Bridging Wonder and Rigor: Nature Journaling as Transformative Practice in Science Teacher Preparation

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Introduction

It was day two of a three-week study abroad experience in Norway. Our students were overwhelmed with awe as we settled into our temporary home in Bø, Telemark in Norway. The small town was far from urban, but our day so far consisted of walking 5 km through the city center to our classroom in the University of Southeastern Norway and then returning to our cabins in the RV campsite at the other end of town, with not a lot of intentional contact with nature. There was chatter amplified by the excitement of the new bonds that come with international travel in a small group. Already, laughter and playful banter filled the room. As we each settled in, I asked them to pull out their nature journals and return to the tree comparison activity from earlier in the day. For the next twenty minutes, they were invited to complete their journal page by adding rich description, color, questions, and details they skimmed over earlier in the day. In place of the excitement and heightened energy came a peaceful stillness.

This phenomenon of quiet peace coming over a group of students who are deep into a nature journaling task is not unique to the influence of a Norwegian landscape, although I can't say it didn't hurt. Through my years of experience taking students of all ages outdoors, I have always found that when I invite students to slow down and add their experiences in nature to a journal page, a calm settles in. The mindfulness that comes through this practice of creating and learning while embedded in an outdoor, natural setting is recognized as a positive psychological benefit that supports our well-being (Dussler & Deringer, 2020; Hart et al., 2013; McClain et al., 2025).

However, years of literature related to the impacts of learning in the outdoors demonstrate benefits beyond mindfulness and well-being. Through a review of empirical studies to describe a causal relationship between nature and learning, Kuo and colleagues identified several key findings. Evidence across the field indicates that nature-based instruction has been shown to be more effective than traditional, classroom-based instruction, regardless of topic, student, teacher, and place, and the impact increases with the amount of time spent in nature (Kuo et al., 2022). Increases in student achievement (Klemmer et al., 2005; Ozer, 2007; Wagner, 2000) and positive impacts on social and cognitive development (Martin, 2003; Rivkin, 1997) are primary motivations for the inclusion of outdoor education for K-12 science teaching and learning.

In a world that moves fast, and the changing landscape of employment and professional life moves faster, the development of so-called "21st century skills" has been a focus of educational reform. The holistic approach to science education (as opposed to discrete fact-based knowledge models) promoted by the Frameworks for Science Education and resulting Next Generation Science Standards is evidence of attention towards the development of 21st-century skills for K-12 learners (National Research Council, 2012; NGSS Lead States, 2013). Emerging research in outdoor science education indicates that science learning outdoors can contribute to 21st-century skill development, with particular evidence related to creativity and cooperation in students who are skilled decision-makers and problem solvers on their way to becoming responsible citizens (Dettweiler et al., 2022).

It has long been my argument that the practice of nature journaling is a powerful tool that helps us as science teacher educators encourage future teachers to connect their students to authentic learning environments, provide them opportunities to engage in a number of scientific practices, introduce them to content and concepts across scientific disciplines, and create an opening to consider crosscutting concepts within a variety of learning experiences (Feille, 2021b, 2025; Feille & Hathcock, 2023; Hathcock et al., 2022). I now add to that argument that the benefits of nature journaling and time in nature far exceed the measurable academic outcomes that are so often our primary focus. In a time where our students as future teachers are inundated with critiques and attacks on educators and the attempts towards dismantling of the educational system, it is almost a wonder they return to our classrooms at all. I use nature journaling as a tool to help them slow down, find meaning, and reconnect with the natural world, as well as their purpose as future teachers.

Evidence and Examples

Preservice Teachers and Outdoor Education

While more and more programs incorporate a component of nature-based or outdoor teaching in their preservice teacher education, the lack of awareness, training, and support is often noted as a limitation for future implementation of schoolyard pedagogy (Feille, 2014, 2021a; Tal & Morag, 2009; Tuuling et al., 2019; Wolf et al., 2022). In an extensive review of research related to outdoor teaching in initial formal teacher education, Wolf and colleagues summarized emerging themes from 46 empirical studies (Wolf et al., 2022). In the area of skills, empirical studies indicated that 21st-century skills of collaboration and creativity were powerful mechanisms of learning as well as skills that were enriched through outdoor learning and teaching.

Throughout the investigated programs, preservice teachers engaged in content areas of environmental education, sustainability, and adventure activities and emphasized pedagogical strategies of experiential learning, place-based learning, and outdoor learning (Wolf et al., 2022). The initial introduction to the value of outdoor and nature-based teaching

during preservice development serves as an intense pedagogical experience that, paired with ongoing support and training, can increase preservice teachers' self-efficacy and confidence in their development of schoolyard pedagogy (Feille, 2021a; Lindemann-Matthies et al., 2009; Wolf et al., 2022).

