

Climate Literacy in Education



A pocket journal
for teachers

**Special Issue:
Teacher Power, Teacher Impact**

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Fall 2026

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.

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Special Issue

Volume 4, Issue 3, Fall 2026

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Introduction:

Teacher Power, Teacher Impact

*Scholarship from the University of Minnesota's
Climate Literacy Teacher Leader Fellows*

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Abstract

In this introduction, we offer our observations on the first year of the University of Minnesota's Climate Literacy Teacher Leader Fellowship Program—an eight-month professional development program that brought together sixteen in-service Minnesota teachers to deepen their knowledge of climate literacy education and produce scholarship that forms the content of this special issue. What are the possibilities when in-service educators are provided time, space, support, and funding to develop, create, teach, plan, assess, and share climate justice curricular projects? We hope their work in this issue gives you a peek into real-life classrooms in Minnesota that are brimming with ideas, creativity, innovation, and learning.

Keywords

Multidisciplinary climate literacy education, professional development, teacher leaders, preK-12, Minnesota education

Acknowledgements

We are grateful to the individual donors whose generosity made this Fellowship possible.

Overview of the Climate Literacy Teacher Leader Fellowship Program

The Center for Climate Literacy's mission is to prepare young people to live well and thrive on a climate changing Earth by transforming education from within. We attempt to advance this mission through several avenues, but the heart of our work is in support of the in-service, classroom teachers who are themselves the core of our education system.

We are not the only organization committed to supporting teachers. UNESCO (2026) named teacher training as one of four pillars in their Greening Education Partnership, their proposal to advance climate literacy education globally. The UN's Sustainable Development Goal 4.7 (n.d.), which seeks to "ensure that all learners acquire the knowledge and skills needed to promote sustainable development" by 2030 (n.p.), includes teacher education and training as a core metric by which to measure progress. Even the World Bank advocates for increased funding for climate education and teacher training (Sabarwal, 2024). These calls rest on an assumption—one that we at the Center share—that no climate education policy or curricular mandate can be effective without well-supported teachers capable of implementing it.

This is why we inaugurated the [Climate Literacy Teacher Leader Fellowship Program](#) (CLTL). Based on a pilot program in the 2022-2023 academic year, the 2025-2026 CLTL Fellowship was designed to equip a cadre of sixteen in-service preK-12 Minnesota teachers to become climate literacy education practitioners, mentors, and leaders in their schools and districts. In effect, it is something between a graduate level course and an extended professional development experience—a combination of scholarly study and practical projects. Once a month, Fellows met in person on the Twin Cities campus to discuss shared academic and literary readings, write and workshop climate literacy curriculum for their own classrooms, and reflect on their experiences implementing them. Together, Fellows reached thousands of students—all while meeting their content area learning standards. They presented their work to their fellow educators, community members, students, and other stakeholders at the first ever Minnesota Climate Literacy Education Symposium in May 2026. Their insights, resources, and materials are recorded in the articles you will read in this special issue.

You will read more from the Fellows in years to come, too. Designed as a three-year program, the Fellowship is meant to support teachers in taking on increasing professional development responsibilities, including serving as mentors to incoming Fellows and leading professional development experiences in their schools and districts.

This “train the trainer” approach is strategic. It accelerates climate literacy education by decentralizing the professional development process while also recognizing in-service educators for the experts and leaders they already are.

There is a final note to make about the ethos of the Fellowship program: we are adamant that participating teachers must be financially compensated for their effort. We are aware, however, that this is a rarity in education. For so long, teachers have been asked—or told—to take on additional labor *pro bono*. Whether it is supervising the concession stand at a basketball game, staying late to help students catch up on homework, or attending additional training, teachers are expected to do so for free because they *love* what they do. We believe that teachers’ love for their work is not mutually exclusive from additional compensation for that work. Moreover, if the climate crisis is to be treated as the existential threat that it is, then we ought to also treat the labor involved in facing it with the same seriousness.

Teaching Climate Literacy in Minnesota

Minnesota, home to the ancestral and contemporary lands of the Dakota, Ojibwe, and Ho-Chunk nations, is a state that prides itself on its more-than-human nature. The cities of Saint Paul and Minneapolis, which together comprise the Twin Cities, have parks systems that are regularly celebrated as among the nation’s best (Trust for Public Land, 2026). Outdoor recreation counts for upwards of \$13.5 billion of the state economy (Explore Minnesota, 2024). However, this affinity emerges in the wake of historical and ongoing violence against the Native Minnesotans who were and are original caretakers of this land. This violence has begot other violence, too: extractive logging and mining industries, pipeline construction, and forever chemical pollution threaten ecological wellness across the state and further exacerbate harms against Native nations and marginalized communities writ large.

This contradiction has a valence in education, too. Despite Minnesotans’ outspoken affinity for the outdoors, there is currently no state mandate to teach climate literacy across content areas. Granted, climate education is included in the state standards for science (Minnesota Department of Education, 2022), based on the [Next Generation Science Standards](#); human relationships with the environment and climate are also thematized in the geography strand of the social studies standards (Minnesota Department of Education, 2024). There is also [Indigenous Education for All](#), a state-wide mandate that all schools include instruction using tribally endorsed resources on Native Nations and Communities within Minnesota, which recognizes Native stewardship of the

land and water (Minnesota Department of Education. n.d.). However, given that academic standards for all content areas are revised on a ten-year cycle, it will be a long while before English Language Arts, Math, Art, and other content areas are required to incorporate climate literacy.

Another reason for the efficacy of the grassroots approach is that it enables educators to create curriculum that responds to ecological issues important to their communities. Minnesota winters are particularly beloved but are also particularly impacted by rising global temperatures. Statewide, over the past 50 years, annual ice coverage has declined an average of 10-14 days, shortening ice fishing and hockey seasons; over the past century, daily average winter minimum temperatures have increased 7.3 degrees, reducing days of snow coverage (Minnesota Pollution Control Agency, 2026). Again, the grassroots approach to climate literacy education enables teachers to adapt—indeed, create—curriculum relevant to their context.

Of course, there are numerous other challenges facing Minnesota teachers. For the 2025-2026 school year, there was no greater challenge than Operation Metro Surge. In December 2025, the Department of Homeland Security began sending thousands of immigration and customs enforcement officials to the Twin Cities area (and soon beyond) in what would become the largest immigration operation ever conducted in the United States. The operation, which has since been labeled a “siege” and “occupation” (Swanson, 2026), left chaos, trauma, and hardship in its wake. On January 7, the day Renee Good was murdered, Border Patrol agents set off tear gas at Roosevelt High School in Minneapolis, just as classes were letting out for the day (McVan, 2026). On January 20, Liam Conejo Ramos, a five-year-old student in Columbia Heights (a Minneapolis suburb), along with his father, was seized while walking home from school (Shockman, 2026). In response, many districts shifted to remote learning even as schools themselves became sites of legal support, food distribution, and other mutual aid. As is so often the case, individual educators stepped in to help organize, facilitate, and offer direct assistance to students and families who were sheltering at home. During this turmoil and its ongoing aftermath, our teacher Fellows worked to support their communities while also remaining committed to infusing climate justice into their classrooms and schools.

In a broader context, this Fellowship occurred at a time when climate, environmental and sustainability education—and education in general—are under attack. Since January 2025, the new administration has taken aggressive steps to dismantle all climate action and policies, defund climate research, and hobble federal agencies such as NASA, EPA,

NOAA, NPS and others, whose mandate was to monitor, study, and protect the integrity of the Earth system in North America and worldwide. Among other things, NOAA's 2024 Climate Literacy Guide was removed from their website. This wholesale attack is compounded by decades of inaction—including lack of educational standards and practices. Yet it also makes each single effort toward climate literacy education more crucial than ever. The hard reality is that no executive order is able to cancel the accelerating climate emergency. All existing research shows that we have entered a period of Earth system shifts that will bring unprecedented economic, demographic, political and other real-life disruptions. Our choice is to design education that empowers young people to understand what's going on, why, and how they can help create the world they want to see. At the Center for Climate Literacy, we are committed to advancing any and all educational initiatives oriented at ensuring thriving and livable futures for young Minnesotans. Our children's futures are not anyone's call but their own.

Facilitator Reflections

We, Drs. Catherine Cavanaugh and Nick Kleese, faculty members at the University of Minnesota's Center for Climate Literacy, supported the Fellows throughout the program. We are both former classroom educators—Catherine taught elementary grades and Nick taught high school English. Informed by our experiences in classrooms and by our scholarly work, we attempted to embody a pedagogy of “guides on the side” rather than “sages on the stage” (King, 1993). In our planning sessions, we often reflected on how providing time, space, and funding to the teacher Fellows allowed them to do what they do best: plan, teach, and assess in caring, authentic, and culturally relevant ways in their own contexts. This special edition is a celebration, showcase, and acknowledgement of how their expertise and brilliance serves students in real-world classrooms.

In addition to providing faculty support to the teacher fellows, we also had a stellar group of guest speakers, or “the Avengers of climate literacy” as one of our guest speakers termed this group, join us for our in-person sessions throughout the year. We offer our deepest gratitude to Cochi Iturralde and Daniel Bryan of [Pachysana](#), Jothsna Harris of [Change Narrative](#), B. Rosas of Climate Generation, Molly Sturges of the [Bakken Center for Spirituality and Healing](#), Jenna Gray Eagle of [Minnesota Pollution Control Agency](#), and Ryan Perez and Melody Arteaga of [Monarcha Movement](#) for their generosity, expertise, and care.

Issue Preview

This special issue is organized into three sections: Secondary Grades, Middle Grades, and Early Grades. The content of the articles varies. Some articles share curriculum and resources. Others offer reflections on practice and pedagogy. There are documentaries, short stories, student works, and more. Collectively, this range testifies to the feasibility of climate literacy education across all grade levels and content areas. The scope also testifies to the creativity, wisdom, and dedication of classroom teachers themselves. We hope this special issue gives you a peek into real-life classrooms in Minnesota that are brimming with ideas, creativity, innovation, and learning. We also hope this special issue inspires many more like it in the days and years to come.

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Inaugural UMN Climate Literacy Teacher Leader Fellows



Back row (L-R): Lisa Swenson, Zhe (Andrea) Feng, Staretta Taylor-Cooper, Amanda Sell, Sofia Mulholland Cerkenik, Shannah Anderson, Gisela Santiago, Kayla Maas, Erika Pierce, Carmen Gavin Vanegas, Kari Matthies, and Zoua Yang.

Front row (L-R): Abbie Kaufenberg, Jill Torres, Lastenia (Jen) Bates, and Xinyue (Jessie) Zong.

Secondary Grades

Applying the Ojibwe Seven Grandfather Teachings to Our Relationship with the Land

Individual and Classroom Reflections

Shannah Anderson, Spring Lake Park High School, Spring Lake Park, Minnesota, USA

Abstract

In this reflection, I consider the concept of the traditional Ojibwe teachings known as the “The Great Law” or Seven Grandfather Teachings. By allowing students to interact with these concepts, both with and without deeper cultural contexts, they are asked to consider how applying the values of truth, humility, respect, courage, honesty, love, and wisdom to their relationship to the natural world could enhance their sense of ownership in taking better care of Niimama Akii (Our Mother Earth).

Keywords

Ojibwe, seven grandfather teachings, traditional Indigenous wisdom, Indigenous values, Ojibwe worldview, storytelling, nature connection narrative

Overview

In 2010, the Minnesota Department of Education published updated standards for English Language Arts and Social Studies that mandated teachers to include cultural components of Minnesota's two main tribes, the Dakota and Ojibwe (Anishinaabe). Ever since that time, I have sought ways to incorporate literature written by Native American authors into my teaching practice. I have also sought to weave in lessons about how humanity's actions (and inactions) affected our connection with the land, air, and water. It seemed like a natural progression to introduce the Seven Grandfather Teachings as a point of entry for my students to begin to reflect upon their own relationships to each of the values (truth, humility, courage, love, respect, honesty, and wisdom) and also their personal relationships with the land, air, and water. As an English Language Arts teacher in a district that has witnessed some community pushback to climate education, this seemed like the most accessible route to engage with the topic of climate change.

To that end, I created a [trimester long curriculum](#) that incorporates the Seven Teachings into three separate units: a research paper about a variety of topics throughout Native America, a choice novel study (using the texts *Night Flying Woman* by Ignatia Broker, *Firekeeper's Daughter* by Angeline Boulley, *Where Wolves Don't Die* by Anton Treur, *Codetalkers* by Joseph Bruchac, and *The Absolutely True Diary of a Part Time Indian* by Sherman Alexie), and an individual mini-memoir where students share their own Nature Connection Narrative centered around one or more of the Seven Grandfather Teachings. Finally, I created a survey for students to complete at the end of the unit to gauge how they might continue to apply their learning around the Teachings to their relationship with the land/air/water/animals.

Framing

In pondering various ways in which to incorporate climate literacy into my 9th grade Language Arts classroom, I was compelled to look back into my personal cultural history as a descendant of Gaa-waabaabiganikaag (White Earth Nation). Although I did not grow up there, I was always hungry to learn more about this part of my ancestry. I met my paternal great-grandmother, Eliza Fairbanks, who spoke Ojibwemowin fluently, only a handful of times as a young child. My father's mother, Caroline Brown, attended a day school where she was denied the opportunity to learn or use her language. It wasn't until I attended the University of Minnesota-Duluth that I was able to take an intro to Ojibwemowin course with David Niib Aubid in 1998, picking up where my great-grandmother left off. After transferring to the Twin Cities campus, I took an Ojibwe

culture course with Pebaamibines Dennis Jones, once again immersing myself in the culture that had been systematically taken from my family members and me.

One of the concepts that had always stuck with me as an undergrad was the idea of *mino-bimaadiziwin*, which is defined by the Ojibwe People's dictionary as "s/he lives well, leads a good life, has good health." This concept swirled around in my mind over the last few decades as I've pondered what this actually looks like when applied in everyday life and to each of our relationships to the land. There are multitudinous facets to be considered, but one set of teachings became of special significance, as they seemed to be of universal appeal: life lessons/values that are specific to Ojibwe culture but also transcend superficial boundaries of racial, religious, and socioeconomic aspects of identity: the Seven Grandfather Teachings. These values not only can serve to inform one's personal identity, but also as a framework to help individuals ponder how each value can also be applied to their relationship to the land.

The Seven Generations and the Seven Grandfather Teachings

In 2023, James Vukelich Kaagegaabaw published *The Seven Generations and the Seven Grandfather Teachings*. I positively devoured the knowledge shared within and yearned to share the profound insights I discovered with my students but was unsure of the best modality to make that happen. I am grateful that Kaagegaabaw resides relatively nearby and was both willing and excited to share the wisdom he had gleaned from extensive study of the Ojibwe language with my students. Here are excerpts from his definitions:

Debwewin/Truth

"S/he speaks from their heart", "truth has neither an end or beginning", and finally "truth must be something that is experienced" (pp. 44-46).

Dabasendizowin/Humility

"I think lowly of myself... in English/Western culture, this seems like a bad thing. In Ojibwe, it's a realization of a human's place in the world, because our food, clothing, and shelter come from Aki (the Earth).... I am not more important than all the relatives who give me life. In fact, without them, I know I will die.... Therefore, I think lowly of myself; I do not exalt myself above my relatives" (p. 50).

Manaaji'idiwin/Respect

"To go easy on...respect is not a submission to authority...but rather an acknowledgement of relationship.... The moment we realize other beings give their lives so that we can survive, we begin to take only what we need for food, clothing, lodging, and medicine and leave the rest behind.... I acknowledge the sanctity of my relatives' lives" (pp. 52-55).

Zaagi'idiwin/Love

"... a description of how something eternal moves within us... to emerge/to rise.... something ineffable, it must be felt. It rises from deep within us, from somewhere beyond thought and sight. When it emerges, it benefits all of our relatives... There is not just one way to say I love you. Zhawenim 'to have compassion for,' 'to love unconditionally,' 'to bless someone' may be one of the most important concepts in Ojibwe spirituality and perhaps one of the most important words in the language" (pp. 56-59).

Zoongide'ewin/Courage

"To have a strong heart" (p. 64).

"We can see the strength of heart in the people we call Ogichidaa 'the warrior.' They are now the people who attend ceremonies and have the strength of heart to pray for all of their relatives. Someone who has Zoongide'ewin is totally unafraid to seek out the good life, not just for themselves, but for all their relatives. We need strength of heart to have faith in people and to unconditionally love all our relatives" (p. 69).

Gwayakwaadizin/Honesty

"... straight/proper/correct ...way of being" (p. 70).

"It is not enough to simply speak the truth; this sacred law instructs us to live honestly, align words with action and lead a holistic life" (p. 71).

"... a person with peace, balance, and order in their life will act with honesty, virtue and righteousness...the words we say are not so important as the deeds we do" (p. 73).

Nibwaakaawin/Wisdom

"...a culmination of all the laws" (p. 74).

"A life led with truth, honesty, humility, respect, love, and courage is a life led wisely. Wise decisions benefit people seven generations from now" (p. 77).

"To lead a life with vision, to see things as they are, to be enlightened... to look at things without prejudice or bias" (p. 77).

Student Reflections on their Relationship to the Land using the Seven Grandfather Teachings

Several students responded to an end of year survey about their reflections around applying the Seven Teachings to their own life experiences. Here is a sampling of their answers:

Question #1: How could learning about the Seven Grandfather Teachings apply to improving humans' relationships (on a large scale) to the land/water/environment?

- "I think, I didnt really apply them, but they did make me more aware about my surroundings and to respect people and other life more."
- "Humility can be taught to many people who think they are above the land that supports our life."
- "By the concept of relatives, and how truly regardless of whether we admit it to ourselves or not we are all connected through life."
- "If we learn about the seven grandfather teachings, we'll see the world through Native Americans' eyes. We could learn to take more appreciation and respect the world and see it as if it's another part of us."
- "It could deepen the emotional intelligence and integrity we have as humans into wanting the best for our environment and nature."
- "Learning about the teachings such as humility and love can help humans be kinder to nature and take less. Because humility includes believing you are not superior than what gives you life, realizing that could make people be more conscious when cutting down trees and destroying the environment. And learning to love the environment would cause us to take less from it and work to protect it rather than destroy it."

Question #2: Has learning about the Seven Grandfather Teachings helped you to understand your own relationship to the land/water/environment in a different way? Why or why not?

- "Not in a different way because I've always seen and treated nature with respect it deserves."
- "Not a whole bunch, but it kind of opened my eyes to nature's importance."
- "Yes it has made me more conscious of how I treat others and animals making me more careful and always know we are equal."
- "Yes, I did already respect the environment because nature is so beautiful and it hurts to see the natural world being harmed and I am glad I was able to see how different groups see the land."
- "Yes, learning about the teachings helped me realize that respecting the environment was right important and that there is a way to live with nature while not destroying it. It was interesting to think about the environment because my love for nature and its sights/sounds was a lot like how some Native Americans felt about nature as well."
- "It gives you this deeper insight on how the emotions or adrenalines we feel everyday can be directed towards the living, breathing creatures and plants around us. To show courage, by telling the people around you, even your friends that they aren't contributing to the life around them like it contributes to us. To be honest, to admit to yourself that you are not doing the best you can, and that the best you think you can has a limit."

After looking through the numerous responses, it seemed clear that most students were able to make at least a superficial connection from these abstract concepts to how they might look when applied to mindsets and actions associated with conservation/preservation of our planet's resources. It also built their ability to take on another's cultural perspective, which is always a valuable exercise to build empathy.

Future Considerations

After sharing my findings with district leadership, my principal agreed that students would benefit from spending more time outside to more fully integrate the lessons held within the Seven Grandfather Teachings on a more profound level. As students have such varying levels of experiences interacting with nature, it would be especially important to ensure that students have at least one significant experience where they are allowed to be mindfully observant outside, take pictures, and then process their experience through the lens of the Ojibwe worldview along with their own five senses.

The Executive Director of Learning and Innovation at Spring Lake Park, after attending my session at our spring symposium through the Center for Climate Literacy, stated that she thought students should go on at least two field trips to help them build up their capacity for not only experiencing what nature has to teach each of us, but also to reflect deeply on the Seven Teachings, a perspective that could stay with them for life.

For myself, I will continue to deeply engage with these concepts and how they continue to evolve within my own personal relationship to the land and to the culture that was systemically taken from my relatives and me. I plan to add in more opportunities for both me and my students to write poetry and short stories about these concepts. There is great wisdom to be gained in not only contemplating the Seven Grandfather Teachings, but also putting them into action, both in personal, educational, and environmental contexts.

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Appendix 1: Personal Definitions of the Seven Grandfather Teachings

Before diving deeper into the Seven Grandfather Teachings, I formulated my own definitions of these values as a baseline and have shared them below. I encourage anyone who might consider exploring these values to reflect on their own definitions and notice how they may change or deepen over time.

Truth: the highest form of wisdom; it does not change no matter the circumstance, used as a measuring stick by which we gauge our reactions and decisions

Humility: not putting your own needs/desires above others'; considering the community's needs as a whole, inextricably linked with one's own

Respect: honoring oneself, one's elders, one's immediate and further reaching community through your words and deeds; following through and keeping your word

Courage: embodying and acting upon your values, even when others may not be (including especially those whom you are close to or admire)

Honesty: being unafraid to examine yourself in terms of strengths and areas where growth/change is needed—extending that same careful consideration to your loved ones/neighbors

Love: the (other) highest form of wisdom-generating and extending a sense warmth, comfort, understanding, and ease to all whom you encounter, a lack of judgement, giving from your heart without expecting something in return

Wisdom: living out and SHARING the culmination of all other values; using discernment when choosing your own next steps and considering past lessons when sharing advice with those who have not yet walked as far on their life path; being a good ancestor

Appendix 2: Student Examples

Nature Connection Narrative #1

On the fourth of July, I was at the park with my family celebrating. We had a barbecue with hot dogs and Pepsi. My cousins, siblings, and I all went to play by a river and catch some fish. I didn't catch any but my cousin caught a lot. Afterwards, he threw them back into the river. This reminds me of manaaji'idiwin as we showed respect to the fish since we didn't need them for food at that time. We left fish for others in case they needed it. Then we had to leave early to find some parking near our fireworks spot. We were sitting on the grass while the fireworks went off. The fireworks were pretty and colorful and loud. It was the perfect summer night.

