Perspectives from Rural Maine Educators:
Supporting and Inspiring Youth Through Place-Based Education

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ABSTRACT

To adapt to changing landscapes, young Mainers must develop knowledge and skills to connect their natural environment to their ways of life. One way to support youth in this endeavor is through place-based experiences, which make learning geographically and personally relevant and build upon knowledge of industry, technology, natural resources, and local history. In this article, we present a case study of nine in-school and out-of-school rural Maine educators to examine if and how place-based education is implemented in rural contexts. We find that while educators do not necessarily elect to use it to structure their activities, the ways in which they engage with youth are prime examples of place-based education in practice. We highlight shared features and challenges of designing and implementing place-based experiences for youth and detail five examples of activities anchored around local changes in natural phenomena.

INTRODUCTION

Place-based education (PBE) is a pedagogical approach gaining popularity in K–12 education. While the term is relatively new in instructional discourse, it reifies a process of learning that traces back to philosophies and practices of Indigenous ways of knowing (Semken et al. 2017). Sometimes referred to as an experiential or community-based framework, place-based education aims to connect learning rooted in physical place with the culture, ecology, politics, and economy of the community living in that place (Smith 2002). PBE can be adopted in any setting, from the most urban to the most rural, and is often presented as a strategy to deepen learning about and connection to the natural world through authenticity and cultural relevance. Situating youth learning in nontraditional environments through experiences like outdoor field trips and scouting excursions has been a cornerstone of US educational practice for over a century (Rillo 1964). While these types of outdoor, hands-on experiences have been shown to benefit youth learning, social skill development, and engagement (Becker et al. 2017), they tend to prioritize physical activity and being in nature rather than cultivating an understanding of the interplay between nature and the people who live, work, and build community around it.

PBE is grounded in understanding how people develop a sense of place through connection to the physical features of a space and experiences of the people within it (Ardoin 2006; Ardoin et al. 2012). In practice, PBE can take many forms, but generally includes design principles like design thinking, inquiry, learner-centered practices, and using local phenomena as a lens through which to understand global challenges (Vander Ark et al. 2020). Granit-Dgani's more recent interpretation expands on these principles and articulates the approach as learning in, of, from, and for the sake of or with place (Wilson et al. 2024). In this model, learning in place emphasizes physically situating the learning in the environment of focus. Learning of place describes understanding the features and systems of a place. Learning from place occurs through exploration and investigation, enhancing sense-making of local patterns and trends and how these might translate to other places. Finally, learning with place is fostered through collaborative effort to see it thrive.

PBE offers an inherently interdisciplinary lens through which to make sense of the world. The significance of place lends itself particularly well to science, technology, engineering, and math (STEM) learning and investigations of scientific phenomena in the face of change. PBE can be used to make global science concepts and phenomena locally and personally relevant. It also sets the stage for the development of skills like collaboration, communication, and leadership.

Generally, educators have expressed interest in and enthusiasm for PBE as an instructional framework (Tan and Atencio 2016; Sewright 2016). However, as is often the case with integrating novel pedagogies,

implementing PBE also presents very real challenges. Adopting a teaching style with no specific textbook or activity guidelines can be daunting for educators, administrators, and program organizers. To make connections for their learners, educators must make time to foster relationships with community members and stay informed about and involved with community happenings. And all of these things need to happen in an environment where youth have the pathways to contribute to and grow community knowledge in meaningful ways. For these reasons, PBE is often introduced to educators through professional training programs or researcher-practitioner partnerships or delivered to youth through organizations with PBE-aligned missions (Yemini et al. 2025).

The move to PBE from more traditional approaches as a tool for STEM learning may seem like a significant and onerous pedagogical shift. However, in contexts in which educators and their learners are already deeply connected to place and the people within it, it is perhaps happening in tandem with the social, political, and industrial changes these communities experience. One context ripe to study this evolution is the educational landscape of rural communities. The natural world is a foundational part of life for rural youth; from an early age, kids bike through forests, help on the farm, and participate in community events celebrating the changes of the seasons. Close-knit communities emerge from sparse and isolated populations, creating an avenue for youth and adults to participate in collaborative planning and decision-making. As a result, institutions like schools, after-school programs, and nonprofits are able to develop partnerships that support diverse learning experiences in which youth can access local sites, engage in authentic data collection and inquiry, and develop voice and agency in addressing relevant local issues. Living, working, and growing in and with nature provides a rich context for STEM learning, setting the stage for the development of content knowledge and skills that can be applied in and out of school (Avery 2013; Sewright 2016).

