



Wildlife Photographs: Seeing, Caring, and Learning Through Place-Based Education

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INTRODUCTION

To ensure global sustainability, the next generation must care about environmental systems, assess environmental problems, and make informed decisions (Monroe and Krasny, 2016; Fang, 2020). Unfortunately, the level of environmental literacy in the United States is still surprisingly low (McBeth and Volk, 2009; Plutzer et al., 2016). Without higher environmental literacy, pressing sustainability challenges (e.g., climate change, pollution, and inequitable distribution of resources) will continue (Kinslow et al., 2019). American teachers are expected to meet national and regional academic standards, many of which include socio-environmental objectives (Hufnagel et al., 2018). Place-based education (PBE), which uses the local context to teach about social ecological systems, is one way to meet these goals (Woodhouse and Knapp, 2000). Some PBE scholars focus on biophysical places (e.g., Smith, 2002), while others also consider socio-cultural attributes (e.g., Bowers, 2008). Regardless of scope, PBE can be designed to encourage civic engagement (Gruenewald, 2003). Our integrated perspective defines PBE lessons as: (1) being grounded in local biophysical and/or socio-cultural context; (2) fostering partnerships between schools and community members; (3) exploring content in interdisciplinary ways; (4) employing experiential pedagogies; and (5) promoting civic engagement (Wright et al., 2021).

Because promoting civic engagement may feel aspirational for some teachers, fostering place attachment may be an important first step (Semken and Freeman, 2008; Kudryavtsev et al., 2012). When people feel connected to their environment, they feel protective of that space (Gruenewald and Smith, 2014), call it home (Altman and Low, 1992), and develop a positive emotional connection to it that helps shape their identities (Hay, 1998; Morgan, 2010). In fact, the theory of place identity emerged from research on place attachment and explains that people's perceptions of who they are can be shaped by their childhood memories of their social and physical place (Proshansky et al., 1983). Place identity develops as children spend more time outdoors, accumulate experiences, connect positive emotions with places, and develop their sense of belonging in social ecological systems (Chawla, 1992; Dallago et al., 2009). Then, as place identity strengthens, people are more likely to advocate for and protect that place (Dresner et al., 2015), or express intentions of doing so (Buta et al., 2014; Stefaniak et al., 2017), or being civically engaged (Anton and Lawrence, 2014). Considering that place attachment develops in early adolescence, (Sobel, 1990), it makes sense to support middle school teachers in curriculum development efforts. Here, we advocate for lessons that center on visual evidence of the local environment to prompt students' place attachment.

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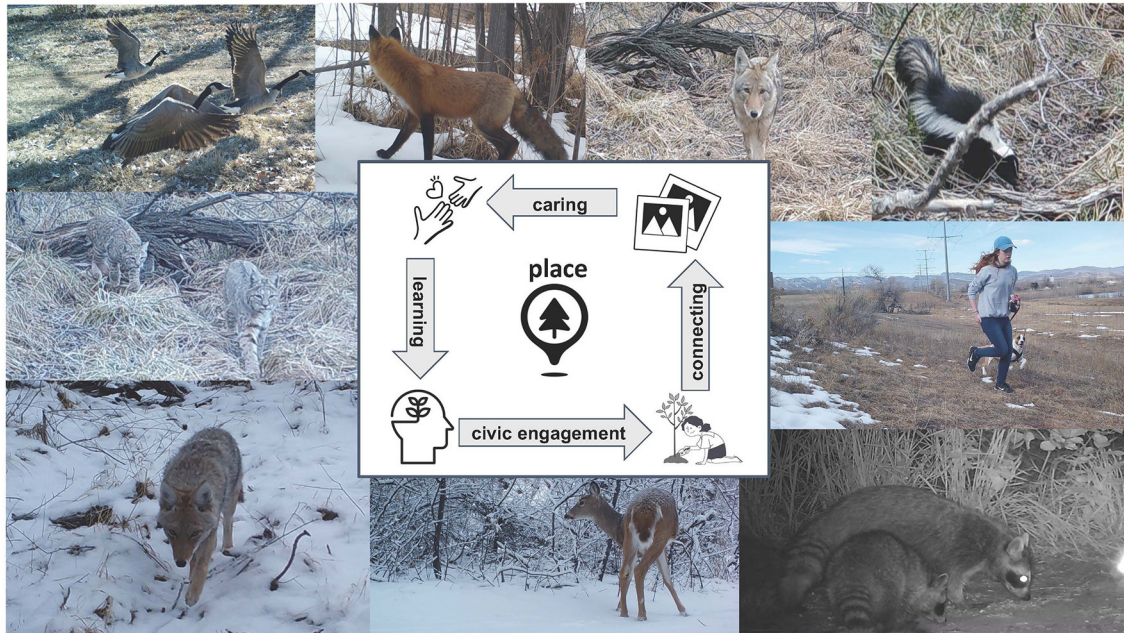


FIGURE 1 | Camera trap photographs allow students to discover “hidden” wildlife, potentially prompting them to connect to, care for, and learn about their local place, often precursors for civic engagement. Images from camera traps were collected by middle school teachers and students in Poudre School District with support from Kevin Crooks.