Nature Connection Narrative #2

Skipping rocks on the lake and feeling so small next to it. I remember feeling calmed and at peace with myself and my life. Hearing the waves crash on the rocky beach spoke to me on how much noise the world makes without humans. Seeing the rocks drop into the lake and hearing the "plop" of it made me feel so small and insignificant compared to the universe. I felt like nature respected me and I respected it, it had me think about myself and the lake was there for me. Sitting there alone made me think about all of my different relationships with everyone in my life. It made me appreciate where I was in my life at that moment. Feeling the cold wind on my bottom half of my wet legs made me feel calm and collected. Driving home that night made me think about how the world showed me how it works with everything. Laying in bed that night I got to align everything in my life and see where all the puzzle pieces fit to make me who I am. All of this gave me the courage to live how I want and not how society tells me to. Being there at that moment forced me to be alone and not be distracted by anything else. This all made me more clear headed for the rest of my life.

Nature Connection Narrative #3

When I was in second grade I saw a bald eagle for the first time. It was around 6:30 about an hour and a half before school started. It must have been in early to mid spring because it was still cloudy and cold but all the snow had melted already. I did what I always did before school which was to go swing on the swing set to me swinging in the dark with a cool breeze on you just thinking about anything was the best feeling at the time. The rough jagged feeling of the chains connected to the swing and the seat being a little bit too big for me grounded me. It almost felt like the world was colorless and emotionless until I saw the eagle. It was like a vibrant barrage of color onto my eyes. I focused my

sight on it immediately. I felt no need to chase or bother it. I felt just fine from where I was on the swing watching it with interest. To me that was showing respect to the eagle. I watched it from afar but I never got up in its business. I let it do its thing while I did mine. I took joy in watching the eagle but I never took more than what I could give if I went into the eagles business and bothered it. I would be talking more than I could give and that wouldn't be respect, but I didn't and only watched from afar. I ended up watching the eagle for the next hour. I was swinging on my swing while the eagle tended to its nest. I could hear the whispering of the wind in the background and the smell of freshly cut grass but I really only cared about the eagle. When we had to go inside I was disappointed to not be able to see the eagle anymore but when one of my teachers at the time told me that since the eagle was nested on our schools roof it would be there the next day and that made me feel excited for the next day for I would be able to see the eagle again. To me I also feel like it was love, love for the eagle, love for the playground and love for the cool breeze of the wind. It was unconditional love. I didn't feel like the eagle needed to love me back to say the truth. I didn't care if the eagle didn't love me I loved the eagle and that was all that mattered to me.

Youth Leadership

Eco-Stewardship Project

青年领导力

环境守护计划

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Abstract

This project-based learning unit challenges students to investigate the "hidden costs" of modern lifestyles, examining the intersection of environmental health and global equity. Through research into four critical areas—soil integrity, fast fashion, energy consumption, and city development—students deconstruct traditional definitions of "progress." The curriculum integrates scientific inquiry with Chinese language arts, tasking students to synthesize their findings into original, illustrated digital storybooks. By personifying environmental crises and proposing actionable solutions, students transition from passive consumers to global advocates.

Keywords

Hidden costs, ecological stewardship, global equity, youth-created stories

Overview

This Project-Based Learning (PBL) unit invites Eastview High School 12th grade Chinese level 5 students to peel back the layers of modern convenience to uncover the "hidden costs" of our global lifestyle. This unit happened at the end of the 12th grade school year. By asking how we can redefine "progress" to prioritize the Earth's health and global equity, students engaged in an interdisciplinary journey that blends environmental science, social ethics, and Chinese linguistic artistry. The goals included:

- students can identify how modern values (like speed, convenience, progress, and consumption) shape our choices and our relationship with nature;
- students can research and analyze the environmental 'hidden costs' of my daily habits and industry practices;
- students can propose actionable solutions at both the individual and systemic levels to promote environmental stewardship;
- students can lead a mini workshop with a persuasive story in Mandarin Chinese using topic-specific vocabulary to advocate for a more sustainable lifestyle.

Students were organized into specialized research collectives focusing on four critical aspects of modern impact: soil integrity, fast fashion, energy consumption, and city design and waste management. The process moved from academic inquiry to creative synthesis; students didn't just report facts—they transformed their data into compelling Chinese-language storybooks. Inspired by the text "The Magic Hole" and the example story *Cry for a Lemur*, students used narrative to personify environmental crises and articulate a moral imperative for change. Students also came up with actionable suggestions in the story book.

The unit emphasized authentic audience engagement. Beyond the classroom, students utilized digital tools like Canva to produce visuals, and their work was presented to younger Chinese language learners and at an educational symposium. This final stage shifted the student's role from learner to advocate.

Framing

We live in an era of unprecedented convenience, where a click brings a new outfit to our door and a swipe power our global connections. But beneath this surface of "progress" lies an invisible thread connecting our daily choices to distant landscapes. Every cheap garment, every discarded device, and every meal carry a silent history of depleted soil, exhausted energy, and mounting waste.

In this project, students became investigators of the unseen. By unmasking these hidden costs, we shifted our perspective from passive consumers to Earth’s protectors. We didn't just study the crisis; we found its heartbeat through storytelling. Through the power of the language learning process, we wove research into narratives that challenged the world to look deeper, listen closer, and finally redefine what it truly means for a civilization to move forward.

At a Glance

Title	Youth Leadership: Eco-Stewardship Project 青年领导力：环境守护计划
Unit Time	4/15/2026 - 5/8/2026
Grade Level(s)	12th grade Chinese level 5
Core Texts	• “The Magic Hole” (teacher-adapted). This story introduces the central concept of consequences and the illusion that waste simply “disappears.” • <i>Cry for a Lemur</i> (teacher-authored). A direct example of how to blend research with emotive Chinese storytelling. • “Diary of a Worm” (《蚯蚓的日记》). A mentor text showing how to use a non-human character to reveal the hidden health of the Earth.
Supporting Texts	• Guest lecture from local Chinese environmental organizations, Ziran, provided primary-source evidence of local ecological action. • Group 1 (Food & Soil): “The Real Cost of an Apple” (Article). Students analyzed the price gap between supermarket convenience and ecological reality. • Group 2 (Fast Fashion): “The True Cost” (Documentary). Provided the visual and ethical evidence of the global supply chain's impact on people and water. • Group 3 (Digital/AI): “Google’s Nuclear Plants for AI” & “Teen AI Chatbot Usage” (Media). These texts challenged students to look at the physical

	and emotional energy required to power our digital "magic." Group 4 (Waste/Landfill): "The Story of Plastic" & "From Landfill to Landmark" (Video/Local Site). These resources contrasted the "out of sight" reality of landfills with the hope of community restoration at sites like Wakaŋ Tipi.
Climate Literacy Terms	Pesticides, organic farming, ecosystem, pollution, sustainability, fossil fuels, climate change, misinformation, environmental justice, landfill, conservation, consumption, waste management
Objectives	- I can identify how modern values (like speed, convenience, progress, and consumption) shape our choices and our relationship with nature. - I can research and analyze the environmental 'hidden costs' of my daily habits and industry practices. - I can propose actionable solutions at both the individual and systemic levels to promote environmental stewardship. - I can lead a mini workshop with a persuasive story in Mandarin using topic-specific vocabulary to advocate for a more sustainable lifestyle.
Materials and Resources	Project main slides Hook lesson: How to live a sustainable life? Guest speaker organization: Ziran Teacher adapted story: The Magic Hole Teacher authored story: Cry for a lemur Student handout (graphic organizer to organize research) Student-created books (Appendix 1)

Going Forward

Moving forward, this project serves as a launchpad for lifelong ecological citizenship. By synthesizing complex global data into relatable Chinese narratives, students have bridged the gap between awareness and advocacy. The journey does not end with the final page of their storybooks; rather, it continues as they share their work with the community, sparking dialogue and inspiring younger learners to question the status quo.

Equipped with a new vocabulary of climate literacy and a redefined understanding of progress, I hope these students are prepared to navigate the 21st century not just as consumers, but as mindful stewards of a shared future.

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Appendix 1: Students' Books

Group 1: [*Andy and the Organic Tomato*](#)

Description: Andy and Wally are two ants who happily live together in a garden and love eating tomatoes every day. One day, humans spray pesticides on the garden crops, causing Wally to become very sick. Wanting to help his best friend, Andy searches for medicine and meets a farmer who grows organic vegetables without harmful chemicals. The farmer explains that pesticides can hurt not only insects, but also forests, animals, and people. Andy brings back an organic tomato, which helps Wally recover, and the two friends decide to move to the organic farm where food is safer for everyone.

Group 2: [*The Hidden Cost*](#)

Description: The Hidden Cost follows AnBeiJun, a girl who loves buying cheap, cute clothes online and initially ignores warnings about the problems caused by fast fashion. During a family trip to Myanmar, she unexpectedly discovers a clothing factory and witnesses workers laboring in harsh and miserable conditions. Seeing the human cost behind the inexpensive clothes she enjoys changes her understanding of fast fashion.

When AnBeiJun returns home, she stops buying fast fashion and becomes an advocate for sustainable fashion. Five years later, she becomes a government representative herself and speaks out against fast fashion. In the audience is another girl looking at her phone—just as AnBeiJun once did—but this time, the girl puts down her phone and listens.

Group 3: *Good Monsters, Bad Monsters*

Description: A young boy grows up hearing terrifying stories his oil teacher teaches him about dangerous water monsters. Because of these lessons, he becomes afraid of the water monsters. One day, lost in the forest, the young boy is rescued by a water monster. As he spends time with water monsters, he realizes they are kind, peaceful, and misunderstood. However, the true danger soon appears when a violent oil monster attacks and destroys the good monsters. The boy tries to warn the people that the oil monster—not the water monsters—is the real threat. At first no one believes him, but after seeing the truth themselves, the people unite to defeat the oil monster and finally embrace the monsters they once feared.

The story's moral is that people can be taught to fear the wrong things. The boy feared water, yet water saved him, while people trusted and depended on oil even though oil was the true monster. It encourages readers to question fear, challenge misinformation, and recognize that what seems unfamiliar is not always dangerous.

Group 4: [A Home for Everyone](#)

Description: This story is about a peaceful forest where turtles lived happily with clean water, fresh air, and beautiful green trees. One day, wolves from far away arrived and slowly changed the forest by cutting down trees, building cities, and leaving behind trash and pollution. As more waste piled up, parts of the forest began to look like a landfill, filled with garbage instead of life. The animals lost their homes, and the turtles became very sad. But with the help of wise eagles and the other animals, the forest was cleaned and restored. Together, they learned an important lesson: nature is everyone's home, and it must be protected with care and respect.

Learning from the Land through Community Partnership

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Annette S. Lee, Université de Bretagne Occidentale, Brest, France

Abstract

This paper describes a climate education curriculum developed and implemented over the course of the 2025-2026 school year in a high school magnet program for Indigenous students. Co-developed and implemented with Dr. Annette Lee, the project's community partner, the curriculum extended climate literacy education from a single, stand-alone unit to be infused into my students' learning experiences throughout the year as part of a culturally and linguistically sustaining learning experience. Ultimately, the curriculum benefited students, community members, facilitators, and the land.

Keywords

Indigenous science, Indigenous education, community-engaged learning, language reclamation, phenology, plant medicine

Introduction

I teach science in a high school magnet program for Indigenous students. The district where I work, Minneapolis Public Schools, is the first urban district in the United States to have a legal memorandum of agreement that gives Native community members control over the educational experiences of their children. Community control means that our curriculum already centers Dakota and Ojibwe languages, cultures, worldviews, histories, and relationships to land, relatives, and the seasonal cycle. Adding a thread of climate education was natural, given the widespread impacts of climate change on land, seasonal cycles of plants and animals, weather, traditional foods and medicines, ability to exercise treaty rights, and cultural activities.

In developing the climate education curriculum, I partnered with Dr. Annette Lee, Director of the nonprofit Native Skywatchers and Senior Researcher for OSPAPIK (Ocean and Space Pollution, Artistic Practices and Indigenous Knowledges) at the Université de Bretagne Occidentale. Dr. Lee provided resources, training, and opportunities for our students to both carry out bioacoustics monitoring and learn from elders and community knowledge keepers on the land and in the classroom. She is deeply committed to educating students and the broader public about Indigenous science, ecosystem restoration, and caring for our plant and animal relatives. As an Indigenous scientist, her work and research have been positioned widely across the sciences: astronomy, physics, mathematics, astrobiology, geology, chemistry, hydrology, and earth systems science. Moreover, working with Dr. Lee as a community partner ensured that students would have her support as an Indigenous researcher and expert on Indigenous science, as well as the support of elders and knowledge keepers from their community. We have collaborated for several years on Indigenous astronomy projects and land-based learning. Although this curriculum work seemed like a natural extension of what we were already doing, we found that this work was transformative and brought unexpected insights, including expanded research in ecology, conservation, and bioacoustics.

My hope is that this reflection will be valuable to both teachers and community partners to learn about the model of climate education we built together and the ways it impacted our lives and the lives of the students. Below, I provide a general overview of the curriculum, then I share how the curriculum helped to shift student thinking. The conclusions that follow are based on a synthesis of oral interactions with students, student work, and student portfolio presentations.

Curriculum Overview

We previously developed a unit on the impacts of climate change on wild rice, a staple food for Indigenous people in our region. This year, we added climate literacy components into units focused on 1) colonization and biodiversity, 2) food sovereignty, 3) plant medicines and dyes, and 4) phenology. Weaving climate literacy into both Earth Science and Chemistry classes throughout the year had important impacts on both student learning and our own thinking about climate change.

Colonization and Biodiversity

This unit focuses on the wide-ranging impacts of colonization on the land and biodiversity on Turtle Island, with a particular focus on the urban area around our school, our local sacred sites (Figure 1), and culturally important sites in our region. In the past, we focused on studying the mass killing of animals and mass destruction of our state's biomes: prairie grassland, eastern broadleaf forest, Laurentian mixed forest, and tallgrass aspen parkland. Students learn that, for example, less than 2% of our native prairies and old-growth forests remain (Minnesota Board of Soil and Water Conservation, 2026). They also learned about the mass killing of animals and how approximately 98% of mammals and game birds were killed by hunting or died from habitat loss between colonization and the 1890s (Hornaday, 1914).



Figure 1: Student researchers at Mound Springs, MN Valley NWR, Sacred Site, Field Site, Bloomington, MN, 2025.

This year, we expanded our learning to look at the current impacts of our way of life on the land and our plant and animal relatives, including the impacts of climate change. Students learned about phenological shifts and mismatches due to climate change, such as flowers blooming when pollinators are not ready or birds migrating before the insects needed to feed their young have emerged. They also studied the impacts of a changing climate on the spread of displaced relatives that can dominate ecosystems and crowd out the native plants needed for our insects and other animal relatives to reproduce and thrive. They learned that a number of culturally important native species, such as birch, depend on photoperiod (day length) to time their life cycle, and cannot adapt to a changing climate and longer growing season as well as some other plants, particularly some of our displaced relatives (Tarascio et al., 2025). With Dr. Lee's support, they went beyond looking at data on the impacts on birch trees; they spent time with knowledge keeper Pat Kruse, who taught them to make birchbark baskets and florals, and to do quillwork on bark. This experience connected them to embodied cultural knowledge and helped them care about birch as a relative. Pat was able to share with them his changing experiences harvesting bark over several decades, as well as his concerns about the future of this relative in our state.

Including climate literacy in this introductory unit completely transformed the way I view climate change. It became clear to me and the students that climate change is part of a much larger pattern of relationships to land and relatives where humans have forgotten or turned away from their roles in maintaining a healthy and balanced ecosystem. This problem is not one that can be solved intellectually or technically; it requires reclaiming embodied cultural knowledge and land-based practices that reconnect us with land and relatives. Learning in this unit helped students to see that colonization is not a one-time event, but an ongoing way of thinking and living that continues to impact the land, relatives, and their communities in important ways.

Food Sovereignty

During the Operation Metro Surge in the winter of 2025-2026, our students' education was disrupted. Many students experienced trauma as they and people in their neighborhoods were targeted. Members of Indigenous communities were detained by ICE on multiple occasions. During the peak of ICE activity, most students stayed home and did remote learning. Many felt depressed and did not see the point of engaging with school. As ICE activity decreased in spring, many students struggled to return to in-person learning. Our teaching team came together and developed a unit on food sovereignty to promote community healing and help students reengage with school.

Our students have always learned about traditional foods, but we leaned hard into embodied practices of offerings, harvesting, processing, and preparing. Students nixtamalized corn to make hominy and tortillas, learned multiple ways to cook wild rice, prepared teas, made jerky, canned jam, and made applesauce. With support from knowledge keeper Fern Renville, they harvested and prepared foods from plants growing in our urban parks and school garden, including pineapple weed, hackberry, plantain, bee balm, yarrow, nettles, and burdock. Tying this learning to the impacts of industrial agriculture on the land and climate brought home to students how important land-based harvesting and hands-on food preparation are for building stronger relationships to land and relatives. Students learned alternative and more sustainable ways of tending the landscape to grow food practiced by Indigenous communities through resources including *Tending the Wild* (Anderson, 2005) and the accompanying PBS video series (2016), *Wildfire* (Anderson & McPherson, 2024), and *Keeping It Living* (Deur & Turner, 2005). Students noticed that harvesting makes us aware of where plants like to grow and that sustainable harvesting requires that we monitor plant populations throughout the seasons and life cycle, year after year. As they learned about the food sovereignty movement, they came to understand that it is as much about the land and relatives as it is about what we eat. Students saw the impacts of displaced relatives crowding out foods in our neighborhoods. They also realized through work in our school garden and at our restoration sites how humans can help bring ecosystems back into balance through disseminating the seeds of our native food plants, tending, harvesting, and engaging with plants on the land. The embodied practices of planting, harvesting, preparing, and cooking were deeply healing after the trauma they experienced. Students felt a strong sense of community and a greater sense of purpose in coming to school because they were learning skills to help the climate, their families and communities, and the land and relatives.

Plant Medicines and Dyes

We have always had opportunities for students to learn to harvest and prepare culturally important medicines such as cedar, sage, red willow, and sweetgrass for their families. This year, we focused on teaching tobacco offerings, sustainable harvest, and the importance of reciprocity. We were very lucky to work with knowledge keeper Charles Grolla, who taught students about the significance of offerings and their centrality in Ojibwe culture. Understanding offerings as an expression of our proper role on the land and among our relatives, and connecting offering practices to important cultural stories, gave students a new understanding of themselves and their place in the world. They

were able to imagine futures where human activities could contribute to the health of ecosystems rather than their destruction.

We expanded our learning to include more medicines, fibers, and natural dyes. Students worked with knowledge keepers Tanaǵidaŋ To Wiŋ (Tara Perron) and Simone Rendon to practice sustainably harvesting medicines growing at a sacred site. It meant a lot to students to learn to care for these medicines and be able to bring them home to their families. At school, students learned about the importance of our native plants as carbon sinks and phytoremediators (US Environmental Protection Agency, 2017; Wild Ones, 2021). In their reflections, they came to think of medicines not just as plants that help with human health problems, but also as plants that help the ecosystem and planet to stay healthy by keeping the climate in balance and cleaning the air and water.

Students also had the opportunity to learn from elder and knowledge keeper Fern Renville. They worked with her to harvest and process nettles to make fiber and learned about the cultural importance of other fiber plants, such as dogbane and basswood. Students contrasted these fiber-making practices to the unsustainable clothing industry and its impacts on the land, relatives, and climate. For example, they learned that much of the fabric used in our clothing is derived from fossil fuels and puts microplastics into our water, that the dyes used on fabric and leather clothing items are poisoning water, people, and animals in the places the clothes are made, and that much clothing ends up in landfills shortly after being purchased (Niinimäki et al., 2020). This learning caused students to see traditional dyes and fibers as solutions for the future, rather than relics of the past. They were motivated to pursue deeper knowledge of plant fibers and dyes traditionally used in their communities. After researching traditional Dakota and Ojibwe dyes and working with Fern, they dyed nettle fibers, fabric, and quills using a wide variety of plant dyes and mordants. They presented their work to educate the public at the Minnesota Indian Education Association Conference.

Students also learned from Marique Moss, a community knowledge keeper, about how to make salves and balms with medicinal plants and bear grease, further deepening their embodied knowledge and relationships to these medicines. Students planned and requested funding to plant a new dye and fiber garden next year to continue their learning and requested ongoing learning with knowledge keepers to continue to learn more about harvesting, preparing, and using plant medicines.

Phenology

Using the Ojibwe and Dakota languages is a critical part of our program. This year, students kept phenology journals in Ojibwe or Dakota to track seasonal changes in weather and in the life cycles of plant and animal relatives. They observed outside in the schoolyard at least twice a week, made observations at our sacred sites during field trips, and also viewed photos and videos Carmen made at the sacred sites the weeks they did not have access to those spaces. In addition, students accessed bioacoustic data from the sacred sites to learn about when bird and frog species bred last year and compare the dates with historical data (Figure 2).



Figure 2: Bioacoustic recording gear, Native Skywatchers grant-funded research project, "Turtle Island Skywatchers-Research and Data Visualization", LCCMR, 2024-2026.

