participant after time spent outdoors, “it makes the connection more relevant.” Learning by doing helps us connect new and previous knowledge more easily. After walking around campus, gathering nature items for an art project, participants discussed how connecting things to emotions makes them more memorable. Besides offering new hands-on ways to step out of their comfort zone, the workshop helped participants recognize the diversity of beings and environments around them.

The workshops also offered time for in-person learning and collaboration. A full day’s-worth of experiences provoked conversations, exchange of ideas and feedback. Meeting in person each summer supported networking and offered teachers time to create and critique lessons in a supportive hands-on setting. The elementary teachers were able to learn from and alongside each other as they worked to adjust Indigenized STEAM lesson content to meet different ages’ needs. The workshops consisted of a blend of indoor and outdoor activities both on UND’s campus and elsewhere in the community. On campus, time was spent at UND’s museum of art integrating art practices into STEAM and walking around campus to observe nature that goes unnoticed in our day-to-day lives. At the education building time was allocated to place-based instruction, brainstorming, and planning, as well as activities such as small group stations showcasing ways to integrate Indigenous learnings into STEAM. Exploring nature elsewhere in the community included adventures such as a wondering walk at a park on the Red River, followed by activity packets with watershed maps to color, as well as the option to paddle on the river.

The seven online modules, each aligning to one of the NDNAEUs, consisted of video interviews of Indigenous Elders and other educational content about Indigenous

history, values, and beliefs. They included activities such as discussion boards, readings, journal prompts, guided observations in nature, and additional resources. The variety of educational material and delivery emphasized that hands-on, immersive experiences can be facilitated through both online and in-person settings as well as in a variety of forms.

Our Reciprocal Relationship with Nature

One project goal is to promote a greater awareness of Indigenized forms of learning within STEAM education. A central value is the significance of the reciprocal relationships between humans and nature. Participants explored this through workshops and online modules, translating their learnings into lesson material to use in their classrooms. They learned strategies for incorporating nature-based learning activities both inside the classroom and while physically out in nature.

Through direct experiences, developing awareness of biocultural systems, and growing their own sense of place, participants learned self-discovery while connecting to others and the environment. We see this as an extension of David Sobel's famous notion that "what's important is that children have an opportunity to bond with the natural world, to learn to love it and feel comfortable in it, before being asked to heal its wounds" (1996;9). This sentiment was exhibited at a park along the Red River, when participants pointed out how this workshop has taught them to be more mindful of the connection, purpose, and value of things around them and the importance of showing respect for things that may be particularly meaningful to another individual or community. While taking on a "one with nature" mindset, participants reflected on their gratitude for our relations with the natural world; how nature gives us things and how we have a role to protect and care for nature in return.

Throughout the workshop, we found that immersive and place-based experiences helped foster the connections between teachers and nature. The materials we used included online sources that centered on Indigenous perspectives such as [Teachings of Our Elders](#) and [Nanabush and the Giant Beaver](#), along with the books [We are Water Protectors](#) by Carole Lindstrom and Michaela Goade and Monika Vaicenavičienė's *What is a River?* Interactive and cooperative role-playing games that built awareness and nurture reciprocity between people and nature were likewise impactful. Games such as Owl and Mouse and Be a Beaver encouraged participants to become another creature, while considering their adaptations to place and how their natural histories intertwine with other creatures and human society. Lastly, other suggestions pertaining to Indigenous studies include the books *The Water Walker* by

Joanne Robertson and Julie Flett's *We All Play*, both of which emphasize the role of nature-based learning.

Conclusion

The workshop encouraged growth of culturally relevant learning by supporting teachers' self-efficacy with implementing those learnings into STEAM instruction. Nature-based teaching presents teachers and students with meaningful, immersive learning experiences that challenge them intellectually, enhance their awareness of the natural world, and encourage their personal development. Through arts- and place-based approaches, the workshops emphasized recognizing and appreciating biocultural relationships and the value in their diversity and interconnectedness. The lessons and activities involved helped advance care for the relationships that will sprout curiosity to continue to learn, grow, and make a positive impact on others and the environment.

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