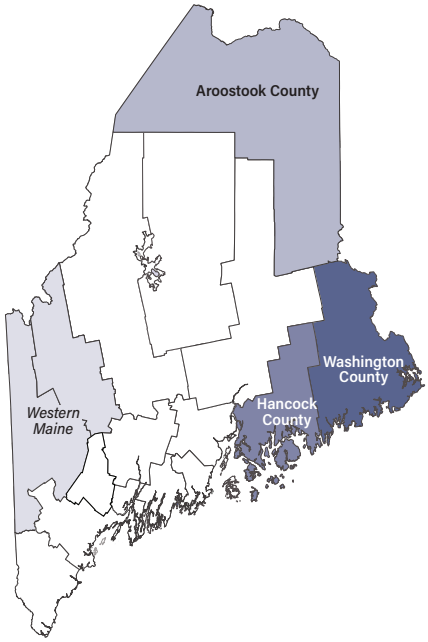
In many ways the state of Maine, one of the most rural in the nation, is setting the standard for how to integrate place into youth STEM instruction and programming. In the 2022 Community-Based Outdoor and Environmental Learning census, 51 percent of responding classroom teachers and 73 percent of responding out-of-school educators indicated that community-based learning was a goal for their school or organization (Teach ME Outside 2022). The recently passed LD 1543—An Act to Establish the Maine Green Schools Network—is dedicating resources to support environmental education and sustainability initiatives in Maine public schools. Coalitions around nature-based education, like Teach ME Outside and the Nature Based Education Consortium, are collaborating with community members to provide and advocate for hands-on outdoor programming for youth.[1] Rural Aspirations Project values the history and knowledge held within rural communities by supporting teachers and administrators in designing learning that is connected to lived experience and local issues (see Soll et al. 2025). Such efforts also recognize the importance of providing long-term connection and professional development at a regional level. The Gulf of Maine Research Institute has supported educators in this work by establishing and nurturing a network of rural regional teacher groups for a decade; this ultimately grew into Learning Ecosystems Northeast (LENE), a group of collaborative, regional peer educator communities dedicated to enriching learning through hyper-local climate change education. Numerous community-based organizations, each unique in their structure and design, work to weave together the assets of their place with the needs of educators and youth learners and are critical to the learning landscape in rural Maine.

Here, we explore if and how rural Maine educators' connection to the environmental landscape, community, and changing natural phenomena of place informs their STEM instruction and programming, particularly in the context of PBE. We detail examples of specific activities and programs and present common goals, assets, and challenges. We find that the activities in which these educators engage with youth clearly demonstrate the dimensions of PBE, even if educators are not explicitly using PBE as a framework for design and implementation. Finally, we conclude with considerations for future studies and recommendations for supporting educators and youth in this community-oriented learning.

EDUCATOR GROUP

We highlight the experiences of four in-school and five out-of-school educators from rural communities across the state who engage with K-12 youth. Educators were contacted through their connection with a professional learning network focused on authentic STEM learning and were recruited with the

FIGURE 1: **Geographic Distribution of Educators in Case Study**



aim of constructing a sample with a diverse range of regional representation, years of experience, learning contexts, and program variety. The geographic reach of the final educator sample is represented by the colored regions of Figure 1. Regions in white indicate urban regions where educators were not contacted, regions where we did not have contacts through the professional learning network, and regions where we did not hear back from prospective participants.

The regions represented in our sample are emblematic of rural Maine, yet also reflect a rich diversity of community infrastructure, industry, and values. Ties to local outdoor recreation like hunting, swimming, skiing, and camping are common in each region. Landscape features like forests, lakes, rivers, mountains, and rocky coastlines contextualize the daily lives of young and old. These regions are made up of areas that are mostly unorganized townships and some are composed of multiple towns, a few cities, and plantations. In some regions, it takes 35 minutes to travel east to west; in others you can travel over 3 hours north to south before spanning one county. Each region has thriving local industry, such as farming, logging, and lobstering, that drives economies and connects people to local history. These industries are more recently complemented by the development and availability of newer industries like aquaculture, healthcare, and energy production. These regions include areas with large regional school units that serve multiple towns as well as districts with one school that serves grades K–8 for a single town. There are also districts that have developed partnerships between the school district, land trust, and organizations focused on health and wellbeing education, life skills training, and/or career and technical career training.