Students learned how the names of the months in Ojibwe and Dakota hold important information about phenology, such as the time wild strawberries and wild rice are ready to harvest, geese are laying eggs, or the leaves change color. Due to climate change, some of our phenology observations no longer align with this traditional calendar, a stark

reminder of the impact our ways of life are having on our relatives. Students learned that 70% of plants studied have shifted their phenology in the past few decades due to climate change, and that the life cycles of birds, insects, and other animals are also being impacted (Tarascio et al., 2026). Students learned about the many factors that influence the timing of life cycle events, including temperature, photoperiod (day length), and precipitation. They learned about the role of genetic diversity within populations in permitting some adaptation to climate change, while also understanding the constraints that make it more difficult for some species to adapt. Recording observations of bird song, plant life cycle events (sap flow, bud burst, flowering, fruiting), and weather in Ojibwe and Dakota led students to relate differently to the land and relatives around them. Students expressed more care and concern for plant and animal relatives, and a stronger desire to change their ways of living to keep their relatives safe. Using the Dakota and Ojibwe languages tied their experiences to the stories and cultural knowledge associated with their plant and animal relatives. It also helped them think of their role on the land in a different way, as they used language to carry out embodied practices (making offerings, harvesting, singing) on the land. Students developed deep gratitude for the myriad ways our relatives care for us every day. For example, they learned how plants provide oxygen, clean our water, soil, and air, and absorb carbon dioxide from the atmosphere. They learned how trees cool the air both by providing shade and through transpiration. They learned how plants release volatile chemicals into the air through transpiration that can improve human health (La Puma, 2026). They reflected on how little they have done to care for and protect these relatives without whom they could not live. This learning made them seek to develop an understanding of the proper role of humans on the land and how to care for their relatives.

Impacts on Students

Students as Future Elders

Students moved from seeing elders as a source of knowledge and taking a passive role in listening to elders to understanding that they need to engage in embodied, land-based practices in their languages. They realized this engagement is required for them to gain the decades of experience needed to pass this knowledge to the next generation when they become elders themselves one day.

Students as Community Educators

As students learned about the wide-ranging impacts of the climate crisis on land, relatives, and the wellbeing of their communities, they became passionate about sharing

their learning with the wider community. They shared their knowledge formally with community members at several conferences and community events throughout the year (American Indian Science and Engineering Society national conference, Minnesota Indian Education Association Conference, and the University of Minnesota Climate Education Conference), as well as informally with family members and neighbors. In addition, every student presented a portfolio of learning to family and community at the end of the year to share what they took away from their learning.

Connection to Language

Indigenous languages are often viewed in the school system and larger society as irrelevant to modern life, not offering the economic advantages of other world languages, and destined to disappear. The students' learning about climate, land and relatives, and their embodied experiences of using language in that learning, caused them to form deeper personal and community relationships to language and to see language as important for their future. Every student, even those who did not have a separate Ojibwe or Dakota class, spoke their languages in their portfolio presentations. Students began to see language as a map to help them find and enact correct relationships to land and relatives and guide who they should be in the community and larger world. This motivated students to grow their language knowledge and use language beyond the classroom, a key component of language reclamation.

Connection to land and relatives

Many urban Indigenous students have experienced limited access to green spaces and even to their own culturally important places and sacred sites due to myriad structural barriers. Reclaiming relationships to land, both in their neighborhoods and at the sacred sites, was deeply healing for many students. Learning more about the history of their local sacred sites through teachings from Ramona Kitto-Statley helped students read the landscape around themselves and their own family histories in new ways. Many students went from feeling discomfort and anxiety on the land to feeling comfortable, recognizing and reconnecting with relatives on the land. Storywork, including hearing stories from knowledge keepers such as Hope Flanagan, Charles Grolla, and Fern Renville, and working with texts including *Binesi Dibaajimowinan: Ojibwe Bird Stories* (Grolla, 2019) and *Plants Have So Much to Give Us, All We Have to Do Is Ask* (Geniusz, 2015), helped students connect with plant and animal relatives in culturally sustaining ways. Students were motivated to help restore local sacred sites as well as spaces in their own neighborhoods, in order to provide better homes for their relatives and bring missing relatives back. They also became committed to working to influence decisions about

land management, such as the Minneapolis 2040 plan, and determining how land will be managed at local parks and sacred sites.

Personal Impacts on Teacher and Community Partner

Learning from Storylines Based on Bioacoustic Data

Dr. Lee led multiyear grant-funded projects at two sites (in collaboration with acoustic biologists Anne Simonis and Gary Casper): Mound Springs (part of the Minnesota Valley Wildlife Refuge) and Crow-Hassan Park Reserve (part of the Three Rivers Park District) with funding from Heising-Simons Foundation and LCCMR. Mound Springs is a Dakota sacred site that includes burial mounds, and students have done water monitoring there in the past. Crow-Hassan is a successful example of prairie restoration on land where agricultural activity disrupted the original ecosystem. Students had opportunities to look at raw data and walk through the data analysis process. They then accessed proofed results to learn more about which animal relatives (birds, bats, frogs, and turtles) were using each site.

One important story that came out of the data was that although many common birds are in decline, some of these same birds were nesting and breeding at both the Mound Springs and Crow-Hassan field sites (Figure 3). Examples include: the American Goldfinch or ozaaweshiinh (Ojibwe), the American Crow or aandeg (Ojibwe), and the Blue Jay, or diindiisi (Ojibwe) (Grolla, 2019). Despite their proximity to the Minneapolis airport and the Mall of America, and the associated noise, air, and water pollution, these avian relatives still show up and play important roles in the ecosystem. Similarly, Crow-Hassan, has an abundance of birds, frogs, bats, turtles, and other wildlife. The bioacoustics data were able to tell a snippet of their story through their songs, a story of hope for land transformation and revitalization when humans make better choices based on reciprocity, relationship, and stewardship. A collection of ArcGIS Story Maps was collaboratively designed to weave together the acoustic data, visuals, and context, including impacts of changing land use and restoration on biodiversity (Lee, 2026; see link in references to access these educational tools)



Figure 3: Great Blue Heron, Mound Springs-MN Valley NWR, Photo by Carmen Gavin Vanegas, 2025.

Seeing how these trends are impacting the land and relatives right around us was impactful for us as researchers and for the students. Students became passionate advocates for additional restoration work to support the animal relatives that are on the land, as well as ongoing work to restore missing relatives to these spaces.

Future Directions

The relevance of climate education to students' lives, and their sense that their education had a deeper purpose to help community and support future generations led them to become more engaged in asking questions and seeking knowledge. They began to drive more of the curriculum and request community support for their learning. Some new topics they wish to explore next year are sustainable housing and architecture and the role of cultural fire in maintaining healthy ecosystems. Students also requested elders-in-residence and more ongoing work with knowledge keepers to support intergenerational transmission of language and cultural knowledge. Further, students

requested opportunities to mentor and share their learning with younger students, as many wish they had opportunities to start this learning journey at a younger age.

Personal Reflections

Carmen: I became more committed to supporting language reclamation and engaging students in embodied, land-based learning. I applied for and was awarded a grant to support some of our land-based work next year. I have continued my Ojibwe learning, will be teaching Ojibwe language part-time next year, and am also taking a Dakota class through South Dakota State University in the fall to continue to develop skills to support students using their Indigenous languages in the classroom.

Dr. Lee: From an Indigenous perspective, viewing Astronomy as an isolated discipline has never been sufficient. My work has consistently centered on the concept of *kapemni* (Lakota), which refers to the mirrored relationship between earth and sky. Collaborating with Carmen and her students has heightened my sense of urgency regarding Indigenous Ecology. In addition to my current role as Senior Researcher for OSPAPIK (Ocean and Space Pollution, Artistic Practices and Indigenous Knowledges) at the Université de Bretagne Occidentale, I have chosen to pursue a graduate certificate in bioacoustics through the Center for Acoustics Research and Education at the Institute for the Study of Earth, Oceans, and Space at the University of New Hampshire.

Conclusion

Integrating climate education into our science curriculum with the support of Native Skywatchers transformed the way my students and I see ourselves and our place in the world. It planted the seeds for further learning and growth as we continue to reclaim language and relationship to land and relatives. As an educator (Carmen) and a researcher (Annette), this learning also transformed each of us personally and gave us a deeper sense of purpose in our work. This project shows that climate education does not have to be depressing or lead to a sense of helplessness. Instead, it can motivate deep healing and reconnection, bringing us back into the right relationship with land, relatives, and one another.

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Urban Design

Designing Cities 50 Years in the Future

Jill Torres, Marshall School, Duluth, MN, USA

Abstract

Students participate in an urban design project whereby they design a city for the future. It is a gamified simulation where cities (classes) compete for scarce resources and funding. Through this unit students learn about climate action and how public and private systems work. The speculative fiction, "City of Choice" and city future planning documents are used prior to the simulation to help students understand how imagination and creativity are essential for designing any city.

Keywords

Urban design, political policy, long-range planning, competing interests, climate action, futurism

Overview

Prior to the urban design project, students examine future cities in a variety of ways. First, students review videos and news articles about different city design projects that are created with the future and scarce resources in mind. Second, students examine a speculative fiction short story, "City of Choice," to analyze how human and AI limitations and creativity have real consequences for city dwellers. Third, students examine their own city's planning for the future, including current and future zoning policies and long-range plans. Finally, students engage in the urban design simulation whereby they create their own city for the future, 50 years from present day. In this simulation, students engage in political policy making, competing interests, scarce resources, and using their imagination to create something livable and sustainable.

Narrative Framing

I adopted this Urban Design unit from a former social studies teacher at my school. Originally, this unit was focused on governmental procedure at the local level and the basics of urban planning. Since this adoption, I have added more climate-based elements and have students look at "future cities" models where cities look at how to plan for a changing climate. We also look at our city's own future planning document to see how cities forecast anticipated needs in the near and long term. In this rendition, I have added a speculative fiction short story, "City of Choice." With students' excitement and use of AI, I want them to see how AI has both the ability to help and harm our humanity now and in the future.

At a Glance

Title	Urban Design
Unit Time	4-5 weeks
Grade Level(s)	7-8th grade
Core Text	"City of Choice" by Gu Shi (Center for Science and the Imagination, Arizona State University, Climate Action Almanac)
Supporting Texts	• your own city's future planning document • various videos on past and present-day future cities planning (see below)
Objectives	• Read and discuss the story "City of Choice" to discern how people and technology make decisions during climate challenges.

	• Compare “City of Choice” to various future cities examples to determine how humans imagine future cities in the near and long term. • Analyze how current economic and political policies impact planning for future cities, including our own city of Duluth. • Work cooperatively to create a successful future city using current political policies and limited resources • Use imagination to plan a future city • Share future city plans and solicit new “citizens” to live there
Materials and Resources	• LA Olympics, news article • Cities of the Future, video • The Line, video • Bad Future, Better Future, illustrated story, NYT • City of Choice, short story • Climate Action Almanac Lesson Plans, ASU • Land Use Planning in Duluth, zoning website • Imagine Duluth 2035, planning document • Want to Escape Global Warming? These Cities Promise Cool Relief, NYT • Is Duluth, MN a Climate Change Safe Haven? Michael Kosta Investigates, Daily Show

Part 1: Examining Cities Real and Imagined

To begin this unit, I have my students watch a few videos about future cities. After watching the videos students are always curious about these cities’ current status, wondering if they became realities and, if so, how they are doing. We then spend a bit of time researching these cities, confirming suspicions and excitement for possibilities. For example, students learn how lofty projects like “The Line” in Saudi Arabia have failed, but how planning for cleaner waste management or creating green areas in Singapore have been wildly successful. Of course, I would be remiss if I did not introduce to them Minnesota’s own [Experimental City](#) from the 1960s, and how it too failed. Through these examples students begin to understand that urban designing is complex.

To hit this home even further, I then have students examine how two Olympics host cities, Paris and Los Angeles, have used the games to address real urban issues they face such as housing and transportation. From these little investigations students begin to see how urban design requires imagination and creativity.

After this we spent several days reading the speculative fiction “City of Choice” by Gu Shi. This short story is part of *The Climate Action Almanac* produced by the Center for Science and Imagination at Arizona State University (Figure 1). Each day we read several sections of the story where I posed questions for discussion and questions for a reflective journal. These questions amplify how urban design can address the climate crisis, particularly flooding that was prevalent throughout the story. We also discussed the role of artificial intelligence (AI) in urban design. AI plays a prevalent role in the story; the reader must grapple with its unintended consequences that have a serious impact on humans. The use of AI was particularly interesting for my students because they see in their own lives both its positive and negative impacts. Placed in a futuristic story that is not entirely too farfetched, we grappled with the role AI will play in future cities and our own humanity.



Figure 1: For this project we read “City of Choice.” There are several engaging stories in this almanac.

Part 2: Examining our Own City

In the second part of this unit, I have my students look closer to home and examine our own city planning documents (Figure 2). First students are asked to identify any city infrastructure or services that they use. We then use the city website to determine what divisions are responsible for these infrastructure or services. From there we examine zoning maps to understand how our city uses zoning ordinances to determine appropriate land use. We then review the city’s long range planning document, “Imagine Duluth 2035.” Students examine the five challenges the city faces as determined in the planning process. In groups students scrutinize various policies created to address these challenges and identify which ones they see as most valuable and viable. I then share

how in 2019 Duluth made headlines because a Harvard University climate adaptation expert identified Duluth as a “climate proof city.” According to several studies, Duluth is an ideal place to escape the impending climate crisis due to its location and geography. We then go back to the long-range planning document and speculate if Duluth is indeed ready for an influx of climate refugees/migrants—could our infrastructure and city services handle that many people? How can Duluth plan for this before it happens, if it happens? Finally, students are asked to identify the top three issues Duluth will face in the future. This is then used in Part 3.

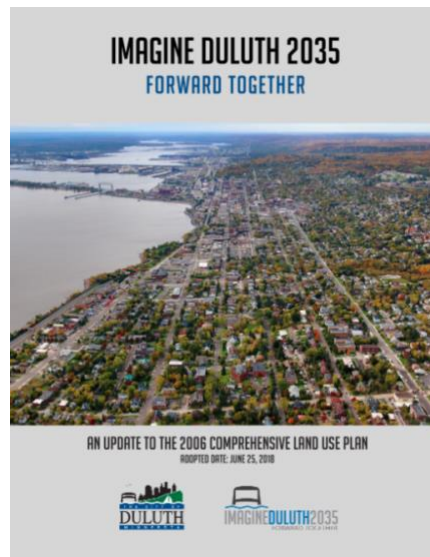


Figure 2: City of Duluth guiding document.

Part 3: Urban Design Simulation

The final part of this unit is lengthy: approximately 26 forty-minute class periods. From the students’ point of view, this is the most fun part. Because this is a gamified simulation, students are often confused in the beginning, but after the first few days they become fully immersed.

Throughout the school year students are given “10,000 extra credit points” slips for good deeds or answering trivia questions. Students do not know what these points are for but are told “you never know when you might need them.” The game begins with the appointment of the mayor of the city—the student with the most 10,000 extra credit points. Any 10,000 extra credit points students have collected becomes their political power for this game.

Each student is also given a citizen role. This is determined by the top three issues students identified in Part 2. For example, if a student identifies having green space as an issue they become “Cityzen Proggreen” or if they identify economics as an issue they become “Business, Industry & Tourism.” Each citizen-role has different political power. Students must then write development proposals from this citizen-role.

In order for each city to become viable, they must reach 50 points of development by the end of the simulation or their city will fail. Students are given a list of potential development projects with point values that range from one to five points. Five-point proposals are competitive. That is, only one city may adopt a five-point proposal and it will then serve the tri-city area. For example, an international airport is worth five points, and whatever city has the most votes for it wins it (votes are derived from the 10,000 extra credit points and points gained throughout the game). They are encouraged to not limit themselves to this list but be creative and use ideas from Parts 1 and 2 of the unit. In addition, cities are in competition for city certificates which will help them in the competition for future citizens during Cities on Parade. For example, if 50% (25 points) of their proposals are green focused, the city qualifies for a LEEDS certificate.

From here the mayor leads the city in the discussion of the city name and their goals for the future city. They then vote and adopt three goals which become the city’s prosperity plan (e.g., environment or public safety). Each goal area then becomes the mayor’s task force committees. Students are randomly assigned to the three committees. The task force committees then elect a chair and a slogan. Students then begin writing development proposals that they submit to the various task force committees for approval. When writing the proposals students must follow a specific format or they are at risk of not having their proposal passed.

The incentive to write strong proposals is two-fold: 1) to win the game and 2) get a good grade on their portfolio (see below). Here is where having a well-liked mayor also helps a city. I’ve had mayors push their citizens (students) to write more than the required two proposals to ensure they have more than enough proposals to get to the 50 points. Other mayors encourage their citizens to write specific proposals so that there are not several of the same kind (e.g., three students writing a proposal for a hydroelectric dam) and thus wasting time on determining which one is the best in task force committees. Once mayors also see what sort of certificates the city can gain, (based on passed proposals) they may persuade citizens to focus their efforts on proposals that can ensure that certification (e.g., Education Magnet certificate – write proposals focused on education and research). All citizens are required to submit two proposals to a

committee. No matter if their proposals are passed or not, all citizens must submit two for their individual grade.

The mayor hosts four task force committee meetings where the citizens lobby people with similar citizen roles and committee members prior to the meeting to pass their proposal (Figure 3). Once at the meeting, task force members read through proposals and determine if the proposal meets their particular prosperity goal (Figure 4). If they do, each member signs it, and the chair passes it onto the dictator (the teacher) who will review prior to giving it to the mayor.



Figure 3: Students lobbying.



Figure 4: Task force committee work.

Here is where the gamification incentivizes students to participate. If a citizen's proposal passes the committee and the dictator, they receive political power points. If the committee passes it, but the dictator finds spelling and grammatical errors and thus denies it, each committee member must then forfeit political power points. Never will you see middle schoolers so committed to examining for spelling and grammatical errors!

All passed proposals are then given to the mayor (Figure 5). From there the mayor determines what proposals they would like to put on the mayor's agenda for town hall meetings. The mayor hosts three town hall meetings where the citizen author must explain why they wrote the proposal and the task force committee chair must explain why the committee passed it. The mayor opens up the town hall for discussion. The dictator keeps track of citizen participation (which will be recorded for Cities on Parade boards). Students then vote on proposals using their personal political power. For example, a Cityzen Green citizen has two political power points. They then add these two points to any 10,000 extra credit points and any points gained throughout the game. Ballots have a very specific format and if citizens do not follow it, they become spoiled and their votes are not counted.

Returning to the gamification part of this simulation, if a citizen gets their proposal on the mayor's agenda they gain political power points. If it passes a town hall they gain political power points. If a task force committee gets a proposal passed in town hall, each member gains political power points. All these points add to their collective political power as a city. The more collective political power a city has, the more likely that city will acquire the competitive five-point proposals and get them closer to the 50-point total.

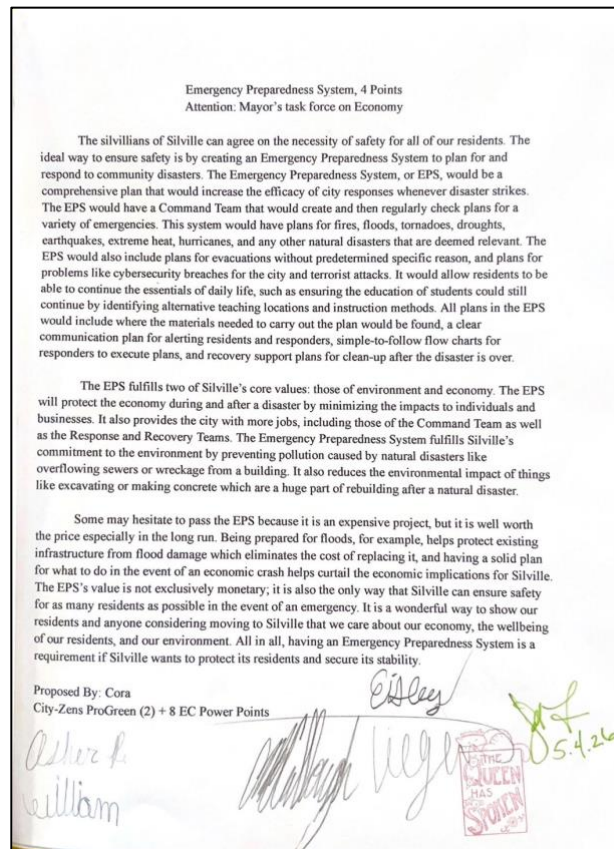


Figure 5: Citizen/Student proposal passed by Task Force on Economy.

Once the simulation is well underway, I then introduce "Development Days" whereby citizens can open small businesses and social service agencies. To open a small business a citizen must give me one political power point as capital and have their neighborhood design completed (see below). They are then given an index card where they create a business logo on one side and describe their business and how it will be good for their city on the back. Each citizen is given two "small business tips" that they can give to the businesses they like. Once a business owner gets three tips, they gain a political power point. Often students turn around and use this political power point to open another

business. To open a social service agency students must select from a list. They then must write one paragraph describing what the agency does and who it serves. In the second paragraph they identify similar agencies within the Duluth area or Minnesota and how people can access these services. Once a social service agency is established it serves the tri-city area (like five-point proposals) and the citizen author receives a political power point. Development Days last for eight class sessions to encourage competition.

No city is without its crime and we simulate this in the city as well. For a two-week period, middle school teachers issue citations for various “misdemeanors” such as left materials in a classroom gets a “littering” citation or if caught running in the hall they receive a “speeding” ticket. At the end of the two weeks, we host a “Council of the Elders” composed of the eighth-grade teachers. Offenders come in front of the Council to plead their case. Citizens are offered to complete 15 minutes of community service to clear their violation. Community service has a two-week period. The mayor keeps track of this crime rate and community service. Ultimately the crime rate is placed on the city boards. This is a fun period for teachers and students alike!

Throughout the simulation, each citizen is also responsible for their own citizen portfolio. The portfolio contains: 1) tracking of political power points; 2) neighborhood design (this is a zoning map to reinforce what they examined in Part Two); 3) two development proposals; 4) a current event analysis on urban issues (to reinforce what they examined in Parts One and Two); 5) minutes of a task force committee; 6) minutes of a town hall meeting; 7) a community ethos project (sculptures, city flags, city legends, etc.—these are used in the Cities on Parade portion of the simulation). Whenever the city is not hosting task force committee meetings or town halls, students work on their portfolios.