VISUAL IMAGERY IN PLACE-BASED EDUCATION

Analyzing images of local environmental disturbances motivates people to be change agents (Sheppard, 2005). Photographic analysis research shows that identity, belonging, and place-attachment are tightly connected constructs (Freeman et al., 2022) and that using photographs to initiate discussions with community members, especially children, is particularly effective (Cappello, 2005; Peroff et al., 2020). Visual images convey multiple concepts at once, evoke emotive responses, and are memorable (Rodriguez and Dimitrova, 2011; Brantner et al., 2013). Furthermore, when students collect visual images, they gain ownership of the data and use them to communicate with others (Rodriguez and Dimitrova, 2011; Altinay, 2017).

Beginning in Fall 2017, we established a formal two-year partnership with middle school science teachers, university researchers, and a non-profit organization focused on wildlife conservation in the mountain west U.S. (Wright et al., 2021). Teachers explained their various goals: to integrate technology, focus on real-world examples, and allow students to analyze authentic data. We introduced them to camera traps to meet all three goals. Camera traps use infrared sensors to capture images of moving objects, including wildlife and people, and are an effective and widely used approach to non-invasively monitor and research wildlife activity and abundance (O’Connell et al., 2011). Indeed, digital technologies, like camera traps, are becoming increasingly important in real-world, data-driven conservation efforts globally (Buxton et al., 2018).

During curriculum development workshops, we collectively brainstormed with teachers the types of questions biologists ask about local human-wildlife interactions and then developed lessons on limiting resources, trophic interactions, and shared natural spaces.

Teachers were excited to use wildlife camera trap images from on or near their school grounds to help their students learn about local wildlife (Wright et al., 2021). Permission was granted by the school district and city to place camera traps in natural areas on or near schools to record urban wildlife. Teachers and students periodically checked the cameras’ SD cards and uploaded photographs to a shared computer drive. Professional development workshops provided teachers the time to (1) exchange and review curriculum, (2) decide how they wanted to use the photographic data, and (3) share how they were currently using these images in their lessons.

Teachers discovered that students cared deeply about issues in their own backyards and were excited to analyze photographic data, without disturbing natural areas, to determine what species were present and when they were active (Figure 1). Although teachers were not at first familiar with how to use camera traps and to identify photographed animals, we argue that it is well worth the effort because it allows students the chance to analyze visual images near their school grounds, uncovering a hidden world of faunal diversity that students often only learn about in textbooks. Discovering that nocturnal animals (e.g., coyotes, foxes, skunks) walked on the same paths that people used during the day elicited great enthusiasm among the students (Lin Hunter and Wright, 2019). Teachers perceived that their students were

more excited and informed about their local ecological systems after analyzing camera trap images, encouraging a connection to their community and discussions about conservation (Wright et al., 2021).

DISCUSSION

Visual imagery in PBE may be an impactful precursor of developing environmental literacy. Photographs provide details that may be missed in verbal or textual descriptions of natural systems, while eliciting emotions about a place (Rodriguez and Dimitrova, 2011; Brantner et al., 2013). Young (2021) argued that when people take or capture photographs, they become “visual citizens,” and when they share these images with their communities, they can promote collective action to conserve their environment. This is consistent with the goals of PBE: to increase students’ understanding of the environment while encouraging them to act within their community (Figure 1).

Although we argue that camera trap photographs can help students discover the “hidden” biodiversity of their environment, we can only surmise that this discovery then prompts them to care about their socio-ecological world and feel motivated to learn more about species diversity and abundance, as well as trophic interactions. However, the relationship between connecting, caring, learning, and acting is well-known in environmental education (Ardoin et al., 2020). Therefore, we posit that these attributes can be fostered when individuals take time to see and understand their environments through photographs. Simply supplying teachers with cameras may not be enough. Teachers need support in learning how to set up

the cameras, download the images from the memory cards, and sort through them to create a meaningful dataset for lessons. In our experience, teachers appreciated help from university wildlife biology students, scientists, and community conservation organizations (Wright et al., 2021). We found that teachers who demonstrated curricular agency and received initial support were more likely to teach using the wildlife photographs. The development of visual literacy may be a powerful component of developing environmental literacy that should be further examined if educators want to better equip global citizens to manage current and future environmental problems.

AUTHOR CONTRIBUTIONS

All authors listed have made a substantial, direct, and intellectual contribution to the work and approved it for publication.

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