The educators also represent a diverse range of personal backgrounds, roles, and experiences. Many grew up in Maine or have familial ties to their region. Seven of the nine educators currently have specific STEM-related roles. Some have been professional educators for a few years, while others have worked with youth for decades. As so many rural educators do, each educator takes on many roles in their learning context and in their community. For example, a classroom teacher teaches multiple subjects across multiple grades and leads multiple after-school programs. A few of the educators who participated are the only ones with that role in their county, region, or (to the best of our knowledge) across the state.

METHODOLOGY AND SAMPLE LIMITATIONS

Eight of the nine educators engaged in an approximately hour-long interview with the two lead authors (one interview was conducted with one author) and remaining questions were clarified via email. During their interviews, educators were asked to describe their general experience working with youth, if they engaged in specific programming tying learning to community and place (and to elaborate on a specific example if so), and about the landscape of STEM learning in their region. To create a space from which themes around pedagogical choice could be identified inductively, language around "place-based education," "sense of place," and "outdoor education" was explicitly omitted from initial interview questions. During interviews, when educators highlighted elements of activities or programs with connections to PBE or outdoor education, this terminology was used by the interviewers only to probe for further detail.

Interview transcripts were reviewed for each educator, for educators within a given region, and across the sample as a whole. We employed grounded theory (Strauss and Corbin 1994) to extract themes from the shared educator experiences. These themes were refined to specifically explore how educators incorporate change

in natural phenomena into their instruction; how educators connect their instruction to place, local industry, and community; and the challenges educators face in their practice. Throughout the analysis process, we engaged in member-checking (Elo et al. 2014) with participants to ensure their experiences and those shared about their communities and regions were represented authentically.

While the educator group in many ways is representative of rural STEM educators across the state, their collective experience also likely exhibits some bias. Educators were recruited through their connection to a specific professional learning network, indicating that at some point, they or their organizations placed value on authentic STEM learning. Each educator had academic training in science (e.g., a bachelor's or master's degree) or a personal passion for STEM topics and teaching and was dedicated to engaging youth in the outdoors. While some insight was shared about shorter, single-interaction programs, they also each shared the desire and ability to sustain engagement with youth over extended periods of time (e.g., a whole school year, a series of after-school events). These factors certainly influence these educators' choices around facilitating youth learning and should be considered when interpreting our findings. We leave further investigation into these considerations and how representative they are of the experience of rural STEM educators for future study.

PBE FOR STEM LEARNING EXAMPLES

Here we share examples of programming in which educators leveraged connections between nature, community, industry, and youth interest to create interdisciplinary STEM learning experiences. For each, we reframe how these educators implemented learning in, of, from, and with place as exemplars of PBE in rural contexts. To protect educator confidentiality, their names have been changed to pseudonyms. A summary of these activities articulated through this lens is presented in Table 1.

Each of these examples is not only grounded in place, but in changes tied to the natural landscape. Despite this clear response to changes driven by natural phenomena, educators did not always highlight youth learning of the mechanism behind these changes as a key learning objective. Rather, they emphasized observing effects, investigating impacts, communicating findings, and preparing for change to come.

Noticing the Changing Natural Landscape

Providing the opportunity for learners to develop their scientific noticing and observation skills is a key goal for Fern, the director of a municipal library in a region where access to nature abounds. Fern runs the library, trains staff, and designs and runs programs for youth of all ages. Much of her programming focuses on youth exploring the outdoors, learning in and of place on public trails near the library, on local farmland, and in the forests on her personal property. Fern uses her community connections to take youth to explore local farmland and engage with farmers. She builds on students' personal experience with agriculture to connect their learning and observational skills to the decisions farmers must make to adapt to changes in their local environment. She takes youth to see the process of tapping trees and collecting sap during maple syrup season and to farms where potatoes, carrots, and fiddleheads are grown. She facilitates discussions around how to apply learning from one farming context to the next. She encourages youth to ask questions about what they observe and discuss why some farmers might grow sunflowers and not harvest them. In addition to farm visits, Fern takes small groups on hikes on local trails. On these excursions, she encourages learners to notice everything from the temperature outside, to the birds in the trees, to the leaves on the ground, and asks them to reflect on how what they notice now may be similar or different to their observations on a prior hike. She takes pride in youth learning from place, sharing a memory of a youth who identified a new mushroom species on a hike that Fern herself had not yet noticed. Fern wants to cocreate a digital archive of phenological change with the youth in her region. Taking photos is already a cornerstone of her field trips, and she hopes to help create a resource where youth are leaders in documenting change and informing the community.