All this work culminates with “Cities on Parade” where the mayor and any other appointed citizens present their city to the eighth-grade class (Figure 6). To do this, each city is given a city board (History Day sized trifolds) where they place their city information, everything from proposals passed to crime rate to their city map. Students get very creative in this part of the project, adopting city colors, voting for community ethos projects, and of course because it is middle school, bringing in the obligatory string of lights.

In the presentations, mayors explain their city’s process in terms of how they developed the city the way they did. For example, a mayor may explain that because one of their prosperity goals was “environment” the mayor encouraged all citizens to write proposals with the environment in mind. As a result, they were then able to apply for environment

related certificates such as the LEEDs certificate. Mayors also explain how the competition impacted development. For example, if they lost out on a five-point development to another city, they would explain how they adjusted to meet the 50-point goal. Prior to the presentations, I meet with mayors and city planners to encourage them to identify both the strengths and weaknesses of their city, so they are ready for any questions. For example, a city can have all sorts of lovely futuristic, climate friendly projects, but what if the crime rate is high? I prod them to have answers ready for such questions

After the Cities on Parade presentations the city boards are placed in the main hallway where all adults in the school building are invited to sign the “welcome mat” to the city they would like to live in. Every year, I find my students near their boards during passing time encouraging school building personnel to sign up for their city. The city that receives the most signatures wins the game!



Figure 6: Mayors and city planners present their cities at Cities on Parade.

Going Forward

Much of the unit is about the process of creating a future city, particularly government processes where students propose infrastructure that have to go through several steps (task force committee, mayor’s agenda, town hall) to reach implementation. This is indeed the heart of the unit—it is not about the actual design so much as the process. This year a number of students pulled ideas from “City of Choice”—flood gates, elevated highways, use of renewable energy sources, etc.—which changed other

proposals put forward. In the future, I will place much more emphasis on how to pull ideas from the story and other green infrastructure to create more sustainable cities.

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Expanding Access in Special Education

A Reflective Analysis

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Abstract

Special Education teachers consistently balance high academic expectations with the responsibility to remove barriers that limit students' access to grade-level content. Students are also entitled to full participation in rigorous curriculum. This article details my work over the past two years to integrate Gemini, an Artificial Intelligence (AI) based tool, into my instructional practice. This reflection examines how intentional, teacher-guided AI use can strengthen independence, agency, and inclusion while supporting culturally responsive practice and democratic participation. In doing so, I argue that supporting my students' participation with AI is an ethical use of environmental resources.

Keywords

Special education, artificial intelligence, access, inclusion

Context

Special Education teachers consistently balance high academic expectations with the responsibility to remove barriers that limit students' access to grade-level content. Many of my students in grades eight through twelve read four or more grade levels below their enrolled grade, yet they are entitled to full participation in rigorous curriculum. Over the past two years, integrating Gemini, an Artificial Intelligence (AI) based tool, into my instructional practice has become a central method for supporting that participation without diluting content or lowering expectations.

My classroom includes diverse learners, including students from the Prairie Island Indigenous Nation, multilingual learners, and students with a range of learning disabilities. Each student brings cultural knowledge and strengths, yet many encounter persistent challenges in decoding, vocabulary, reading efficiency, and executive functioning. This reflection examines how intentional, teacher-guided AI use can strengthen independence, agency, and inclusion while supporting culturally responsive practice and democratic participation.

AI Environmental Impacts

Concerns about AI's environmental footprint, particularly water consumption, energy use, and carbon emissions, are increasingly present in public discourse. These concerns are valid, but they are often overstated or based on outdated information. Recent reporting, including Jasmine Sun's 2026 analysis in *The New York Times*, demonstrates that water use in AI systems has decreased substantially due to improved cooling technologies and regulatory pressure. As a result, the primary environmental impact of AI today is electricity consumption, not water.

In educational contexts, the scale of AI use is comparatively minimal. Classroom-level interactions with AI tools represent a low-impact application, similar to other digital accessibility supports. Teaching students about AI's environmental footprint also provides an opportunity to engage them in critical conversations about sustainability, ethics, and responsible technology use. All are essential components of education.

Research Connections

Current research on AI and learning disabilities aligns closely with the practices described below. Panjwani-Charania and Zhai (2024) identify seven categories of AI tools used to support students with learning disabilities, noting that most research focuses on

dyslexia and reading difficulties. Their review emphasizes that AI is most effective when paired with explicit instruction and high expectations.

Paglialunga and Melogno (2025) similarly highlight the importance of strong instructional design and caution against over-reliance on AI without teacher guidance. Broader reviews of AI in education identify systemic challenges—including teacher readiness, equity concerns, and data privacy—that must be addressed to ensure responsible implementation (Nguyen & Truong, 2025).

Research also suggests that students may use AI to avoid cognitive effort unless explicitly taught responsible strategies (McQuiston, 2025). This finding directly supports my instructional approach: AI lowers barriers, but students must still think.

Benefits of AI for Diverse Learners

My use of Gemini is grounded in the principle that AI should function as an accessibility scaffold rather than a replacement for cognitive effort. Like text-to-speech, graphic organizers, or sentence frames, Gemini adjusts the entry point to learning while preserving the academic destination. For students with decoding challenges, limited vocabulary, or reduced reading efficiency, Gemini can lower the Lexile level of complex texts while maintaining conceptual integrity. This enables meaningful engagement with grade-level assignments and increases participation in general education settings.

The integration of AI has also expanded student independence. Instead of relying on adults to modify materials, students can adapt content themselves in real time. This shift enhances dignity, agency, and confidence. Students who previously hesitated to participate now enter classrooms equipped with tools that support their learning needs.

In Practice: Instructional Routines

Introducing AI into a Special Education setting requires explicit instruction, modeling, and predictable routines. To ensure responsible and purposeful use, I teach a structured process that emphasizes clarity, accuracy, and student agency.

Students begin by identifying the specific task they need support with, such as lowering Lexile levels, generating outlines, organizing information, or clarifying vocabulary. We treat prompting as a literacy and metacognitive skill, practicing how to write precise, purposeful prompts. Once Gemini produces a document, students evaluate it for accuracy, completeness, bias, and voice, reinforcing the understanding that AI is a tool rather than an authority.

Students then revise, annotate, and expand the content so the final product reflects their own thinking. Instruction also includes discussions of academic honesty and transparent citation. These routines build executive functioning, self-advocacy, and critical digital literacy.

Community, Collaboration, and Democratic Practice

Preparing students for the digital age requires more than technical proficiency. Students must learn to question sources, recognize bias, and understand how information circulates. Many of my learners enter school feeling that academic spaces happen to them rather than with them. When AI lowers barriers to reading and writing, students can participate in classroom discourse, form opinions, and defend their ideas. This is inclusion in action: access not only to curriculum, but to participation, agency, and voice.

The insights gained from integrating AI into Special Education extend beyond my classroom. I share practical strategies with colleagues through brief demonstrations, conversations, and curriculum committee work. I am also preparing to participate in a family-facing event to help caregivers understand how AI supports access, confidence, and independence for diverse learners. Making this work visible strengthens trust and builds a shared understanding of inclusive practice.

Conclusion

While AI systems carry an environmental footprint, current evidence shows that these impacts, particularly water consumption, have decreased substantially due to advances in cooling technology and regulatory oversight. The primary environmental cost now lies in electricity use, a factor that must be acknowledged but contextualized within the scale of classroom-level implementation. When used intentionally, transparently, and with explicit instruction, AI in Special Education represents a low-impact, high-benefit application of emerging technology. Its ability to remove literacy barriers, strengthen executive functioning, and expand access to rigorous curriculum offers educational gains that far outweigh its comparatively modest environmental demands. In this way, responsible AI use not only supports equitable learning trajectories but also models sustainable, informed engagement with technology.

AI does not replace the relationships, scaffolding, or pedagogical expertise required in Special Education. Instead, when implemented intentionally, it enhances them. Gemini has become a tool that removes barriers rather than adding new ones, enabling students to access rigorous curriculum, build independence, and participate fully in general education settings. As educators continue to explore the role of AI in K–12 schools, it is

essential to center equity, cultural responsiveness, and student agency. This reflection demonstrates that when AI is used as a scaffold, not a substitute, it can transform learning trajectories for students with learning disabilities.

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Middle Grades

Connecting Science to Real Lives

Developing Empathy with Climate Stories

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Abstract

This article describes the development of empathy in 8th grade before students conduct interviews for a design thinking project on environmental sustainability. The goal of this lesson is for students to develop a better understanding of how people hold different views on climate change and their connections to the climate they live in. The use of the text *Unikkaaqatigiit: Arctic Weather and Climate Through the Eyes of Nunavut's Children* to demonstrate climate stories, as well as other texts, helps students be more prepared when entering into conversations with others about their needs in creating a sustainable society.

Keywords

empathy, climate stories, design thinking, interview, sustainability

Narrative Framing

Teaching Earth Science at a small independent school in Duluth, Minnesota, climate change is an integral part of my 8th grade course. Understanding climate science and how it is gathered, analyzed, and presented is important for both students and adults, as it helps dispel distrust in the scientific process. However, teaching climate science is like giving a 30,000-foot overview to this topic; its view is just too broad and overwhelming. Students need something tangible in order to feel like they can be a part of the change. I saw the need to create a human action-centered unit that would empower my students to see how they could make real change in our climate crisis. Over the years I sensed that my students were overwhelmed by what they were learning whenever we tackled environmental science topics. What follows is a description of a portion of this unit on how I developed empathy in my students using climate stories and interviews for a design thinking project on sustainability.

To bring this topic closer to my students, at a more 10,000-foot level, we began by discussing why there are different attitudes towards climate change. As we have been learning about climate science along the way, students wonder why some are still skeptical about the urgency of this issue. I also wanted to help them understand that some of the people they are going to talk to for this project have their viewpoints for a reason and to allay any concerns they may have about broaching this topic with them. So, at this point, I introduced my students to Yale's Program for Climate Communication's Global Warming's Six Americas (2025), which breaks down the different types of American attitudes on climate change. Students took the test themselves to see where they fall, and they discuss which category they think their family members might be. This prepared my students for the interview stage of the project and helps them empathize with their "users"—the people on which they focused their sustainability project.

Using Stanford's Institute for Design process for design thinking, empathy-building is one of the first steps in designing novel ways to solve a problem (Howard Plattner Institute, 2010, p. 2). Creating empathy for others' situations around climate change is a crucial step, as it helps us to see problems in a different light. Middle school students sometimes come into climate discussions with prejudgments on climate change, which can come out in the questions that they ask. Having an open mind and going in with genuine empathy is crucial for a productive interview (ibid). One way to do this is through engaging with first-hand accounts or stories. Connecting to fictional characters helps students absorb other people's perspectives while still holding onto their own

experiences. This broadens the student's worldview without them feeling threatened and shutting down their willingness to listen. (Abramson, 2021)

Part 1: Building Empathy Through Climate Stories

To ground this topic, I asked my students first write their own climate story, describing a place they enjoy using sensory details (Figure 1). My students really enjoyed this step and were eager to share their stories of life at the lake, time on the hockey rink, hikes in the Superior Hiking Trail. It was clear at this point that they were ready to step away from the science and wanted to make connections with others about the environment.

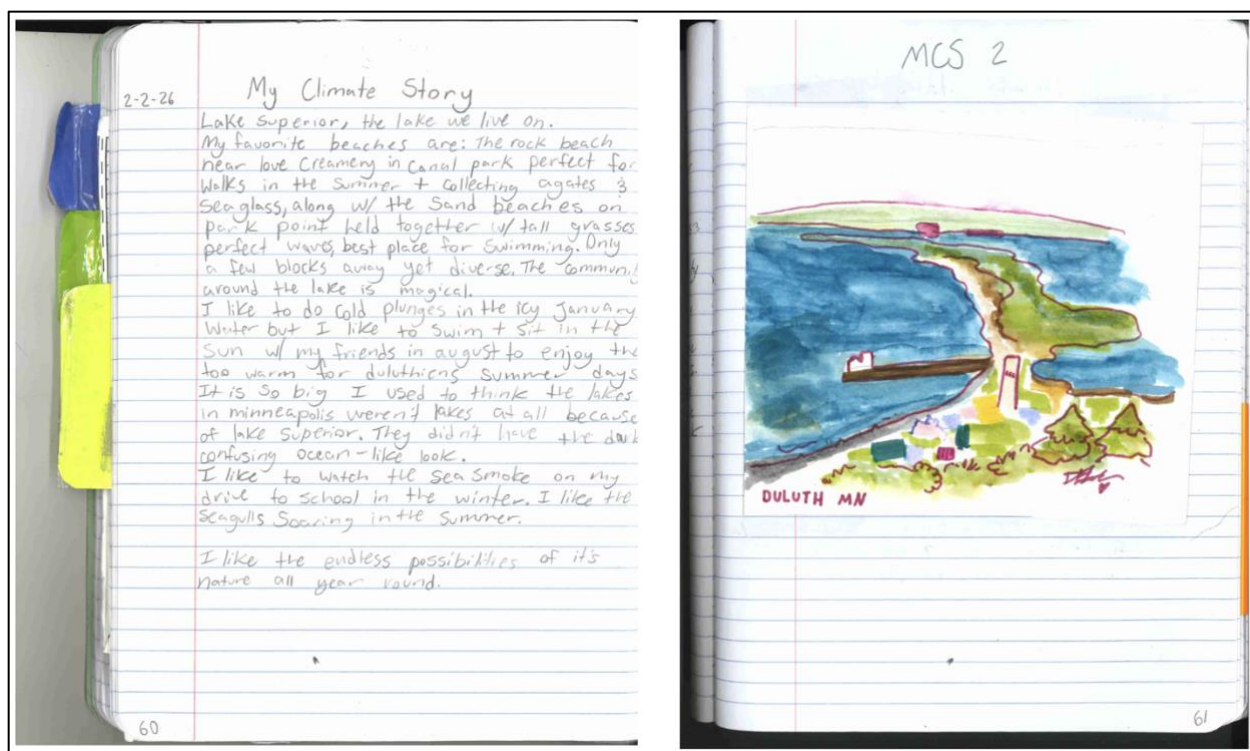


Figure 1: One student's climate story.

Next, we engaged with stories of the Inuit in Canada's Arctic. In the first book, *Unikkaaqatigiit: Arctic Weather and Climate Through the Eyes of Nunavut's Children*, we read first-hand accounts of Inuit life in the arctic from children and adults. Excerpts tell us about life in this area, shaping our understanding of how climate impacts culture: "The weather also affects our traditional clothing when they are made. When the women bleach the skins of a seal for women's kamik, they do this in April when the sun is not too hot to burn the leather" (Natcher, et al., 2013, p. 70). We discussed some of the ways of life for them, observing the pictures and language (text is in both native and English

text), comparing and contrasting to what we do in northern Minnesota. Additionally, we listened to interviews from elders about how life in the arctic has changed over the years due to climate change.

After engaging with the stories, I guided my students through questions after viewing the stories to help pull out possible “pain points” with the environment, or problems that are occurring. This was an important discussion, as it gave my students a sense of what kind of information we are looking for when they do their own interviews. I asked:

- What are some themes that you heard in these stories?
- What concerns did you hear/read?
- What kinds of motivations or goals do you think these people have for their lives?

At this point, I told students they would conduct their own interviews in the hopes of gathering climate stories and grounding our work with those around us. I required one parent and then someone who has a different viewpoint than the parent (going back to the Six Americas lesson) or someone with strong ties to the environment. They brainstormed questions in their groups (“Tell me about” or “Describe” as sentence starters), and I guided them to include these questions:

- Describe an outdoor place you feel most connected to.
- How has it changed over your lifetime? Please describe it to me.
- How does the environment where you live shape who you are or how you live?

We discussed the importance of asking “why” questions when interviewing, as it gets to the heart of the story, building empathy with the interviewee. With this list of questions, students were required to record the interview, take a picture with their interviewee, and submit a summary of what they learned.

Part 2: Define

In their sustainability groups, my students shared their interview stories. They recounted their experiences and the stories they gathered, and just like we did with *Unikkaaqatigiit*, helped each other identify the themes and pain points for each interview. They enjoyed talking with each other about what they learned from their interviewees and would have liked to continue for many more class periods talking about their experiences. This topic was now real to them. In reading through their reflections after the unit concluded, I was struck by the insight my students had about this point in the process (Figure 2).

What I learned from the stories is that the places had meaning to me and my interviewees. The places also changed over time or was affected in different ways. The stories always brought out the best in the place not the negative of it in the stories. Lastly the stories made the interview more interesting instead of just asking questions which brought up the mood.

When I was writing my climate story, I was thinking about how terrible it would be if my space was altered. I think that this is probably what helps create the empathy. Thinking about how terrible if your favorite place was altered, and realizing that someone else's is. My interviewees climate stories enforced this determination as well, I heard about someone else's favorite spot was being changed and that created an empathetic bond between us.

Figure 2: Screenshots from student reflections on the interview process.

Creating empathy through shared stories grounded the science in real life and helped my students during what is often the most challenging stage of design thinking: defining the users' needs (here, the interviewees) in order to bring clarity to the task at hand (Howard Plattner Institute, 2010, p. 3). They then created Need statements, which further clarified the problem, using the phrase, "how might we... so that.... ". For example: "How might we reduce the amount of trash Arctic animals get exposed to so that they don't get sick and die?"

Part 3: Ideate, Prototype, and the Summit

Connecting science and real-life experiences helped my students see that they could address climate problems, even if it was not about solving all of climate change. Several activities helped my students understand the design process: a rapid-fire brainstorming session for each Need statement, developing prototypes, and writing presentations of what they believed were novel solutions to an individual environmental concern.

As a result, my students came up with some novel solutions to help combat climate change and its impacts. This process helps them feel invested in being part of the solution to our current environmental challenges. The Sustainability Summit at the end of the unit was a success and inspirational. Parents, teachers, and students came to hear the pitches of their solutions, voting on which one they would "invest" in (Figure 3).

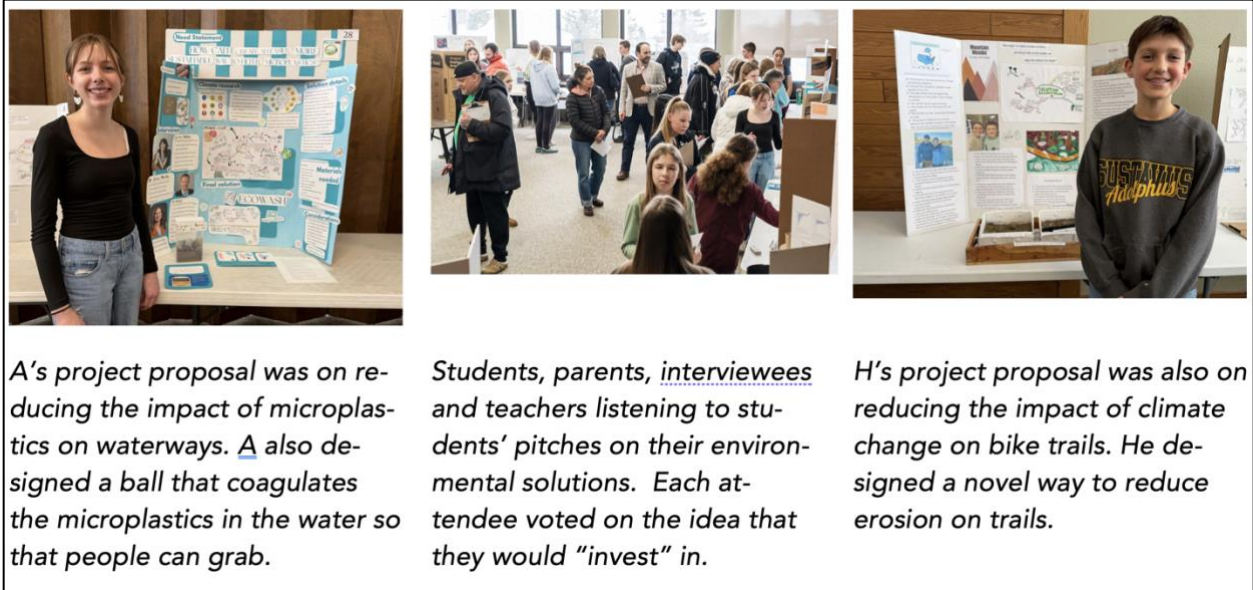


Figure 3: Photos from the Sustainability Summit

The Summit was an exciting time for my students to showcase their hard work and understanding of all the layers of knowledge it takes to make a climate solution a realistic one that addresses both a person's needs and that of the environment. They were able to communicate their knowledge to the public of the climate challenges that face us and the humans behind it. Creating empathy through climate stories was key for making this happen (Figure 4).

This project changed by thinking by making me feel more connected to nature. This is because I got to hear stories from many different people about how nature affects them. This could be the stories that caused my peers to come up with their solution, or my interviewees climate stories. These made me realize how much nature impacts people, making me realize how important it is and making myself appreciate it more.

This challenged my thinking because it forced me to think differently. This helped me create solutions that weren't only for myself, but for others to. It made me think about what is ethical. It also made me think about what is sustainable and what problems were bigger than others.

Figure 4: Screenshots of student reflections on the project.

At a Glance

Title	Connecting Science to Real Lives: Developing Empathy with Climate Stories
Unit Time	approx. 4 hours plus student-conducted
Grade Level(s)	8th grade
Core Text	<i>Unikkaaqatigiit: Arctic Weather and Climate Through the Eyes of Nunavut's Children</i> by Neil Christopher, David Natcher, and Mary Ellen Thomas (Eds)
Supporting Texts	• Inupiat Elder Delano Barr Talks about Climate Change in Shismaref, Alaska, 2019 (YouTube) • Subsistence, a Way of Life: How Climate Change Is Affecting Alaskan Traditions (website)
Climate Literacy Terms	climate change, solutions, climate stories
Objectives	Students will build empathy for others' individual experiences with the environment and climate. They will use this empathetic foundation to create a sustainable solution for the environmental needs of their "users" in a design thinking project.
Materials and Resources	• Climate Action and Sustainability Slide Show • Building Climate Empathy Slide Show

Going Forward

The types of need statements that my students initially came up with made me realize that I needed to guide them to ask about more day-to-day concerns. Need statements such as "Ms. F needs a way to clean the air so that she can canoe with her baby when there is wildfire smoke in the air" or "Mom needs a way to keep the temperature cool so the glaciers don't melt" were too broad and overwhelming. It was as though my students were going back to the 30,000-foot level of climate change with climate science and not empathizing with individual experiences with the topic. This may also be due to the high-level way adults often view this issue, so creating questions about their day-to-

day interactions with the climate rather than “climate change” may be a more effective way moving forward.