Investigating Changes in Local Species Population Dynamics and Distribution

Applying and extending observation and analysis skills to specific changes in local species populations is a prime context for PBE in these communities. Sparked by youth curiosity, these examples highlight how youth are exploring changes in their ecosystems and making connections to recreation, community, and industry. Each of these experiences are also grounded in authentic inquiry practices, demonstrating science as a process in which

TABLE 1: **Summary of Example Activities Described by Educators**

Educator	Educator role	Activity summary	In place *where it happens*	Of place *features of focus*	From place *understanding and applying patterns and trends*	With place *engaging with community members*
Fern	Municipal librarian	Guiding exploration of local farms and nature areas for youth of all ages	Trails, on farms, in forests	Changes in farming patterns and practices Native species	Transferring learning at one farm and applying to the next Comparing species they notice on various trails	Talking with local farmers about changes in harvest season, crops, etc. Creating a public digital archive to track local change over time
Abby	Middle and high school STEM teacher	High school research project studying river ecosystem	River near the school	Fish population distribution and diversity	Extending results to think about invasive species and fishing practices	Sending data to researchers and getting results back
Grace	Elementary and high school gifted and talented teacher	Elementary-school research project studying changes in bird migration	Observing feeders at school and regional birding festival	Types of birds regionally and statewide	How observations of population shifts in their region might extend to other regions	Learning with community about bird migrations from local experts and researchers
Carly	Career and technical education high school teacher	High-school research project studying invasive species	Water tanks in the classroom to simulate ocean conditions	Invasive and native ocean species	Patterns of invasive species behavior and distribution and potential statewide application	Presenting at the Fisherman's Forum
Emmy	Out-of-school program staff	Series of hands-on programming inspired by youth lived experience	Woods, grassy areas, etc. to collect ticksTown dike	Types, location, prevalence of ticks Coastal flooding events	Extrapolate what they're learning about ticks to a statewide context Relationship between flooding events and infrastructure	Sending data to a state-wide tick project. Getting information back to inform best outdoor practices Presenting findings to community forum
Hannah	Land trust environmental educator	Series of hands-on programming inspired by youth lived experience	Town causeway beach planting beach grass	Relationship between beach and causeway; features of beach grass	How humans can support habitat loss	Writing to the newspaper to protect their beach grass

Note: organized post-hoc in the Granit-Dgani PBE framework (see Wilson et al. 2024).

information is constantly being gathered and our understanding of the world is being refined.

Our first example comes from Abby, a middle and high school STEM teacher whose teaching philosophy is that youth learn best when they're "doing" science. When possible, Abby engages her learners with hands-on, data-rich experiences and emphasizes that actively collecting, analyzing, and talking about data will help them not only in her class but also in life outside school. One of Abby's high-school class research projects was catalyzed by her students' interest in the fish population in the nearby river. The class partnered with the University of Maine's Maine-eDNA project and received supplies for their investigation.[2] Students collected water samples containing the fish DNA from the river, sent the samples to the university research team, and received data about what the samples showed. They learned that they had collected samples of a species of brook trout that had not yet been coded in the project system. The students also learned that their samples showed evidence

of fish species that should not live in such cold, northern waters. These results led to rich discussions about predicting population range shifts and how invasive species impact ecosystem balance. Ultimately, the students concluded that the mystery fish was likely an imported bait fish, which led to further discussion of how recreation may affect the native environment.

In a multiyear project inspired by students' observations of changing local bird populations, Grace, an elementary and high school gifted and talented teacher, designed a project to guide their learning of birds endemic to their region and across Maine. She encouraged them to learn from their observations and archival regional reports, identifying species appearing more frequently than in previous years. Eager to apply their knowledge and contribute to Project Feederwatch, students collectively made decisions around which feeders and food to purchase so that they could more closely observe birds in their area. They also attended a regional birding festival to learn about the benefits of uninterrupted tracks of land for migratory birds. The following school year, students created a video documenting their research about the challenges of Rose-breasted Grosbeak migration and entered it into a STEM film festival. They also monitored BirdCast and discussed the connection between weather, climate, and migration patterns. Throughout this project, students developed research, collaboration, and communication skills; explored the relationship between weather and climate; and cultivated a deeper understanding of how local changing climate patterns affect native and new species in their area.[3]

Another example comes from Carly, a career and technical education teacher in a coastal town where lobstering and clamming are important sources of income and history for the community. As a general pedagogical philosophy, Carly prioritizes creating opportunities for her high-school students to ask questions, craft hypotheses, and conduct experiments. Many of her students are involved in their families' businesses, and their questions often stem from real-world challenges facing coastal industries. One challenge students sought to investigate was around green crabs, an invasive species in Maine that poses a threat to native shellfish species, harming the productivity of Maine's soft-shell clam fishery in particular. Students wanted to understand if and how green crabs are eating clams. Because she could not take her students to observe this phenomenon in the wild, Carly set up tanks with crabs, clams, and water environments with differing temperatures in her classroom. For a few months, students studied the relationship between green crab predation, water conditions, and the size of the clams, ultimately presenting their findings at the statewide Fisherman's Forum. Although students did not have enough data to make recommendations for industry action, they engaged in conversation with industry experts and generated ideas for how resources might be allocated in the future. The experience gave these students a voice in their community and helped tie their classroom learning to experiences at home and to those of others in their community.

Connecting Directly to Changing Community Experience

In our final set of examples, we find educators responding to the changing natural landscape and how it affects youth lived experience, particularly routine, everyday activities.

Emmy is a staff member in a popular out-of-school youth development program. She anchors her programming in supporting youth development of life skills and resilience. One common challenge faced by the youth in her region is the increasing prevalence of ticks and the diseases they carry. Emmy runs programs to prepare youth of all ages to enjoy the outdoors safely and fosters agency and ownership by helping them contribute to the community's growing understanding of how the tick population is changing. She implements hands-on activities so students learn practical solutions to dealing with ticks like wearing light-colored clothing and removing ticks by modeling with sponges and pins. She also collaborates with youth by helping them collect and submit ticks to a statewide tick study that monitors the movement and presence of tick species along with tick-borne diseases across the state. After receiving data, Emmy adjusts her programming, so it reflects the evolving reality of her region's tick population. Another challenge directly affecting the youth in Emmy's region is an increase in coastal flooding events; flooded roadways may force detours on the way to school, or a flooded dike might keep their families from selling their catch of the day. Drawing on youths' experience, Emmy implements simulation-based activities with middle- and high-schoolers that inspire them to think critically about how the geographic features of their communities, like proximity to the coast or elevation above sea level, might be tied to impacts on infrastructure. Youth can then collaborate with each other and community stakeholders to propose solutions for community resilience. Emmy has also seen this

theoretical experience transfer into the real world. One youth from her community was interested in investigating how features like ocean and river water salinity, temperature, and pH might affect events around the dike in his town. He used his findings as the basis for a presentation for his after-school program in which he discussed potential solutions and their environmental, human, and ecosystem-level impacts. After this presentation, community members asked if he would serve on a local committee actively working on solutions, bridging learning across contexts and generations to help the community.

Our last example comes from Hannah, an environmental educator for a land trust. In her position, Hannah plans programs, engages directly with youth, and connects with local schools to provide opportunities for youth to explore and learn in various public land areas in her region. Hannah describes an ongoing project collaborating with youth to maintain and protect the causeway (a rock structure with road over the top, surrounded by beach) on which their community relies to connect the island and mainland. Sea level rise and intense storms have undercut the causeway, and the beach protects the causeway from storm damage by absorbing some of the impact. The youth noticed the shape of the causeway was changing and connected some of that change to structural damage inflicted by off-roading vehicles. They wanted to help their community and proposed planting beach grass to stabilize the beach, applying their learning from other ecosystems where beach grass provides a natural barrier and protects coastline structure and habitat. Hannah supported the youth in this effort, facilitating multiple planting excursions and checks on progress. Shortly after their first planting session, the youth found their newly planted beach grass had been destroyed by off-roading vehicles. Determined to advocate for their project, they connected with the local newspaper to educate the community about their planting and the significance of the beach grass for the causeway. This initiative resonated with the larger community, who then worked with the youth to create and install signage to protect the causeway.