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A Case for Environmental Health in the Health Classroom

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Abstract

The real-world impact of the climate crisis on our students' physical and mental health makes climate health a critical topic for health programs to address. However, due to the amount of content already mandated in Minnesota's health curriculum, teachers should look to interweave climate health topics into established lessons instead of incorporating them as a new, standalone unit. This article provides ideas on how to incorporate climate literacy into the health classroom.

Keywords

Climate crisis, climate literacy, environmental health, wellness, mental health, nutrition

There's a heatwave and wildfire smoke has engulfed our area. It burns my throat to be outside and it hurts my eyes. Everything is hazy. I think of my friend and her two little kids with no air conditioning. My house is messy, which stresses me out, but I invite them over for the day anyway. Children are especially vulnerable to the respiratory effects of increasing temperatures (Bignier, et al. 2024) adults face an increased heart attack risk in high temperatures (LeWine, 2026). This is a true scenario and also one I'll use in my classroom as we discuss the many levels of "environment" impacting our health. In this paper I explain how I incorporate climate literacy into my health classroom. In the scenario I just described, students can discuss impacts on physical health, mental health, social health, and environmental health. They can use the scenario to think through their own experience of the heat wave and reflect on the decisions they made or use it as a jumping off point for an advocacy project.

The climate crisis has an impact on student health, but do we have time to give it a place in a health classroom? The amount of content health teachers are required to cover in class makes incorporating new material, such as climate health, challenging. In Minnesota, health is legislated more than any other subject area. Not only do we have state standards to implement (MN Statute 120B.021), but state legislation requires health teachers to teach the following:

- Cardiopulmonary Resuscitation and how to use Automated External Defibrillators (MN Statute 120B.236)
- Sexually transmitted infections (MN Statute 121A.23) and sexual abuse prevention (MN Statute 120B.021 Subd. 1(c))
- Mental health and suicide prevention (MN Statute 120B.21)
- Vaping prevention (MN Statute 120B.21)
- Cannabis and fentanyl awareness (MN Statute 120B.215)

All of this and more (as indicated by the state standards) needs to be taught in just two semesters of health—one in middle school and one in high school (MN Statute 120B.024). Every lost class period due to field trips, snow days, etc., is one less day teachers have to teach crucial content, such as learning about birth control or how to recognize the signs of opioid overdose. Due to these schedule constraints and the established curriculum requirements, it would be hard for teachers to add climate literacy as a new unit. In light of these challenges, a more effective approach to climate literacy instruction is to weave it into already existing curricula.

There are several opportunities for teachers to incorporate climate literacy into their curricula. The easiest way is to include it through the Wellness Wheel. The Wellness Wheel is a content unit many health teachers teach at the beginning of their classes, which sets up a framework for holistic health. The goal of the Wellness Wheel unit is to encourage students to think beyond physical health and more about integrating the areas of their lives that contribute to their health. As a part of this framework—whether a teacher teaches six, eight, ten, or more dimensions of health—environmental health is usually one of those dimensions. Environmental health is summed up simply by Project School Wellness (n.d.) as “My Surroundings.”

In my class, we dedicate an entire class period to thinking through environmental health, which helps us also think through the skill of practicing healthy behaviors because we think in terms of what we can and cannot control. We talk about it in terms of students’ immediate surroundings, like their bedroom, and scale it up to their city, their state, their country, and the world. When we talk about environmental health, we ask ourselves: what is within our control? We read a story about Mae, who cannot control the fact that she has moved away from her gardens to the city, but eventually finds a way to exert some control over her environment by using pots to create an urban community garden (Florette, 2018). We look at artwork by Joan de Art and take time to imagine and illustrate our own idealistic future spaces.

So much of our class is discussion-based. One way I facilitate the discussion is through hexagonal dialogues, a strategy I found from the blog Slow Chat Health by Andrew Milne (2020) and Edutopia (2020). I have eight basic hexagons printed and laminated with each dimension of wellness (Figure 1). For the environmental health lesson, I also have 16 hexagons printed with images and text from the book *Florette*. Students discuss the book and its connections with the Wellness Wheel by puzzling together the hexagonal pieces. Each touching piece must have a reason for touching and each piece must be used. There is no right final configuration and students can then learn from other groups as to why they made the connections they made. The easiest way to incorporate Climate Literacy into the rest of the semester is to add a hexagonal discussion, including an environmental health hexagon, to every unit. First aid? Come up with a list of 20 first aid-related terms and throw in the Wellness Wheel hexagons. Mental health? Same. Nutrition? Same. That one simple hexagon and a routine of practicing hexagonal discussions is a way to pull climate through the rest of the course.

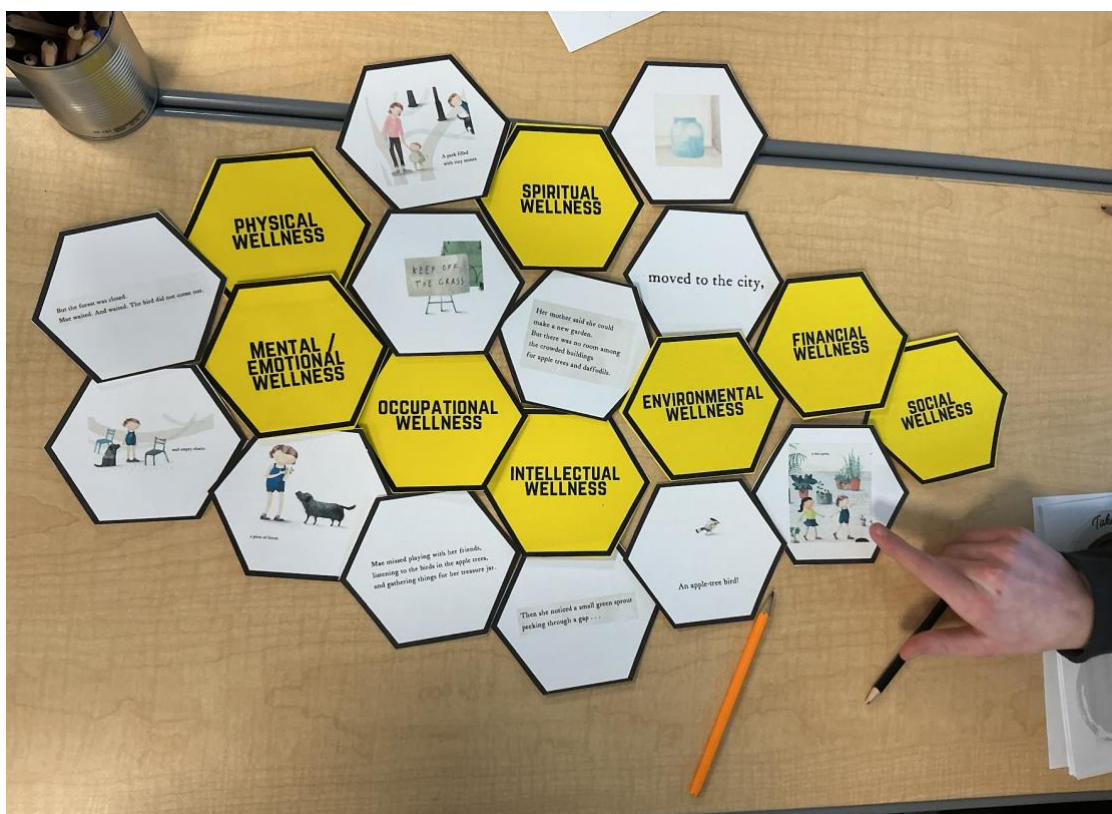


Figure 1: Example of hexagonal discussion

Mental health is an easy, content-based unit to infuse with climate literacy. Students today are anxious about the climate crisis; this climate anxiety is felt by many students throughout the world, as noted in *The Lancet* (Hickman et al., 2021). In a survey of 10,000 adolescents across ten countries, including the United States, the majority of respondents said they were either worried about the climate crisis (84%) or very or extremely worried (59%) and that it affected their daily functioning (45%) (Hickman et. al 2021). Therefore, it makes sense that we would address the climate within a mental health unit. In our classroom, we address climate anxiety during our lesson on identifying emotions. We learn about the importance of labeling feelings—the "name it to tame it" principle (Siegel & Bryson, 2011)—and discuss how we can feel many different emotions about a single topic. This serves as our entrance into discussing climate emotions. We watch the video "Gen Z Climate Stories" (Climate Mental Health Network, n.d.-a), in which young adults talk about their climate anxiety as well as the actions they take to feel hopeful. In the video, we see a range of feelings, including positive emotions like hope. We then use the framework from the Climate Emotions Wheel (Climate Mental Health Network, n.d.-b) to illustrate how we are feeling multiple, simultaneous emotions surrounding the climate crisis.

Nutrition is another opportunity to weave climate literacy into the health classroom. Our food systems are being impacted by the climate crisis (Mirzabaev et al, 2023). In my nutrition unit, we learn about the nutrients and the importance of eating nutrient-dense foods, and then we work through the SHAPE America health skills. When practicing decision-making, we look into how people choose their diets; this is a great opportunity to discuss food accessibility, food transportation, seasonal eating, and eating for planetary health. These themes also come into play when analyzing influences on what we eat. When practicing advocacy skills, many of these themes come up again as I provide students with a range of articles and videos to choose from as a base for their advocacy. Recently, my most popular topic in the work advocacy work collected by students is the idea that we should be eating more insects. According to the TED ed video they've chosen, insects can be farmed on a much smaller scale than cattle, so even though you'd need to eat a lot of them, their carbon footprint per pound is very small (Bryce, 2015). Students are able to complete this advocacy work in a single class period. If there is time or a substitute teacher, students watch the documentary, "The Optimist's Guide to the Planet: Nourish" (Bloomberg & Coster-Waldau, 2024).

Using climate literacy as a lens through which we study Health or treating it as a layer of an everyday lesson, has been an effective way to incorporate climate literacy into my Health classroom without losing time for other important topics. To support other Health educators in doing so, I share three curricular supplements (with links to relevant resources) in the appendices to this article.

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Appendix I: Mental Health Identifying Emotions Supplement: Climate Emotions

Overview

This is a chunk of a lesson on identifying emotions. The work prior to this activity drew on resources like *Heads Up: Changing Minds on Mental Health* by Melanie Siebert (2020) and the [How Would You Feel? scenarios](#) from Be Good People to establish the why and how of identifying emotions. This supplement supports students in understanding that they can feel many emotions at the same time and answers questions as to what to do with the emotions they are feeling. The supplement is based on resources from the Climate Mental Health Network.

Students watch the movie “Gen Z Mental Health: Climate Stories.” As they watch the short film, they track the emotions they see on a Mood Meter; my students continue their work with the Mood Meter from Be Good People, but you could also use the Climate Emotions Wheel from the Climate Mental Health Network. The movie is followed by group discussion and personal reflection on climate emotions.

At a Glance

Unit Time	20 minutes
Grade Level(s)	6-8
Core Text	<i>Gen Z Mental Health: Climate Stories</i> (Link)
Supporting Texts	<i>Climate Emotions Wheel</i>
Objectives	Students will: • Identify emotions and how they can change throughout the day and over time • How being aware of your feelings influences behavior and vice versa • How expression of your feelings helps/hurts oneself/others • Healthy/unhealthy ways to manage unwanted emotions like: anger, stress, anxiety, frustration, disappointment, sadness

	Standards: • 1.8.4 Analyze practices and behaviors that support health and well-being, including how to manage health conditions. • 7.8.2 Analyze practices and behaviors that support personal health and well-being.
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Lesson Sequence

- Before watching the video, ask students to reflect on topics that bring up a variety of emotions. Emphasize that some situations can elicit a variety of emotions.
- Before watching the video, assign each student a different person featured in the video to focus on. In each discussion group after the video, the students should have tracked different people. Let them know they will be responsible for being the expert on their person.
- As students watch the movie, ask them to mark the emotions they hear the person they are assigned to expressing on their mood meters using BINGO chips. If you would like to have students take notes, that is an additional option.
- After the movie, facilitate discussion about the emotions that were shared. The discussion may be supported by using RMC Health's [sentence frames](#).
 - How did climate change influence the emotions of the people in the video? Share the emotions your person expressed in the video.
 - Is climate change an internal or external influence on their emotions?
 - What did your person do because of their climate emotions? How did being aware of their emotions help themselves and others?
 - How did acting change the emotions for the person you tracked?
 - How do you think your person is affecting the future due to their actions?
 - Can adverse emotions affect positive change?
- After the movie discussion, give students time to think about their own climate emotions. Share the Climate Emotions Wheel and encourage students to [illustrate or journal](#) their emotions for each section of the wheel.

Go Further

This activity is simply a supplement to a broader lesson on identifying emotions for Health teachers who are strapped on time. If you have more time to dig into climate emotions, there are additional lesson plans from [Subject to Climate](#).

Appendix II: Wellness Wheel Environmental Health Supplement: Joan de Art

Overview

Students will take time to look through solarpunk art created by the artist Joan de Art. Students will then reimagine a space of their choice for a better future.

At a Glance

Unit Time	15-20 minutes
Grade Level(s)	6-8
Core Text	Solarpunk artwork from Joan de Art
Supporting Texts	Instagram Account: @joan_de_art
Objectives	SHAPE America Standards: 1.8.6 Analyze how individual, interpersonal, community, and environmental factors impact health and well-being.
Materials and Resources	Printed color solarpunk images from Joan de Art Paper Colored pencils

Lesson Sequence

- Provide each group with a different printed solarpunk art piece by Joan de Art
- Facilitate discussion:
 - What is your favorite part of the image?
 - How is this space similar or different from one you already have access to?
 - What would it be like to have access to this space?
 - How would this space affect your health?
 - How would this space affect community health?
 - What do you think is doable in this image?
- Every two minutes, have students pass their artwork to the next table so that they can discuss each piece of artwork.
- Provide students time and resources to imagine their own future spaces. Students will pick a space that is a part of their world and update it to make it ideal for individual and community health.

Appendix III: Wellness Wheel Environmental Health Supplement: *Florette*

Overview

Students will read the *Florette* by Anna Walker. Students will then engage in a hexagonal discussion connecting *Florette* to the dimensions of Wellness.

At a Glance

Unit Time	20 minutes
Grade Level(s)	6-8
Core Text	<i>Florette</i> By Anna Walker (YouTube)
Objectives	Students will know that they have some agency over their environments.
Materials and Resources	<i>Florette</i> Table Discussion guide (link) Hexagonal discussion tiles for <i>Florette</i> (link)

Lesson Sequence

- Read *Florette*, by Anna Walker
- In groups students discuss:
 - Retell the story as a group
 - What was out of Mae's control?
 - What was in Mae's control?
 - What barriers did Mae face?
 - How did Mae show resilience?
 - How did Mae's garden improve her own health?
 - How did Mae's garden improve her community?
 - What are some possible next steps for Mae? (Example: she could get permission to plant a garden in her community park.)
- Students will then work with hexagon tiles to connect *Florette* to the dimensions of health.
- Gallery walk: Students will choose one group member to stay behind to explain the hexagonal tiles. The rest of the group will complete a gallery walk to see how other groups connected their hexagons. Option to have students create a video submission explaining their hexagon maps.

When We Care for the Earth, The Earth Cares for Us

Exploring Reciprocity and Responsibility through Story

Kayla Maas, Cass Lake-Bena Middle School, Cass Lake, MN, USA

Abstract

This five-day unit is designed to help students see the important connection between people and the Earth. The idea that when we care for the planet, it, in turn, cares for us. Using *The Giving Tree* by Shel Silverstein and *The Apple Tree* by Sandy Tharp-Thee, students explore how our choices affect the world around us and the ways that giving and receiving can exist in balance. We start the week by building background knowledge about how the Earth provides for us every day with clean air, water, food, and beauty, and our responsibility to care for it in return. Students analyze the two stories: *The Giving Tree* shows what happens when we only take, while *The Apple Tree* demonstrates what happens when we nurture and care for something over time. Through discussion, journaling, and reflection, students begin to see themselves as part of a circle of care, capable of making small actions that truly matter.

Keywords

Sustainability, reciprocity, trees, close reading, compare and contrast

Overview

The unit uses *The Giving Tree* by Shel Silverstein and *The Apple Tree* by Sandy Tharp-Thee as anchor texts for comparing relationships between humans and nature. Students begin by activating background knowledge about how the Earth provides for us and how our choices impact the environment. Through close reading, text comparison, discussion, and written reflection, students analyze themes of reciprocity and responsibility.

The unit concludes with students demonstrating understanding by expressing appreciation and outlining specific actions they can take to care for the planet with a class Earth Pledge. This unit integrates reading, writing, and reflection while supporting Minnesota 7th grade ELA standards

7th Grade Minnesota ELA Standards Addressed

- **7.1.2.2** – Determine the theme of a text and analyze its development; provide an objective summary.
- **7.1.3.3** – Analyze how elements of a story interact (like how setting shapes characters or plot).
- **7.1.7.7** – Compare and contrast a text with another in terms of theme, approach, or topic.
- **7.6.2.2** – Write informative/explanatory texts that examine a topic and convey ideas clearly.
- **7.9.1.1** – Draw evidence from texts to support analysis, reflection, and research.

Narrative Framing

The Giving Tree introduces the idea of imbalance. In this story, the boy continually takes from the tree until she has nothing left to give. It mirrors how humans sometimes use Earth's resources without thinking about giving back. Later, *The Apple Tree* by Sandy Tharp-Thee offers a contrasting example. Where the boy cares for the tree, nurturing it from seed to maturity. This second story invites students to imagine what a balanced, respectful relationship with nature can look like.

As the unit unfolds, students move from awareness to reflection. They discuss, write, and make personal connections to how their choices affect the world around them. By the end of the week, they will make a personal promise to care for the earth. The narrative framing centers on a simple but powerful message: When we care for the Earth, the Earth cares for us.

At a Glance

Title	When We Care for the Earth, The Earth Cares for Us
Unit Time	42 minute class period x1 67 minute class period x4
Grade Level(s)	7th grade ELA
Core Text	<i>The Giving Tree</i> by Shel Silverstein <i>The Apple Tree</i> by Sandy Thrap-Thee
Climate Literacy Terms	Reciprocity – The idea of mutual exchange or balance; when humans care for the Earth, the Earth provides care and resources in return. Sustainability – Using resources in a way that meets present needs without compromising the ability of future generations to meet theirs.
Objectives	• Understand the concept of reciprocity and how it relates to the relationship between humans and the Earth. • Identify and explain the central themes in <i>The Giving Tree</i> and <i>The Apple Tree</i>. • Recognize the consequences of taking from nature without giving back. • Analyze how characters' actions and choices affect both people and the environment. • Cite textual evidence to support ideas during discussions and written responses. • Express understanding through reflective and creative writing that demonstrates personal connection and accountability.
Materials and Resources	Climate Lit Unit Climate Lit Unit Materials Day 1 Climate Lit Unit Materials Day 2 Climate Lit Unit Materials Day 3 Climate Lit Unit Materials Day 4

Going Forward

My hope is that students leave this unit thinking differently about their relationship with the Earth. Too often, environmental topics can feel overwhelming or make students feel like there is nothing they can do to make a difference. This unit intentionally focuses on the opposite message: small actions matter.

Through reading, discussion, and reflection, students explore the idea that caring for the Earth is not about being perfect. It is about recognizing that we are part of a relationship. The Earth provides us with clean water, food, air, beauty, and places to gather and play. In return, we have a responsibility to care for it in ways both big and small.

The Earth Pledge created at the end of the unit is meant to help students identify realistic actions they can take in their own lives. Whether that means picking up litter, planting something, conserving resources, spending more time outdoors, or encouraging others to care for the environment, each action contributes to a larger culture of stewardship and respect.

As students continue beyond this lesson, I hope they carry with them the understanding that caring for the Earth is not a one-time project or assignment. It is an ongoing practice of gratitude, responsibility, and reciprocity. When we care for the Earth, the Earth cares for us. By helping students see themselves as capable of making a difference, we empower them to become thoughtful community members and future leaders who understand that even small acts of care can create meaningful change.

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Ayni

Sofía Mulholland Cerkenik, Highland Park Middle School, Saint Paul, Minnesota, USA

Artist Statement

This project is a multimedia collage to explore sources of climate education and community strength beyond the classroom walls. The collage uses interview recordings, videos, photos, and text to explore the Quechua concept of *ayni*, a deeply valued practice of community reciprocity: today for you, tomorrow for me. The setting of this learning is the high Andes in Perú and is facilitated by the Sinkumunchis Foundations. The Foundation is a non-profit that hosts soccer schools and programs in rural communities with the intention to develop children through sport while honoring their community and cultural heritage. The soccer schools work with the players in Spanish and Quechua. In 2024, on my second research trip to the Sinkumunchis Foundation, I sat down with three of its leaders: Gonzalo Garcia (Founder), Diego Garcia (Founder), and Lucero Totocayo (Data Intern and Coach). We discussed ways that sport and movement can be used as a vehicle for social, academic, and emotional wellbeing. We looked at ways mindfulness and movement can contribute to positive development for students and communities. We shared educational experiences we had grown up with outside of the classroom. At that time, I was researching ways that classroom teachers like me could implement sports education strategies in our curriculum. What I was taught was the concept of *ayni*. I learned the word during our interviews then was able to immediately understand it in practice—we spent the day taking care of the fields that one of the soccer player's family uses to farm. Controlled burns have been practiced by Indigenous communities in the Americas for thousands of years.

Climate justice work requires a strong community and does not stand apart from other social movements. Climate justice education can take place anywhere because nature is everywhere- we are all parts of nature and I was reminded of that. Not only can sports be a tool for physical health, emotional wellness, and academic wellbeing: Sinkumunchis has demonstrated that sports can also be a source of community and climate education.

Declaración de artista

Este proyecto es un collage multimedia que explora las fuentes de educación climática y la fortaleza comunitaria más allá de las aulas. El collage utiliza grabaciones de entrevistas, videos, fotos y texto para explorar el concepto quechua de ayni, una práctica profundamente valorada de reciprocidad comunitaria: hoy por ti, mañana por mí. El contexto de este aprendizaje son los altos Andes en el Perú y es facilitado por la Fundación Sinkumunchis. La Fundación es una organización sin fines de lucro que promueve escuelas y programas de fútbol en comunidades rurales con la intención de desarrollar a los estudiantes a través del deporte, honrando al mismo tiempo su comunidad y patrimonio cultural. Las escuelas de fútbol trabajan con los jugadores en español y quechua. En 2024, en mi segundo viaje de investigación a la Fundación Sinkumunchis, reuní con tres de sus líderes: Gonzalo García (Fundador), Diego García (Fundador) y Lucero Totocayo (Datos y Entrenadora). Discutimos cómo el deporte y el movimiento pueden ser un vehículo para el bienestar social, académico y emocional. Analizamos cómo el mindfulness y el movimiento pueden contribuir al desarrollo positivo de los estudiantes y las comunidades. Compartimos experiencias educativas con las que habíamos crecido fuera del aula. En aquel entonces, investigaba cómo los docentes, como yo, podíamos implementar estrategias de educación deportiva en nuestro currículo. Aprendí el concepto de ayni. Conocí la palabra durante las entrevistas y la comprendí de inmediato en la práctica: pasamos el día cuidando la chacra que la familia de uno de los jugadores de fútbol utiliza para cultivar. Las comunidades indígenas de las Américas han practicado quemadas controladas por miles de años.

El trabajo por la justicia climática requiere una comunidad fuerte y no está aislado de otros movimientos sociales. La educación sobre justicia climática puede tener lugar en cualquier sitio porque la naturaleza está en todas partes; todos somos parte de ella, y eso me lo recordó. El deporte no solo puede ser una herramienta para la salud física, el bienestar emocional y el rendimiento académico: Sinkumunchis ha demostrado que también puede ser una fuente de educación comunitaria y climática.

Keywords

Traditional ecological knowledge, sports education, reciprocity, documentary

Palabras clave

Conocimiento ecológico tradicional, educación deportiva, reciprocidad, documental

Documentary



Access the full documentary by clicking the image above or by visiting <https://youtu.be/I9fl4HNEVFA>.

Climate literacy education and advocacy for climate justice can and should transcend the classroom walls. Follow Sofía Mulholland Cerkenik as she learns with and from the Sinkumunchis Foundation: an organization in the high Andes that uses soccer as a tool for social change, mental and physical wellbeing, and education. Here we have an example of how climate justice work requires a strong community and does not stand apart from other social movements. Climate justice education can take place anywhere because nature is everywhere. How can we be intersectional and intentional with climate literacy education?

La educación en alfabetización climática y la defensa de la justicia climática pueden y deben trascender las aulas. Acompaña a Sofía Mulholland Cerkenik en su aprendizaje con y de la Fundación Sinkumunchis: una organización en las regiones altoandinas que utiliza el fútbol como herramienta para el cambio social, el bienestar físico y mental, y la educación. Aquí tenemos un ejemplo de cómo el trabajo por la justicia climática requiere una comunidad fuerte y no está aislado de otros movimientos sociales. La educación en justicia climática puede tener lugar en cualquier sitio porque la naturaleza está en todas partes. ¿Cómo podemos abordar la educación en alfabetización climática de manera interseccional e intencional?

Connecting Math and Climate Justice

Erica Pierce, Osseo Middle School, Maple Grove, MN, USA

Abstract

This three-day unit explores the connection between mathematics, science, and climate justice through a study of water systems in Minnesota. Because the climate crisis is not explicitly included in the Minnesota math standards, the unit is designed to help students connect mathematical thinking to real-world environmental issues. Students begin with a gallery walk and an introduction to *We Are Water Protectors*, generating questions and building prior knowledge, and then analyze competing perspectives on pipelines and examine water quality, river systems, and data on human and environmental impacts. In the final lesson, students explore Earth's water distribution and Indigenous knowledge through the work of water protector Sharon Day, reflecting on stewardship and justice. While engagement was strong, reflection revealed a need for a more intentional foundation of climate empathy and personal connection, as well as more explicit and intentional connections to mathematical thinking and computation, both of which will be integrated into future iterations of the unit.

Keywords

Water, pollution, pipelines, climate justice

Overview

Teaching math at a large suburban middle school in Maple Grove, I am aware that the climate crisis is not included in the curriculum or the Minnesota math standards. As a result, math is often treated as a standalone subject, disconnected from other areas of learning. Many students struggle to see its relevance in their daily lives and frequently ask, “Why do we need to know this?” While math builds critical thinking and problem-solving skills, my role is also to help students make meaningful connections between math and the world around them, including creating opportunities for students to apply mathematical thinking to local and global climate issues, helping them understand inequities, and consider their role in promoting environmental responsibility and justice.

To begin this three-day unit, students participated in a gallery walk to preview key concepts by examining photographs and graphs from the presentation slides. Students then listened to a read aloud of *We Are Water Protectors* by Carole Lindstrom and analyzed information about oil pipelines using both supportive and opposing sources. Throughout the unit, students explored water quality in Minnesota, examined the distribution of water on Earth, and learned about an Indigenous climate justice advocate. Students engaged in meaningful discussions to deepen their understanding and reflected on their learning by considering the question, “What now?”

Instructional Sequence

Day 1: Preview Gallery Walk and Read Aloud

To begin the unit, students were given their handout packet (Figure 1) and instructed to complete the gallery walk. Students viewed each of the eight slides posted around the room and completed the “what I think” and “what I wonder” sections corresponding to each image. Images included different types of graphs, maps, and photos. At each station, students were asked to read and interpret the data quantitatively before recording their responses — identifying the scale, axes, and units of measurement on each graph or map, and extracting specific values to support their observations (for example, “What percent of...”, “How many more... than...”, or “What is the difference between...”). Students moved freely around the gallery, spending as much time as they needed at each station.

What I think:	What I now know:
What I wonder:	So what now?:

Studies indicate that 97% of climate scientists say climate change is happening and human-caused

58% of the American public thinks climate change is happening and human-caused

Figure 10.

Figure 1: Page from the student handout

Next, students discussed what they saw with their table groups, each sharing their biggest wonder. Then, volunteers shared their own big wonder or one that they heard from their group. Some examples were:

- Why is one side of the river brown?
- What is a water walk?
- How does water quality affect swimming and fish?
- How do humans cause the climate crisis?
- How do people not know about the climate crisis?
- Why do we need to know this in math?
- Why is there so little freshwater?

After discussing their observations and questions, I introduced *We Are Water Protectors* by reading the jacket description aloud. Students then watched and listened to an online read-aloud of the book. Following this, they used their gallery walk notes to complete the “What I Now Know” section. Students independently completed a story reflection page in their packet and then shared their responses in small groups. To conclude, we engaged in a whole-class discussion around the question “What now?” and students recorded their final reflections.

Day 2: Pipelines and Water in Minnesota

I began the lesson by asking students what they already knew about pipelines to activate prior knowledge, and how pipelines were represented in *We Are Water Protectors*. I then guided students through reading two informational excerpts from *Energy for Progress* (2021). I clicked the linked graphic, which revealed that this organization was “brought to you by the American Petroleum Institute” (n.p.) Before we reviewed the section on safety, I asked students to predict how the American Petroleum Institute might respond to questions about pipeline safety. Finally, we read and discussed how this organization answers the question of pipeline safety, helping students consider how the source influenced the information presented.

We continued by viewing a map of all of the pipelines in the United States and exploring the Earth Justice website. I navigated to the “Our Work” and “How We Work” sections to help students understand the organization’s goals and perspective (Earth Justice, 2021). I then asked students how Earth Justice might respond to the question, “Are pipelines safe?” Before revealing the information, I prompted students to make predictions based on what they had learned about the organization. I then revealed the information and read each note about pipeline safety to the class. Finally, I asked students to reflect on why the two organizations presented different answers, encouraging them to consider how perspective and purpose influence information.

Next, I asked students if they remembered a photo from their first CER in science and whether they would swim in the water. Students first shared one reason at their tables why they would or would not swim. Then we examined the next slide together and discussed what they noticed about the Mississippi River in Minnesota, including where the Minnesota River and the St. Croix River meet the Mississippi River (Seitz, 2021). Students turned to their notes to record observations as I showed a video of the rivers flowing together and read information about how sediment from the Minnesota River is shaped by agricultural land and eroding glacial soils, which affects downstream water clarity.

We then analyzed a map and discussed patterns in water quality, including connections between sediment flow and land use. Students considered whether water quality in Minnesota has changed over the past 11 years and why water issues can become political (Dunbar, 2019; Friends of the Mississippi, 2025). Students then explored water quality in Minnesota using an interactive map with a legend showing conditions, and we zoomed in on our local area to observe patterns (Minnesota Pollution Control Agency, 2015).

Finally, students discussed what they noticed and how different water uses might be affected by these conditions.

Day 3: Water on Earth and Water Walks

On day three of the lesson, I began by showing students an image of Earth from space and asking what they noticed. Students then turned to their notes as I explained that while Earth appears mostly blue, representing the oceans, all of the planet's water is actually a very small, thin layer relative to the size of the Earth. I guided students through a demonstration of Earth's total water supply, including a comparison of all water condensed into a single sphere and a breakdown of where that water exists. Students analyzed data showing that most of Earth's water is saline, and that most freshwater is locked in ice or underground, leaving only a very small fraction available as surface water, yet this is the primary source humans rely on daily.

We then connected these scientific observations to cultural and relational understandings of water. I introduced the idea of water as a living entity through the work of Ojibwe leader and water walker Sharon Day, including the practice of water walks and the belief that water can listen, remember, and respond to human relationships. Students watched a video and discussed the purpose of water walks, considering how relationships with water differ from data-driven approaches. We then explored reflection questions about how humans impact water, including challenges such as historical inequities and infrastructure, and introduced the idea of "water wealth." To close the lesson, students recorded personal commitments on water drops (Figure 2), shared ideas at their tables, and completed reflection questions individually and as a whole group.

Excerpts from student reflections

- *I think safe drinking water is a right, but we are privileged to have it. We have to protect it so that everyone can have it.*
- *Small actions can help save clean water for everyone who needs it.*
- *It is our responsibility to ensure everyone's safety.*
- *Why should we listen to indigenous voices? Because they were here first. They have lived and respected water for generations.*
- *How can we encourage others to take care of the environment? By talking to others and listening.*

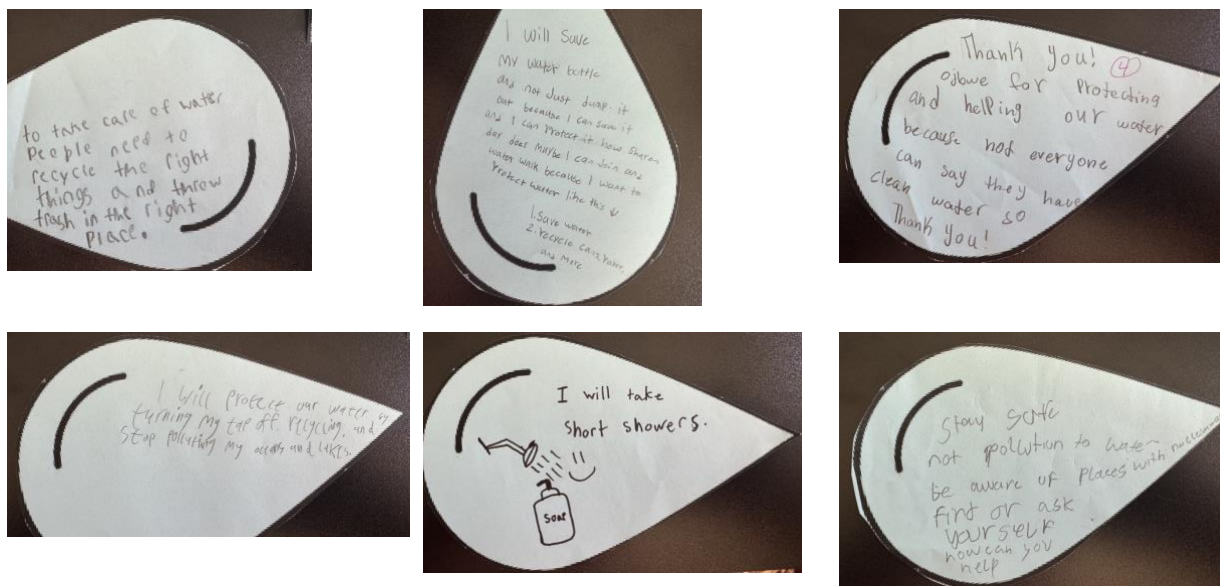


Figure 2: Photos of Water Pledges.

At a Glance

Title	Connecting Math and Climate Justice
Unit Time	3 - 50-minute class periods, taught consecutively
Grade Level(s)	6th grade
Core Text	We Are Water Protectors by Carole Lindstrom and Illustrated by Michaela Goade
Climate Literacy Terms	water, pollution, pipelines, climate justice
Objectives	Students will investigate water systems in Minnesota to understand issues of climate justice by analyzing data, exploring human and environmental impacts, and examining Indigenous perspectives on water stewardship, in alignment with Minnesota Department of Education Indigenous Education for All standards, Minnesota Science standards on Earth systems and human impacts, and Minnesota Math standards related to data analysis and interpretation.
Materials and Resources	Presentation Slides Gallery Walk Photos to Print Teacher Guide Student Handout

Going Forward

For the next school year, I plan to develop a series of lessons that explore different dimensions of climate justice, introduce students to climate justice advocates, and strengthen connections between mathematics and students' lived experiences. While student engagement was high throughout the three-day water unit, I recognized that I had missed an important foundational step: intentionally building climate empathy and fostering personal connection before introducing the water lesson. In future instruction, my first lesson in the sequence will focus on helping students explore their personal relationships with the environment and climate to establish this foundation. This could take several forms: a personal water-use journal where students track and quantify their own daily water use for 24 hours before the unit begins, giving them concrete personal data to compare against the unit's broader statistics; a "water memory map" where students write or sketch a personal experience involving water (a lake, a tap, a storm) and share it in small groups to surface prior emotional connections; or a brief survey/discussion protocol asking students where their tap water comes from and where it goes after use, building curiosity before the data-heavy lessons arrive. From there, each subsequent lesson will build on these connections by prompting students to reflect on their own experiences and relationships to topics such as water, ensuring that learning is both meaningful and personally relevant.

I also plan to strengthen the unit's math content by adding a short fourth "math lab" period or folding an additional 30 minutes into Day 2 or Day 3, where students perform actual calculations using real numbers pulled from the unit's existing sources. Currently, these sources are used primarily for reading and discussion; building in dedicated computation time would ensure students are applying, not just observing, mathematical thinking. For example, the Mississippi, Minnesota, and St. Croix River confluence and sediment discussion could support a map-scale and distance/rate problem, such as calculating river flow rate or using map scale to determine distances between points. Additionally, given my reflection above about wanting to incorporate more source-based exploration, I plan to pair that shift directly with a statistics literacy goal: teaching students to critically question a data source by asking "What's the sample size?", "What's the source's bias?", and "What's missing from this graph?" as a formal skill, using the contrast between the two pipeline organizations as the case study. I would also incorporate more source exploration to find information, rather than a direction-based instruction model.

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Todo Está Conectado

Mapping Connections and Incorporating Identity, Language, and Community in Middle School Science

Amanda Sell, Highland Park Middle School, Saint Paul, MN, USA

Abstract

This unit was implemented with 6th grade students in a Spanish Immersion classroom in Saint Paul, Minnesota. The curriculum moves beyond traditional science instruction by grounding climate literacy in identity, language, community, place, and connection. Through multi-day instructional activities, students were asked to make personal, local, and global connections with the world around them. The following texts, *Old Enough to Save the Planet / Ya soy mayor y puedo salvar el planeta* and *Our World Out of Balance* were used to help students identify and explain relationships and interconnectedness with the Earth and with one another.

Keywords

Place-based learning, collective climate action, interconnectedness, youth voice, climate change, climate crisis

Narrative Framing: Centering Identity in the Science Classroom

Teaching middle school Earth Science within a Spanish Immersion Dual Language Program has allowed me to center identity, language, community, and connection in the classroom. Historically, our climate learning was only a part of our weather unit and our natural disasters unit. Students received basic information about climate change, but they weren't afforded opportunity to study it deeply. This unit was designed to help students to build their capacity for collective climate action and to help form connections with one another and the world around them. Students were able to go more in-depth with topics that interested them and we were able to have authentic conversations in Spanish about nature, the environment, science, and the climate crisis. True to the title of the unit, "Todo Está Conectado," students moved from viewing climate change as a distant data point to understanding it as a web of relationships involving their own lives and global communities. They were able to see physical connections with the culminating project: a 3D poster and mapping project.

Instructional Sequence

Part 1: Climate Connections through Stations

The unit begins by grounding students in nature through interactive stations. Using the picturebook *Everything Is Connected*, students recorded their "Observaciones, Preguntas, y Sentimientos" (Observations, Questions, and Feelings), and they critically reflect on their emotions and their experiences regarding changes in the world around them (Figure 1). Students created visual symbols representing "nature"—often featuring trees, water, and wildlife—and contrasted them with symbols for "climate change," these symbols often included things such as factories, melting ice, and fire (Figure 2). These initial stations allow students to ground their previous science learning in real-world narratives, personal stories, and feelings. Students also shared their own experiences and created a class map related to their identities, cultures, and experiences.



Figure 1: Student work from the 6th grade science stations (Part 1)



Figure 2: Symbols of nature (on left) and symbols of climate change (on right)

Part 2: Research places and stories

In the second part of the unit, students moved from general concepts to specific, personally meaningful locations. Each student chose a country or state to which they had a personal connection—whether through family heritage, travel, or interest. They conduct research focused on:

- **The Past and Present:** Identifying the Indigenous caretakers of the land and the current state of its air, water, and soil.
- **The Climate Story:** Investigating how climate change is specifically impacting the people, land, animals, and plants in that location.
- **Direct and Indirect Impacts:** Analyzing temperature changes, natural disasters, and shifts in landscape or lifestyle.

Students were also asked to answer the following questions about their connection to a place (¿Cuál es tu conexión con un lugar en el mundo?):

- ¿Dónde? (Where) ¿Por qué? (Why)
- ¿Qué sabes de este lugar? (What do you know about this place?)
- Es importante para mí porque.... (It's important to me because...)
- ¿Cuál es su historia personal en relación al tiempo y clima? (What is your personal climate story in relation to this place?)

Finally, they needed to conduct research (Investigar/Buscar Información):

- Información sobre el lugar
- Información sobre las personas, animales, plantas
- El pasado, el presente, y el futuro
- Impactos del cambio climático (impactos directos e indirectos)

Part 3: “Mapping Connections” - 3D poster prism (Summative Project)

To synthesize their research, students created a 3D triangular prism that serves as a model of their learning. Each side of the prism was dedicated to a specific theme (Table 1; Figure 3)). Students chose a country or state of their choice that has some meaning or connection to them.

Table 1: Instructional guide for creating triangular prism

Side 1 of "3D Poster/Prism"	Side 2 of "3D Poster/Prism"	Side 3 of "3D Poster/Prism"
Themes Facts Connections/Meaning Who represents this place Quotes from people that live here. Quotes from people doing the work in the community. What represents this place?	Themes The present (land, water, and air connections) Changes Climate impacts What is happening now? What is impacted Who is impacted? How? Natural disasters and/or problems	Themes Hopes for the future Solutions Ideas Actions What can you commit to doing for the Earth?
Scaffolding for students: What do you like about this place? What is some unique information about the place? Who are the people indigenous to this land?	Scaffolding for students: Temperature changes Natural disasters Changes to landscape Changes to lifestyle	Scaffolding for students: Small solutions and actions that we can do now. What is being done? (visibility) Big hopes and dreams. Empower the youth.

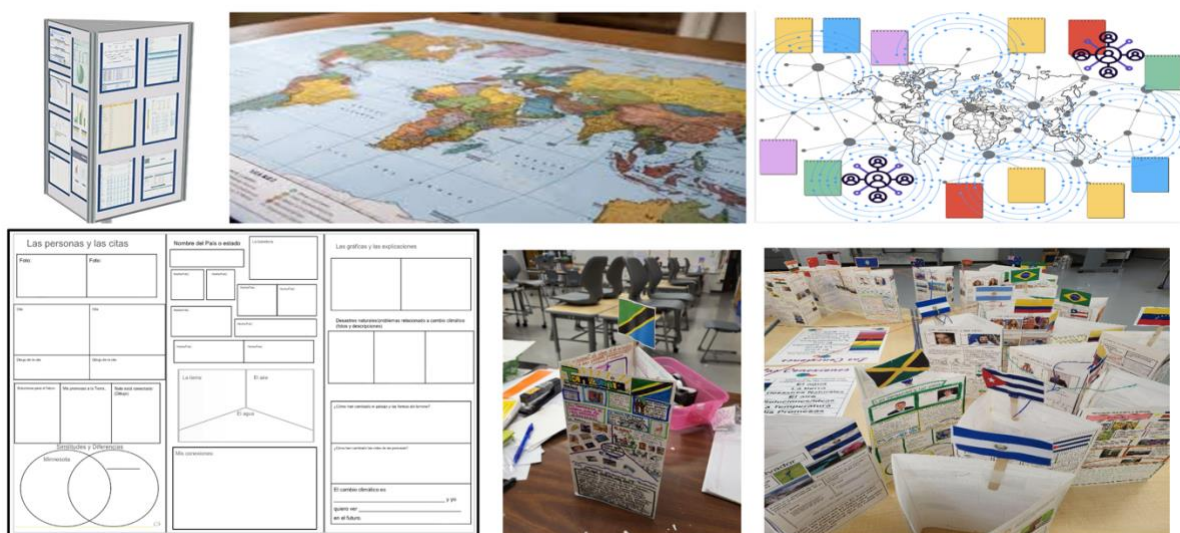


Figure 3: These images represent the global connections and the 3D prism that students created to show their learning and understandings.