GENERAL FINDINGS ON STEM PBE IN RURAL MAINE

Analysis of the interviews revealed that connecting the natural and social dimensions of place is a common and consistent thread in STEM programming for these educators. Each educator shared examples of youth learning outdoors and engaging in programs to learn about region-specific natural phenomena. They also shared examples of youth developing solutions to real-world problems, communicating them to a broader audience, and collaborating with adults to affect change in their region. Several key goals, assets, and challenges emerged as educators detailed their experiences and spoke to the broader landscape of STEM education in their rural communities. Access to natural settings like hiking trails, lakes, and rivers, was a boon expressed by all, but perhaps more telling were shared factors around learner experience, educator pedagogies and training, and community infrastructure.

First and foremost, educators voiced a shared goal of creating locally and personally relevant experiences for youth in which they are learning not only content knowledge, but also valuable life skills. Leveraging familiarity with place was a foundational pedagogical move to achieve this goal. As they described their learners, each educator mentioned how youth in their area grow up "being outside." From an early age life is connected to the outdoors. Youth learn through experience how natural patterns affect their hobbies and seasonal activities like harvesting and hunting that puts food on their tables. They understand how the places where they play interact with how family and community members earn their livelihoods. This integration of the natural world across different areas of life helps youth develop a unique connection and comfort with their environment and sets the stage for educators to create rich place-based opportunities to keep youth engaged, expand on their interests, and provide them with the opportunity to develop skills like collaboration and leadership.

Another shared goal was to individualize learning so every learner could participate in a meaningful way. This is in part facilitated through small group sizes, in which the needs of each learner could be attended to and addressed. In some cases, this was naturally supported through the size of the town or district in which they work—less populated communities have fewer youth in a single class or out-of-school program. But in other cases, school district leaders or program directors in larger communities are making concerted efforts to organize programming that supports smaller groups of learners for entire grade cohorts in a district. No matter the context, educators described how engaging in place-based programming benefitted all learners, particularly those who do not thrive in more traditional learning environments. They also shared how placed-based activities help youth

find their voices and become advocates for their communities and their futures.

Relationships with and support from institutional administration, community members, and community organizations was identified as a critical asset. Each educator commented on how members of their administration (e.g., district leaders, program directors, governing boards) are supportive of learners engaging with the outdoors. This enables educators to have some flexibility in where and how they engage with youth. Administrative support also often leads to strong partnerships with community organizations, creating a network of dedicated people who are then able to reach youth in multiple settings. Adults in these partner institutions (e.g., other educators, industry professionals, town council members) serve as role models, support career exploration, and become familiar faces students recognize at community events. These connections can lead to internships, employment opportunities, and future career pathways for youth. As these adults collaborate and learn together with youth, they can not only adapt and enrich their programming but also adjust how they respond to changes in the natural landscape both personally and professionally.

Another vital asset is the educators themselves. The programs were made possible through their (and their collaborators') dedication, creativity, and effort. For example, one educator highlighted the efforts of a small volunteer corps keeping their region's only science center operational. Several educators mentioned that the programs that they run are unique to their regions, and in some cases, to the state. In these rural communities, educators are the holders of the knowledge, experience, network connections to other programs and educators, and energy necessary to facilitate programs and sustain their implementation over multiple youth groups or school years.

Educators also identified a diverse array of challenges. The significance of these challenges was best illuminated when a program feature was mentioned as an asset for one educator and a challenge for another. This was most commonly shared in the context of infrastructure support. Some educators shared how support from their principals or supervisors gives them the flexibility to organize and implement novel learning opportunities; others shared how lack of support prohibits them from fulfilling the potential they see for STEM learning in their contexts. Access to technology was also essential for some educators, but limited access to computers was challenging for others. One educator described how having a van for their learning context enabled them to transport learners to outdoor areas; others described lack of transportation as a limiting factor in exposing learners to a greater diversity of natural resources, industries, and cultures. In the context of STEM learning, a particularly interesting contrast that emerged was around the idea of what counts as science or science learning. Many educators described community support for their more nontraditional means of instruction, but some shared experiences of community pushback or skepticism about the applied, nontextbook approach. This disconnect between alternative forms of science learning and the community understanding of high-quality science can make it hard for educators to get support to build these unique and effective programs.