Part 4: Bringing it all together: Mapping Connections and Reflecting

The unit culminates in a physical "Mapping Connections" activity. Students place their 3D prisms in map order on a table, and they use different colored strings to physically connect their chosen locations to those of their classmates (Figure 4). Students collaborate to decide what the string colors represent—such as shared climate impacts (e.g., water scarcity in both Nebraska and France) or common solutions (e.g., a shared desire to reduce pollution in Ethiopia and China). This visual web reinforces the overarching theme that what happens in one part of the world affects us all, “Todo está conectado.” Following the creation of the web, students discuss the following:

- ¿Cuáles son las conexiones o similitudes entre tu lugar y los lugares de tus compañeros? (What are the connections or similarities between your place and the places of your classmates?)
- Acción colectiva por el clima (Collective actions for the climate)?
- Soluciones/ideas para el futuro (Solutions/ideas for the future)?

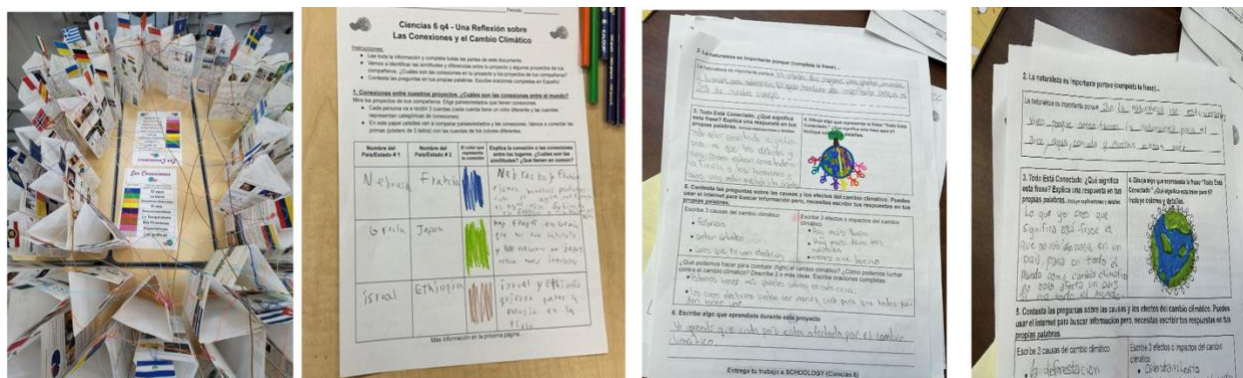


Figure 4: Examples of student work, including the connected prisms and discussion notes.

At a Glance

Title	<i>Todo está conectado (Everything is Connected)</i>
Unit Time	<i>3 week unit (block schedule - every other day)</i>
Grade Level(s)	<i>6th Grade (Spanish Immersion Earth Science)</i>

Core Texts	• <i>Old Enough to Save the Planet / Ya soy mayor y puedo salvar el planeta</i> by Loll Kirby • <i>Our World Out of Balance</i> by Andrea Minoglio
Supporting Texts	• Mapmaking with Children: Sense of Place Education for the Elementary Years • Direct Impacts of Climate Change
Climate Literacy Terms	Climate adaptation, climate emotions, climate literacy, Earth care, Earth systems, place-based knowledge, social inequality, solutions, and systems care
Objectives	• Students will be able to make connections between the past, present, and future, in regard to climate change impacts and they will be able to make connections to personal/local and global communities. • Students will create a final 3D product that will show different connections with a country or state around the world. Students will share their science knowledge as well as their new knowledge that they learned about climate change and climate literacy. Students will also present their projects to the class in a gallery walk style activity to show their knowledge and understanding of how these connections to places help shape our interactions and experiences with the world. • 6E.3.2.1.3 Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment. • 6E. 1.1.1.3 Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century.
Materials and Resources	Instructions for Everything is Connected Stations Student Notebook Pages for Climate Stations

	Investigación: • Investigar un país o estado - ¿Cuáles son tus conexiones? • Reflexión sobre las conexiones y el cambio climático • Plantilla para el póster (la sumativa) Research: • Summative research about a place that you connect with (this could be a country or state) • Reflection about connections and climate change • Template for Summative Poster (12x18) <i>World maps (printed copies /digital copies)</i> • Simulating Climate Futures in En-ROADS • Resource Center for Environmental and Climate Action Changemakers
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Going Forward

In future versions of this unit, we—my students and I—intend to further expand the storytelling component through mapmaking. Integrating digital tools like the Climate Stories Map will complement our physical string-mapping, allowing students to see their local stories and connections as part of a global narrative. By centering the linguistic and cultural identities of Spanish Immersion students, we ensure that climate science is relevant and accessible to all learners. When students see their own family and community histories reflected in climate stories, they move from being passive learners to active, empathetic climate problem-solvers and climate doers. Furthermore, we plan to deepen this work through interdisciplinary collaborations. In the future, we would love to partner with the Minnesota Studies history class to bridge the gap between environmental science and the history of land caretaking. By exploring Indigenous histories and historical shifts in Minnesota's landscape, students can better understand the "why" behind current climate impacts. Collaborating across disciplines—such as art, language arts, and math—will further reinforce the idea that climate literacy is a collective effort, essential to understanding our shared future

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Early Grades

Beyond the Vocabulary List

A Reflection on Integrating Climate Literacy in a Cross-disciplinary Project in a Language Classroom

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Abstract

This reflection examines a cross-disciplinary, project-based Mandarin immersion curriculum designed to integrate English Language Arts (ELA) and Science units on wild animals' habitat and ecological crises in a third-grade classroom. Moving beyond print-based instruction, I reflect on using multimodal pedagogy to alleviate the "linguistic bottleneck" where primary students' complex, higher-order climate awareness outpaces their novice-stage target language proficiency. The narrative details critical pedagogical struggles—ranging from the limitations of static vocabulary lists to the emergence of profound student climate anxiety (eco-grief). To ground abstract ecosystem parameters and process heavy climate emotions, I pivoted to incorporate picturebooks, physical movement such as Tai Chi (Cloud Hands) and Daoist cosmological lenses (Yin-Yang and Tian Ren He Yi). Leveraging non-Western cultural assets allows young immersion learners to bypass linguistic bottlenecks, transform eco-anxiety into actionable daily advocacy, and embody a relational, non-dominant worldview.

Keywords

Cross-disciplinary immersion, multimodal literacy, ecojustice education, somatic pedagogy, deep time

Introduction

As a first-year third grade language immersion teacher, I am constantly challenged to instruct a dense set of vocabulary and language points from a mandated curriculum while aligning them with English Science and ELA Tier 2 academic vocabularies under strict classroom time constraints. At the same time, climate change and the cultivation of sustainable ecological communities have become pressing issues that our students need to become aware of and act on. I decided to design a project-based thematic unit that emphasizes critical awareness, inquiry-driven research for environmental solutions, and authentic student advocacy.

This project-based unit leverages students' natural passion and love for wild animals and nature to push them toward a deeper understanding of ecosystem niches, habitat crises, and the direct impact of human behaviors on the biosphere. Ultimately, the unit encourages students to take the initiative in advocating for animals and the natural world. This unit optimizes limited instructional time by directly aligning with state and national subject standards, including Minnesota ELA (3.2.1.1, 3.2.2.2), Minnesota Science (3L.4.1.1.1, 3L.3.2.1.1), WIDA Language Standards for ELA and Science (Standards 2 and 4), and ACTFL Interpersonal & Presentational Proficiency Standards (1.1, 1.3) (Cutshall, 2012; Minnesota Department of Education, 2019, 2020; WIDA, 2020).

Through active cooperation with the English science and ELA teachers, this thematic unit invites content knowledge directly from students' English blocks, transforming it into tools for critical L2 research and inquiry. Students were divided into groups organized by their self-selected animals' geographic habitats to study how everyday human actions alter environments and impact wild animals. Furthermore, after exploring the mechanics of the greenhouse gas effect, students were inspired to advocate for sustainable, eco-friendly daily routines.

By integrating touching literature, embodied robotic geography navigation, 3D habitat building and mindful Tai Chi movements, students successfully built an understanding of how all living systems are intricately intertwined. Through these multiple modes, students explored how human stewardship and guardianship for the natural world can be developed. This exploration ultimately led the classroom to ponder a deeper question: how can humankind and nature achieve a better, more harmonious state of coexistence, rather than humans simply seeking to dominate the natural world?

Framework

The Bridge model (Beeman & Urow, 2013) assists educators in designing explicit instruction for language transfer within content-area learning. This framework serves as an essential step for preparing students to utilize target language (L2) academic structures, providing a solid foundation for further deepening their content comprehension. Following that linguistic transition, subsequent classroom discussions use these newly acquired L2 terms to develop critical cross-cultural comparison and analysis. For example, once the direct translation of an "ecosystem" is established, the concept can be integrated into Daoist philosophy and the unity of nature and humanity (Tian Ren He Yi) (Laozi, 2006, Chapter 42) within the Chinese language setting—a positioning that is naturally coherent with EcoJustice education theory (Martusewicz et al., 2020). Similarly, comparing the concepts of industrial "development" versus ecological "cycles" allows students to ponder the relationship between nature and humankind, directly reflecting the theoretical contrasts between Western anthropocentric perspectives and Eastern relational worldviews.

The unit takes place in three third grade Mandarin Chinese immersion classrooms with 72 students, where the listening and speaking ability ranges from Novice Mid to Intermediate Mid, the reading ability ranges from Novice Mid to Intermediate Low, and the writing ability ranges from Novice Low to Novice High (Cutshall, 2012).

Data sources

Grounded in the traditions of practitioner inquiry, my reflection relies on a qualitative review of student work collected during the unit. This material includes ten pieces of my own teacher reflection journal entries, approximately 48 students' text analysis entries, 93 students' digital multimedia entries hosted on our classroom platform, 144 written responses, equally divided between responsive and free-writing exercise, and 156 student-produced multimodal artifacts (consisting of hand-draw maps, 3D habitat making, and environmental posters).

Reflective Analysis

Instead of grading language skills through rigid tests, I looked through these materials to find common patterns and themes. I read over my journal entries and what we said during lessons to spot exactly where students got frustrated, where their language skills held back their big ideas, and how their feelings changed over time. I also looked at the students' projects and stories to see how smoothly they used every day spatial words and how well they expressed an awareness of the environment. Finally, I connected these

common themes to ecojustice ideas and Daoist philosophy to map out my own journey as a teacher and see how my lessons evolved.

Cycle 1: Embodied Cognition in Spatial Navigation

In the first month of this unit, students successfully transferred their background knowledge from ELA and science into Chinese, utilizing visual graphic organizers to map out animal body features and habitats. Through traditional L2 language practice tools, students demonstrated that they were able to describe animal physical traits, habitat environments, and basic food webs. However, when introduced to more complex verbs in dynamic scenarios—such as migrating for food and shelter, or explaining how plant and animal life shifts along changes in latitude—the students became confused. Although I provided mentor texts alongside AI-generated pictures and videos (Figure 1), a significant number of students still struggled with the underlying logic and their subsequent language output. At this moment, I knew that multimodal pedagogy (Kress, 2010) needed to kick in. To support the development of their comprehension and language production, I introduced a series of individual and collaborative tasks, including food web mapping, travel route design, robotic navigation instructions, 3D habitat construction, and cross-grade-level presentations. During my post-lesson reflection, a compelling instance of student narration was captured from an anonymous video file. Navigating a purely visual map completely devoid of Chinese characters, Student A stated:

机器人一从雪山高原往前走40厘米，往右转，再往前走，走到森林和池塘，往前走，就到了地下，森林里面住着大象，大熊猫，池塘里面住着乌龟。

[Once the robot comes out from the icy mountain, walks 40 cm, turns right, walks straight again, he arrives in the forest and the pond, walks forward, he arrives underground. Elephants and pandas live in the forest, and turtles live in the pond.]

And in another video file, Student B with higher language ability narrated with sentence structure notation by herself as:

3号的机器人从地下出发，往右转，向前走到了森林，森林里住着穿山甲，左边是池塘，池塘里住着鱼，再往前走，是雪山高原，雪山高原住着雪狐。他向右转30步，走到北极。北极里住着雪鸮。

[Robot No.3 left from underground, turn right, go straight to the forest, the pangolin lives in the forest. On the left, it's a pond. Fish live in the pond. Further straight forward, it's a snowy mountain, and an Arctic fox lives there.]

In summary, students were highly engaged through all five different multimodal activities and different levels of students' language output both orally and written showed that students' higher-level thinking, deeper content understanding and higher level of academic vocabulary memory and usage at the end of this cycle.

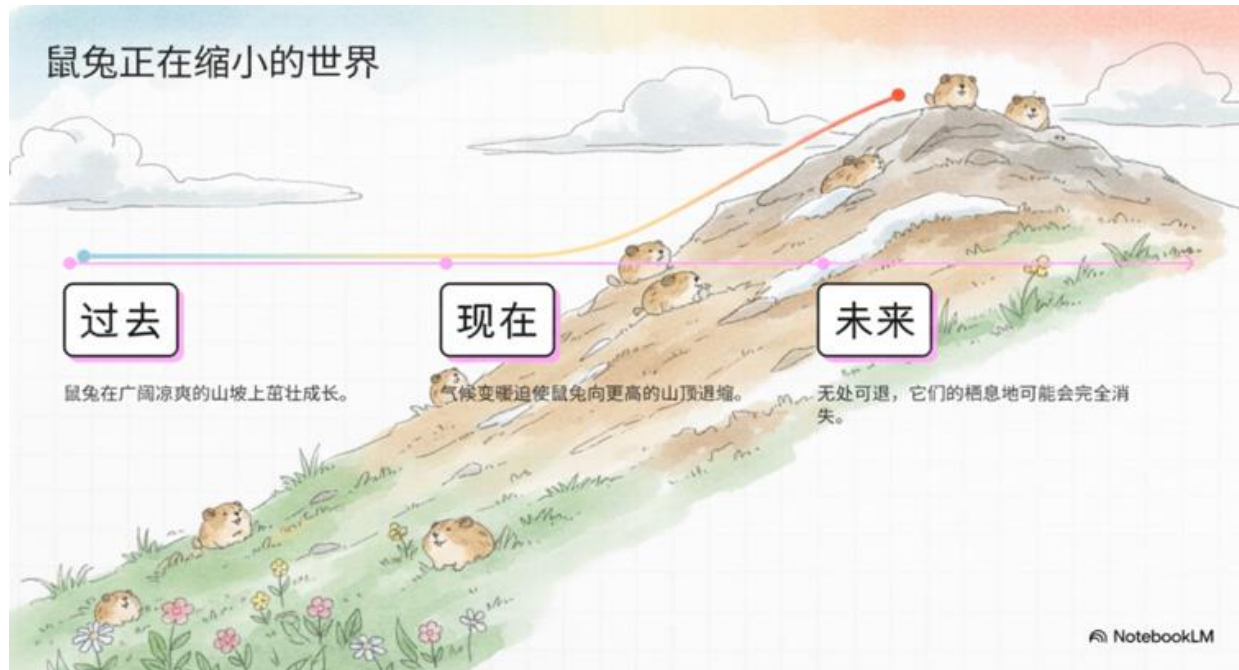


Figure 1: Chinese explanation of Pika's migration through time and increased temperature.
Generated by Notebook LM.

Cycle 2: Wordless Literature and Narrative Advocacy

After the first month of instruction, student expressions of eco-grief and anxiety began to surface, accompanied by more passive and somber language in their video reflections—including terms like “dying,” “sad,” “no food,” “disappearing,” and “extinction.” Confronted with the challenge of how to help them cope with these heavy emotions, I introduced a blend of non-fiction and fiction texts. I shared several videos demonstrating how advanced technologies utilize waste incineration and ocean-cleaning initiatives; however, the students' anxiety remained palpable. I found myself deeply considering how to relieve them of the overwhelming burden that they personally carried full responsibility for the Earth's health and the future of wild animals. Reflecting on my

own concepts of humankind and nature, I recalled how Daoist and Confucian philosophies emphasize that humans are small in the presence of Mother Nature, encouraging us to awe, respect, and follow the "Dao" inherent in the natural world. I wondered how I could convey this profound idea to young students who had subconsciously absorbed Western anthropocentric worldviews.

After searching existing children's literature, I discovered the perfect mentor text: Aaron Becker's wordless picturebook, *The Tree and the River*. Because the book contains no written text in any language, students were pushed to read the illustrations and form their own interpretations of the underlying themes. At the same time, they were completely freed from the linguistic anxiety of decoding complex target-language vocabulary, allowing them to immerse themselves fully within and between the pages. Moving from silent thinking and writing time to small-group and whole-class discussions, and supported by abundant processing time and reflective space, the students' eager expressions of understanding reached a clear peak. Through their individual sharing and engagement, I recorded insightful student observations, including:

- 人要更多土地，更多水和更多的人，他们就打仗。[Humans want more land, more (parts of the) river and more people so they have fights.]
- 河水越来越少，树很不开心。[The river is shrinking, (and) the tree is not happy.]
- 他们改变了河的路，因为他们想要更多的地。[They changed the river channel, because they wanted more land.]
- 人没了，大自然还有。[Humans disappeared, and nature is still there.]
- 有新的树，还有小朋友。他们在听妈妈说以前的故事” [There are new trees, and kids. They are listening to mom tell old time stories.]

These comments were beautifully inspired and showed students' understanding of Deep Time and Unity of Humankind and Nature (Dao Dejing). Through the discussion among different human tribes, river, tree and the wild animals, students experienced the change of the tension between different things through time, and further understood that everything is connected while changing, which is reflecting Yin and Yang theory in Daoism. To embody this concept, I taught students a movement in Taichi – 云手 the Cloudy Hand, which is originally Daoism Kongfu. In this simple movement, we need to keep moving the position of two hands to form circles, switching the body gravity between two legs to keep the moving flow. Along with the breath, students can feel the endless flow generated inside, while the core of the body and the head keeps straight

and balanced. Just like how nature and humankind are united (Tian Ren He Yi), while everything changes in cycles.

Students felt how humankind, nature and wild animals' faith were intertwined, while growing tenaciously individually, which greatly decreased their feeling of effortlessness in changing the big picture of environment damage, switching to focus on daily actionable behaviors. As the output in this cycle, students made eco-friendly action advocacy posters in Chinese without prompts and the minimum level of language support in different themes. Some are focused on preserving the habitats, some focused on saving typical animals, some focused on step-by-step instruction of sorting waste. From my observations, student participation increased, including the students whose oral language ability remained Novice Low.



Figure 2: Students' posters

Going Forward

Through this cross-disciplinary exploratory unit, I realized that navigating today's changing educational landscape as a primary Mandarin immersion teacher forces me to constantly balance big-picture goals with daily classroom realities. At the macro level, I kept asking myself how to truly cultivate modern global citizens who care about the planet. At the micro level, I faced a very real, practical dilemma: how to collaborate with other subject teachers to respect my students' learning holistically while avoiding the boredom of content overlap. At the same time, I had to manage the deep frustration students feel when their high-order thinking outpaces their developing, novice-stage target language skills—a major linguistic bottleneck in immersion classrooms.

Language is never just a mechanical tool; it is a cultural carrier that opens spaces for different ideas and worldviews to meet. Throughout this exploratory unit, I used a continuous cycle of reflection and iteration to fine-tune my teaching, though the process was far from linear. Despite inviting students' interests and drawing from their knowledge in other subjects, it was truly frustrating that students were initially not engaged enough; language learning was purely seen as a vocabulary list aligning with their content knowledge in English. When discussing food webs, students preferred to use a large amount of English to express animal names and habitats—the Tier 2 academic language—even though these terms had been provided multiple times. That was the moment I realized there was more to do. By implementing multimodal tools, students were given enough time and space to build a deeper understanding of both the content knowledge and their language ability through rich, multi-layered interaction: teacher-student, peer-to-peer, and student-to-digital interfaces.

A similar frustration showed up when students' emotions surrounding eco-anxiety emerged. After introducing Yin and Yang in Daoism, exploring advanced technology, and guiding them through environmental advocacy poster-making, their mood became calmer and more self-managed. However, for some students, the Unity of Humankind and Nature was still a little too abstract, and more suitable activities besides Tai Chi are yet to be explored.

Ultimately, this practitioner journey facilitated a deeper understanding of my own pedagogical agency within the dual-language immersion classroom. Activating cultural assets from myself and continually piloting pressing issues with standardized language instruction, I can be an active cultural mediator placing language acquisition within meaningful global issues and employ multimodal methods to balance students' high

cognitive ability and not-yet L2 language ability, furtherly inspire students' curiosity of different narration of relationship among humankind and nature. The practice confirms that the dual-language classroom can serve as a dynamic space where a reflective teacher can utilize diverse philosophical lenses to foster holistic, empathetic, and critical global citizens.

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Reprogramming Planet Earth

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Abstract

Students in pre-K through 5th grade designed programs that reflect what they learned about climate change through children's literature and videos. Students spent 1-3 weeks programming various physical computing devices like the Micro:bit, Robot Mouse and Dash, and they used various software like the Scratch Jr. App, Scratch online, and Microsoft MakeCode. A collection of student work can be viewed through this PDF document or view this video for a quick look. Below are resources with direct links to cross-curricular concepts applicable to this thematic unit of climate literacy and programming, and there are brief lesson plans and resources used for each grade level.