Synthesizing the educators' comments, it is clear that they are implementing learning experiences that embody and actualize the principles of PBE and that share many of the assets and challenges identified in the research literature. Perhaps the most compelling finding is that when elaborating on their pedagogies and experience with youth, none of the educators used the terms "place-based education" or "place-based learning." In contrast, "outdoor education," "outdoor learning," and "hands-on learning" were used to refer to their instruction and specifically to instructional techniques supported by their communities. While it is likely that the educators in this group have participated in some PBE professional learning (given their connection to the recruiting network), they do not spontaneously associate their work with the PBE framework. Instead, they allude to individual principles like learner-centric design and the outcomes of 21st century skills. This suggests that these educators are not necessarily taking PBE as a holistic pedagogical approach per se, but that they elect to apply their general pedagogical expertise to craft locally relevant experiences driven by the lived experience of their learners and their experience as educators and members of their regional communities.

CONCLUSION

In this article, we presented a case study of the experience of nine rural educators, highlighting examples of PBE activities driven by changes in the local natural landscape and summarizing how these educators integrate place-based education (PBE) into their practice. We find that the strengths and challenges described by these educators reflect much of what is reported in the literature.

Of particular note are two findings around reifying components of this instructional approach. First, we find that despite engaging in PBE educators do not name it as such, and we hypothesize that this could be attributed to three factors. It is possible that these educators may never have heard of PBE, but this seems unlikely given their professional training. It may also be that these educators are such experts in the individual design principles of PBE that it is through those components that they build a mental schema of their practice. Perhaps to them, the overarching framework doesn't matter as much as the individual principles that contribute. Or, overlapping pedagogies like environmental education and community-based learning might be more familiar. While this finding does not affect educators' practice, it does have significant impacts for research. We recommend that future investigation of PBE consider experiences that exemplify the dimensions of the approach and not just those that self-identify with the framework. Second, we find that across communities and community members in these rural regions, there is not always a shared understanding of what counts as science, which may lead to a lack of support and resources. It is likely that some community members do not recognize how daily practices like financial decision-making, soil analysis, and aquaculture site selection use STEM skills (e.g., Esmonde et al. 2012; Snow and Dibner 2016). By recognizing that they engage in these practices themselves, community members might be more willing to provide support for new forms of science learning.

Considering the case study in the landscape of PBE more broadly, we posit that unique conditions of rural communities help foster an environment in which educators and their students are naturally inclined to engage with their surroundings, allowing PBE to develop organically. This includes features such as the diversity and abundance of natural phenomena, culture that fosters an outdoor lifestyle from an early age, a rich history of industry and economy tied to nature, and the ability to tailor learning experiences to the interests of smaller groups of learners. As do most educators, the educators in this case study clearly leverage personal and community assets to orchestrate experiences for their youth. Exploring the impacts of these specific rural assets on youth learning and affective outcomes, understanding the degree to which each asset or combination of assets optimizes PBE, and recognizing if and how these rural assets could translate to more urban contexts would be worth future study.

Continuing to support PBE in Maine's rural communities is critical. Understanding the interplay between the changing natural landscape and evolving industry, economy, and community values will be essential as we move into a more unpredictable future. Legislation allocating grant funding to PBE activities could provide necessary resources and infrastructure. We must also empower educators to dedicate their valuable time and energy to nontraditional modes of instruction and share lessons learned from their experiences with others. One way to do so is to cultivate the conditions necessary for PBE to thrive: creating networks that empower educators to form partnerships within their communities and providing them the opportunity to codevelop and share hyper-local resources, curriculum, and opportunities. Support for PBE also means providing backing at the district and organizational level and encouraging partnerships between schools, community organizations, and industry partners. Furthermore, to facilitate this process, educators must be allowed to use their community knowledge and expertise, which may sometimes require deviating from conventional textbooks and instructional models. We must also continue to develop avenues for youth to actively engage with their communities through platforms such as newspapers, councils, and forums. If we can do all these things, PBE can flourish, and Maine will continue to be an example of how rich experiences grounded in, of, from, and with place can benefit all youth.

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NOTES

1 https://teachmeoutside.org/; https://www.nbeconsortium.com/
2 https://umaine.edu/edna/
3 Project FeederWatch, https://feederwatch.org/; BirdCast, https://birdcast.info/
4 The questions were framed or grouped into tactical considerations (i.e., financial reserves in local Economic Development Corporation, limited freely available housing stock, Main Street in Fort Fairfield has fiber connectivity, partnerships with local and state groups for resources and expertise), key insights, and market-, wisdom-, technology-, and future-related.

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