Keywords

climate change, climate crisis, climate literacy, computer science, cross-curricular learning, programming, elementary school

Introduction

My name is Zoua and I have been teaching for a decade. I started out as a classroom teacher in grades 3 and 4, but for the past 5 years I have been a technology specialist at Wellstone Elementary in Saint Paul, Minnesota. I work with twenty-five pre-K through 5th grade classes—nearly 500 students! In our school, 90% of our student population is Black, Indigenous, or People of Color, and about 80% are eligible for free or reduced lunch. More than 50% of the student population are English Language Learners and about 15% of the students are in Special Education. We also have a Spanish Dual Immersion program and a Karen Language and Culture program.

As a professional, I have an immense desire to learn new things and apply it to my instruction. As I've deepened my understanding of climate literacy and climate justice, I was devastated to see more clearly that the choices we make here in the USA, as a developed nation, have a greater negative impact on less developed countries who have done very little to contribute to the climate crisis. This is climate injustice. Suddenly, having access to clean water (our 10,000 lakes), an air conditioner and heater, and being able to travel and enjoy lush forests, towering mountains, and serene blue waters have all become a great privilege. They are precious relatives (seeing all living things as beings equivalent to human life) that need to be taken care of and taught about in schools.

I am extremely fortunate to know that I can share what I learned about with my students. I want them to think and ask questions about what is happening around them. I hope they gain new insights and feel inspired to act. I designed sustainable lessons that I can teach each year by integrating climate education into programming education. Pre-K students programmed robotic mice to sort trash after learning about why they recycle and compost at school. Kindergarteners programmed robot mice to build forests after students learned about how trees are essential for living on this planet. First graders learned about different ways trash could be reused and then created characters and objects out of trash and used them to program animations on the Scratch Jr. app. Second graders learned about smaller-scale solutions they can do each day to help protect the Earth and programmed a solution on the Scratch Jr. app. Third graders learned about young climate activists and programmed Dash to become a climate activist who teaches about locations vulnerable to climate change. Fourth grade students learned about larger-scale impacts of climate change and advocated for positive change by programming solutions on the online Scratch platform. Last, fifth graders developed micro:bit solutions to address three sustainable development goals: Good Health and Well-Being, Reduced Inequalities, and Climate Action. Lastly, my fourth and fifth graders

in summer camp reimagined what a greener world would look like by designing their own worlds on Scratch.

I hope the lessons below allow students to think about issues relevant today and inspire them to see themselves as capable of creating change. My service to protecting this planet is to educate these 500 students and hope that their work and their words will extend beyond our classroom to their families, relatives, friends and other professionals and places. I want everyone who comes in contact with climate education to feel inspired enough to help "reprogram" the Earth. This means that we retrain our habits and mindsets so the choices we make will combat the climate crisis or mitigate climate change and "reprogram" the Earth to be healthy again.

Resources

1. [Applicable Cross-Curricular Concepts](#)
2. [Pre-K - Squeak & Sort: A Recycling Coding Adventure](#)
3. [Kindergarten - Growing a Forest One Code at a Time](#)
4. [First Grade - From Recycled Art to Animations](#)
5. [Second Grade - Code Green: Solving Earth's Challenges](#)
6. [Third Grade - Dash the Climate Activist](#)
7. [Fourth Grade - Scratch the Climate Crisis: Solutions in Code](#)
8. [Fifth Grade - Tiny Tech, Global Impact](#)
9. [Fourth & Fifth Grade - A Greener World](#)

My Weather Journal

Climate Literacy in Dual Language Elementary Classrooms

Gisela Santiago, Eagle Heights Spanish Immersion, Eden Prairie, MN, USA

Abstract

This 1st grade climate literacy lesson, designed for bilingual or dual-language classrooms, introduces young learners to foundational weather concepts through literature, observation, and personal reflection. Centered around the Spanish-language picture book *¿De qué color es el cielo?* by Mandie Davis, the lesson invites students to explore how the sky and weather change, and how these changes affect people's daily lives. Aligned with Minnesota academic standards in science and language arts, the lesson engages students in describing current weather conditions, collecting simple observational data in a personal weather journal, and discussing emotional and sensory responses to weather patterns.

Keywords

Weather, nature, observation, seasons, environmental awareness, climate change

Overview

This 1st grade lesson introduces students to basic weather observation and environmental awareness through the Spanish-language picture book *¿De qué color es el cielo?* by Mandie Davis. Designed for bilingual, dual-language or immersion classrooms, the lesson blends science and literacy by encouraging students to observe the sky, identify weather patterns, and reflect on how weather affects their daily lives.

The lesson begins with a whole-class weather discussion and charting activity, followed by a read-aloud of the book. Through guided questions, students connect the imagery and feelings in the story to their own experiences with weather. Students then collect simple weather data using a “My Weather Journal” worksheet, drawing and labeling current sky conditions, temperature, clothing, and emotions. To close the lesson, students express their understanding through drawing, writing, or sharing with a partner.

Aligned with Minnesota academic standards in both science and language arts, this lesson fosters curiosity about the natural world, builds vocabulary, and lays the foundation for future climate literacy. It encourages students to notice, describe, and care about the environment in meaningful, age-appropriate ways.

Dual Language Instructional Context

I teach first grade at a suburban Spanish Immersion school in Minnesota, where students develop both their academic knowledge and their Spanish language skills. Teaching in an immersion setting requires me to provide students with repeated opportunities to hear, practice, and apply new vocabulary in meaningful contexts. Young language learners are more confident and successful when new concepts are introduced gradually and reinforced through consistent daily routines.

One of our daily morning meeting activities is discussing the weather. We use a daily weather chart with colorful illustrations representing different weather conditions in Spanish, such as ‘sunny’, ‘cloudy’, ‘rainy’, ‘snowy’, ‘hot’, ‘cold’, and ‘humid’. Every morning, students observe the weather outside and describe what they noticed using the target vocabulary. We also talk about how the weather affects our daily lives by discussing appropriate clothing choices and the types of activities we could do in different weather conditions. These conversations encourage students to make connections between classroom learning and their own experiences while naturally developing their oral language skills.

Lesson Framing

In early spring, first grader students come to school with lots of curiosity. They notice everything: the way the wind blows harder than yesterday, the clouds that cover the sun, the puddles that weren't there last week. They look up at the sky not just to see it, but to wonder about it. This lesson begins with that wonder.

Using the poetic Spanish-language book *¿De qué color es el cielo?* As our guide, we invite students to slow down and truly look at the sky. Through colors, feelings, and observations of the sky students begin to connect what they see outside with what they feel inside. The story opens a space for curiosity and conversation: Why is the sky different today? What does it tell us about our world? About ourselves?

As we move through the lesson, students collect simple weather data—drawing, coloring, and talking about what they notice. These early acts of observation are more than academic skills—they are acts of care. Students begin to understand that weather affects the way we live, how we dress, what we do, and how we feel. These conversations plant the seeds of climate literacy not with fear, but with connection. By observing shifts in temperature, cloud coverage, breezes, and moisture, students develop second-language vocabulary that helps describe their surroundings.

A fundamental aspect of this instruction is for students to tell the difference between weather and climate. While weather pertains to our immediate, daily experiences, climate reflects the enduring patterns of our environment, such as the characteristic seasonal cycles and temperatures documented in Minnesota over decades. Helping students learn this distinction (that sometimes even adults can struggle to do successfully) helps young learners to recognize that a single day's event is merely weather, whereas long-term observations tell the story of our climate.

These dialogues help students learn climate literacy. Initially, students engage by documenting the current season through sketches, symbols, or reflective journals. As the academic year progresses, they can revisit these records to contrast their observations and experiences with what would be expected for that region and time of year. This comparative process invites them to ponder: What trends emerged in our data? How did reality align with our expectations? In what ways does our daily weather similar to or different from the overarching climate patterns?

In a world where our climate is changing, and children will inherit both those challenges and that beauty, this lesson helps students develop their environmental awareness with

both joy and with scaffolded language they understand: stories, drawings, feelings, and the shared experience of looking up at the same sky.

The sky belongs to everyone—and noticing it is where learning begins.

At a Glance

Title	The Sky and Me: Observing Weather Through Story
Unit Time	1 lesson, approximately 60 minutes (can be split into two 30-minute sessions)
Grade Level(s)	1st Grade (bilingual, dual-language, or immersion classrooms)
Core Text	<i>¿De qué color es el cielo?</i> by Mandie Davis
Supporting Texts	• <i>Come On, Rain!</i> by Karen Hesse (English) • Weather poems or simple picture books on seasons and sky
Objectives	By the end of this lesson, students will be able to: • Observe and describe daily weather conditions using age-appropriate vocabulary. • Identify how weather affects people’s feelings and activities. • Collect simple weather data in a Weather Journal. • Retell key details and express understanding from a literary text related to the environment.
Materials and Resources	• Copy of <i>¿De qué color es el cielo?</i> • Weather chart or large anchor chart for whole class • “My Weather Journal” worksheet with icons and drawing space • Crayons, markers, or colored pencils • Thermometer or weather app (optional) • Standards alignment document (Minnesota Science and ELA standards) • Optional: Slide deck with visuals and vocabulary

Going Forward

When I implemented this lesson, I realized that students' previous exposure to weather vocabulary through our daily routine made a significant difference in their confidence and independence. Because the concepts were already familiar, students were able to focus on applying their knowledge rather than trying to learn entirely new vocabulary. They independently completed weather journals by recording observations, writing simple sentences, drawing pictures, and coloring illustrations that represented the day's weather. Watching students confidently use the language they had practiced over time reinforced for me the importance of building background knowledge before introducing more structured learning activities.

One of the most valuable lessons I learned from teaching this unit is that vocabulary instruction should be introduced before students are expected to use new concepts independently. Using visuals, drawings, gestures, and repeated discussions provided students with the support they needed to understand and retain new words. I also found that connecting weather concepts to students' everyday experiences made the learning more meaningful. Discussing the clothes they wore, the activities they enjoyed, and how weather influenced their daily decisions helped students see the relevance of what they were learning and increased their participation during lessons.

If I were implementing this unit again or recommending it to another teacher, I would emphasize the importance of intentionally building vocabulary over time instead of introducing all of the concepts at once. Daily routines, visual supports, and opportunities for discussion allow students to develop confidence before being asked to complete independent tasks. I would also encourage teachers to differentiate support based on students' language proficiency by providing sentence frames, picture supports, or opportunities to work with partners when needed.

Reflecting on this experience has strengthened my belief that meaningful learning occurs when instruction is connected to students' lived experiences and when teachers intentionally scaffold learning over time. Rather than viewing the weather lesson as a single activity, I came to see it as the result of many small, consistent learning opportunities that helped students build language, confidence, and independence. This experience reinforced the value of thoughtful planning, routine, and meaningful connections in supporting both content learning and language development in the elementary classroom.

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Appendix I: My Weather Journal / (Mi Diario del Clima)

Date / Fecha: _____

1. How is the sky today? (¿Cómo está el cielo hoy?)

(Students circle or color one or more)

☀ Sunny / Soleado

☁ Cloudy / Nublado

☔ Rainy / Lluvioso

❄ Snowy / Nevado

🌫 Foggy / Brumoso

2. How is the temperature? (¿Cómo está la temperatura?)

(Students circle one)

🔥 Hot / Caliente

☀ Warm / Tibio

🧊 Cool / Fresco

❄ Cold / Frío

3. What clothes are you wearing today? (¿Qué ropa usas hoy?)

(Draw or color your clothes)

[Space for drawing]

4. What do you like to do when the weather is like today? (¿Qué te gusta hacer cuando hace este clima?)

[Space to draw or write a sentence]

5. How does this weather make you feel? (¿Cómo te hace sentir este clima?)

😊 Happy / Feliz

😐 Okay / Bien

😞 Sad / Triste

(Circle one or draw a face)

When the Ice Melts / Cuando el Hielo se Derrete

Caring for the Earth and Its Animals

Lastenia Bates, Green Central Elementary School, Minneapolis, MN, USA

Abstract

This preschool lesson uses “When the Ice Melts” by Rosie Eve to introduce young children to the concept of climate change and its effects on polar animals. Through storytelling, discussion, and art, students build empathy for nature and learn simple ways to care for the Earth, aligned with Minnesota Early Childhood Indicators of Progress (ECIPs) in science, literacy, and social-emotional learning.

Síntesis Breve

Esta lección para prescolares utiliza “Cuando el hielo se derrite” de Rossie Eve para introducir a los niños pequeños en el concepto del cambio climático y su efecto en los animales polares, a través de la narración, la discusión y el arte. Los estudiantes desarrollan empatía por la naturaleza y aprenden formas sencillas de cuidar la Tierra, alineado con los estándares de Minnesota Early Childhood Indicators of Progress (ECIPs) en las áreas de ciencias, literatura y aprendizaje socioemocional.

Keywords

Climate change, Arctic, ice melting, polar bear, animal conservation

Palabras claves

Cambio climático, Artico, derretimiento de hielo, oso polar, conservación de animales

Overview

This preschool lesson introduces students to the foundational concept of climate change through the engaging picture book *When the Ice Melts* by Rosie Eve. The story follows a young polar bear whose home in the Arctic is melting, offering a gentle, age-appropriate way to explore environmental changes and their impact on animals.

Students will participate in a read-aloud, guided discussion, and art activity to deepen their understanding of the story's message. The lesson integrates science, literacy, and social-emotional learning, encouraging children to build empathy for animals and to think about how they can help take care of the Earth. Aligned with Minnesota Early Childhood Indicators of Progress (ECIPs), the lesson promotes vocabulary development, critical thinking, and environmental awareness in a fun and developmentally appropriate way.

Visión General

Esta lección para prescolares introduce a los estudiantes al concepto fundamental del cambio climático a través del cautivador libro ilustrado *Cuando el Hielo se Derrite* de Rossie Eve.

La historia sigue a un joven oso polar cuyo hogar en el Ártico se está derritiendo, ofreciendo una manera suave y adecuada para su edad de explorar los cambios ambientales y su impacto en los animales. Los estudiantes participarán en una lectura en voz alta, una discusión guiada y una actividad artística para profundizar su comprensión del mensaje de la historia. La lección integra la Ciencia, la literatura y el aprendizaje socioemocional, alentando a los niños a desarrollar empatía por los animales y a reflexionar sobre cómo pueden ayudar a cuidar la Tierra. Alineada con los indicadores de Progreso de la Infancia Temprana de Minnesota (ECIPs), la lección promueve el Desarrollo del vocabulario, el pensamiento crítico y la conciencia Ambiental de una manera divertida y apropiada para su Desarrollo.

Narrative Framing

This lesson uses *When the Ice Melts* as an age-appropriate narrative to introduce preschool students to the concept of climate change through the lens of empathy and environmental awareness. By following the story of a polar bear affected by melting ice, students begin to understand the relationship between human impact and animal habitats. The lesson fosters early climate literacy by encouraging observation (Figure 1),

compassion, and care for the Earth—establishing foundational attitudes for future environmental responsibility.



Figure 4: Students manipulate the ice cube they feel the texture the temperature and the same time they increase their vocabulary: ice, hard, cold, melt / hielo, duro, frío, derrite in both languages

At a Glance

Title	When the Ice Melts / Cuando el Hielo se Derrite
Unit Time	One month / un mes
Grade Level(s)	Preschool / Preescolar
Core Text	<i>When the Ice Melts / Cuando el Hielo se Derrite</i> by Rossie Eve
Supporting Texts	• <i>The Last Bear/El Último Oso</i> by Hannah Gold • <i>Can We Help the Polar Bears? / Podemos Ayudar a los Osos Polares?</i> by Katie Daynes • <i>Laura y el Oso Polar</i> por Vicente Muñoz (only Spanish)
Objectives	By the end of this lesson, preschoolers will • Recognize that the Earth is warming and this affects animals like polar bears.

	• Demonstrate empathy and care for living things and the environment. • Use language to describe what they observe and feel. • Express their ideas through drawing and conversation. Al final de la lección, los preescolares podrán: • Reconocer que la Tierra se está calentando y que esto afecta a los animales como los osos polares • Demostrar empatía y Cuidado hacia los seres vivos y el medio ambiente. • Utilizar un lenguaje para describir lo que observan y sienten • Expresar sus ideas a través del dibujo y la conversación.
Materials and Resources	• <i>When the Ice Melts</i> (physical or digital copy) • Visual aids (photos of polar bears, the Arctic, melting ice) • Vocabulary cards (ice, polar bear, melt, warm, cold, Earth, care) • Drawing paper, crayons, markers • Globe or world map • Short videos about the arctic and polar bears • Interactive songs • Recyclable materials for creative activities (small model of the polar habitat) • Ice melting experiment • <i>Cuando el hielo se derrite</i> (copia física o digital) • Ayudas Visuales (fotos de osos polares, del Ártico, del hielo erritindose) • Tarjetas de vocabulario (hielo, oso polar, derretirse, cálido, frío, tierra, cuidado) • Papeles para dibujar, caryones, marcadores • Globo terráqueo o un mapa del mundo • Videos cortos acerca del ártico y los osos polares • Canciones interactivas • Materiales reciclables para actividades creativas (modelo pequeño de un habitat de oso polar) • Experimento de derretimiento del hielo

Hello, Tree Explorations

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Abstract

This literacy article presents a comprehensive unit curriculum designed for early childhood and primary educators inspired by Ana Crespo's picturebook *Hello, Tree*. The curriculum leverages the book's colorful illustrations and poetic narrative to foster environmental awareness, sensory exploration, and creative expression among young learners. Through interdisciplinary activities integrating literacy, science, and art, the unit encourages students to observe and connect with nature, develop descriptive language skills, and cultivate mindfulness. Educators are provided with practical strategies for using *Hello, Tree* to support social-emotional learning, promote curiosity about the natural world, and inspire stewardship. This curriculum aims to enrich classroom experiences by turning a simple story into a dynamic learning journey that nurtures both cognitive and emotional growth.

Keywords

Interconnectedness, Wildfire, Ecological Awareness, Symbiotic Relationship, Forest, Sapling Tree, Animals

Overview

This literacy unit was created for grades preschool to first. The literacy curriculum unit is centered on Ana Crespo's *Hello, Tree*, is designed to engage young learners in exploring nature through language, observation, and creative expression. The unit integrates reading, writing, science, art, and social-emotional learning across multiple lessons. Students develop key literacy skills—such as vocabulary building, descriptive writing, story sequencing, and comprehension—while cultivating a deeper appreciation for trees and their environment. Activities encourage sensory exploration, visual literacy through illustration analysis, and personal connection with nature. The curriculum also incorporates environmental stewardship, fostering responsibility and mindfulness. Through these interdisciplinary experiences, educators can inspire student curiosity, creativity, and meaningful engagement with both literature and the natural world.

Narrative Framing

This ten lesson unit begins with the creation of an anchor chart where young learners share their responses to key unit terms such as interconnectedness, wildfire, ecological awareness, symbiotic relationship, forest, sapling tree, animals, tree, and climate. These terms are revisited throughout the unit to build vocabulary and support oral language development as students explore and explain concepts through various activities. Young learners are able to share their responses through a drawing and telling activity, a writing prompt, or brainstorming as they learn key unit terms such as: sapling tree, animals, wildfires, environment, etc.

The first three lessons (lessons 1-3) focus on critical thinking and inquiry, prompting students to consider questions like: What is a tree? What is a wildfire? What does it mean to plant a tree? During this phase, students are also introduced to Ana Crespo's *Hello, Tree*.

Lessons four and five (lessons 4-5) engage students in hands-on learning by planting a seedling pine tree in a milk carton, followed by planting a sapling tree in the school community, including the playground and surrounding areas. Each planting activity spans a week, allowing students to develop a deeper awareness of plant growth and the care required for young trees. These experiences are reinforced through oral explanations and group discussions.

The final five lessons (lessons 6-10) emphasize oral language development through mini hands-on activities that encourage students to compare humans with trees, and animals

with trees/forests. Throughout the unit, environmental stewardship is a key theme, gently guiding students toward responsible attitudes and behaviors toward nature.

By situating literacy within the broader context of ecological mindfulness and creativity, this curriculum transforms *Hello, Tree* from a story into a meaningful pathway for nurturing curiosity, empathy, and lifelong learning in young learners.

At a Glance

Title	Hello, Tree Explorations
Unit Time	8 – 10 weeks
Grade Level(s)	Preschool – First
Core Text	<i>Hello, Tree</i> by Ana Crespo Illustrated by Dow Phumiruk
Supporting Texts	Links to other reviews, author interviews/talks, related books, lesson plans, or other resources: Hello, Tree by Ana Crespo to author interviews, lesson plans, and other resources.
Objectives	• Students will understand and explain why trees are important. • Students will understand the basic idea of planting trees to help nature. • Students will connect wildfires to the story <i>Hello, Tree</i> by Ana Crespo and the importance of caring for trees. • Students will collaboratively create an anchor chart to reinforce learning. • Students will develop an awareness of care and plant growth through planting a sapling tree and pre-mature trees. • Students will engage in a group discussion and activity to reinforce learning.
Materials and Resources	Slides * Climate Lit Entry * Resources * Curriculum Unit

Going Forward

Cross-Disciplinary Integration: *Hello, Tree* by Ana Crespo can serve as a bridge between literacy, science, art, and social-emotional learning. Ongoing projects like journaling tree observations, environmental stewardship initiatives, or creative storytelling inspired by the book help sustain engagement.

Skill Development: Introduce another genre of books that requires repeated readings to develop that comparison of two stories; however, you can research other children's literature to deepen the knowledge of young students. This provides opportunities to practice comprehension strategies, oral language development, and vocabulary expansion, adapting activities to students' growing literacy levels.

Community and Environment Connection: The book can inspire long-term community-based projects such as tree planting, nature walks, or environmental care programs that keep learning grounded in real-world experiences.

Reflective and Creative Expression: Throughout the year, students can revisit the book's themes through creative writing, art, and discussions, reflecting their evolving perspectives and deepening ecological empathy.

References

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