Nature Journal Implementation

In an early-childhood education course, preservice teachers explored the human-nature relationship and the pedagogy of nature-based teaching. In collaborative groups, students experienced the more-than-human connections through various activities and then reflected in their nature journals with particular attention to mindfulness. The effects of the nature journaling experiences included a deep admiration and appreciation of the natural world and a spiritual relationship with the more-than-human world (Tsevreni, 2022).

In my elementary science methods course, students complete a semester-long nature journaling project where they engage in deep observation of change over time. Early in the semester, they identify a *Sit Spot* that they can return to regularly and observe nature (Laws, 2016; Laws & Lygren, 2020). Letting their interest guide them, they choose an object or natural phenomenon to observe in detail using words, drawn pictures, and numbers to record detailed observations and investigate changes over the course of the semester. Students have focused on birds' nests, trees, flower beds, sunrises or sunsets, and the changing night sky, as a few examples. By asking them to take a few moments each week to stop and pay attention, they begin to recognize the ways that science exists all around them and that the opportunities to engage their future learners in practices of observation, questioning, and investigation are so abundant that they are practically unavoidable. And without fail, each time I facilitate a nature journaling task such as *Zoom In, Zoom Out,* or *Sound Maps*, students who begin the activity worried about their lack of artistic ability leave the day amazed at how much they appreciated the experience beyond the academic learning that took place. (For detailed descriptions of how to facilitate a variety of nature journaling tasks with students, see Laws & Lygren, 2020.)

Benefits Beyond Academic Achievement

While national attention remains on test scores and district or school report cards, I have yet to meet an educator who isn't more concerned with the whole child in front of them, rather than their score on a test. We have also seen countless examples of how meeting the health and wellness needs of a learner dramatically improves their academic achievement. Practices related to nature journaling and time teaching outdoors positively impact children's enjoyment of and engagement with learning experiences (Waite et al., 2006; Waite & Aronsson, 2022). Time outdoors reduces stress and increases attention in children and adults (McCormick, 2017) as well as promotes overall happiness and well-being (McClain et al., 2025).

Regardless of the nature journaling task assigned, the very nature of the process requires the learner to slow down, look closely, and pay attention in a way that pulls them into acute awareness. Senses are heightened (Dussler & Deringer, 2020), and learners find a deep connection, not only with nature but also to the peers surrounding them (McClain et al., 2025). By pulling learners away from a screen and into their more-than-human surroundings, nature journaling invites a mindfulness that benefits academic engagement and supports social and emotional health.

Authentic Scientific Practices

As science teacher educators, one of our primary aims is to support our future teachers as they learn to facilitate student engagement with authentic scientific practices. Learners, young and old, need to be supported in the practice of observation as a means for both asking questions and collecting data. Guiding students through *Questioning Questions,* where they use their careful observations to list as many questions as possible, can create a framework for generating investigable questions, while *Mysteries and Explanations* can help them form inferences and use evidence to support their claims (see Laws & Lygren, 2020). Nature journaling tasks promote the use of models as explanatory tools while learners use observations and data to create *Nature Blueprints* of a seed pod or *Phenomenon Models* of a rainbow (see Laws & Lygren, 2020). Data collection through a *Biodiversity Inventory* or *Species Account* can support the investigative process while students answer questions about the world that surrounds them (see Laws & Lygren, 2020). These are only a few concrete examples of how nature journaling tasks can be used to facilitate authentic engagement in scientific practices for all students.

Pedagogical Framework

To fully capitalize on the health, mental, and academic benefits of nature journaling and nature-based teaching, several key pedagogical components should be considered. First, observation should be open-ended, meaning that what precisely the learner attends to should not be prescriptive. Instead, student interest and attention should be allowed to lead. Much of the enjoyment of learning in nature stems from the autonomy of the experience and the opportunity to let the individual students' interest guide their engagement. Second, like the development of any skill, regular practice is essential. Providing learners multiple opportunities to engage in nature journaling practice and increase their awareness and comfort will yield the best results (both academically and related to health and well-being). Third, encouraging the incorporation of multi-modal expression and honoring the integration of multiple ways of knowing enhances the learning experiences related to nature journaling. Finally, in consideration of preservice teacher development, specific reflection on learning related to content and pedagogical practice, as well as personal responses to time in nature, is imperative.

Call to Action

While we all struggle to balance accountability measures with authentic learning, perhaps our most radical act is to invite future teachers to simply sit still and notice. To draw what they see, to wonder, and to simply breathe. The quiet peace that settles over students during nature journaling isn't just a pleasant side effect; I see it as an example of what learning can be.

I challenge you to integrate nature journaling into at least one course experience or teacher development you facilitate this academic year. You can start small with an *I notice, I wonder, it reminds me of* observation or explore a semester-long phenology study like my students' change over time journals. I invite you to join me in systematic documentation of nature journaling's impact on content knowledge and scientific practices, as well as on your future teachers' resilience, sense of purpose, and joy in teaching.

As we face unprecedented challenges in recruiting and retaining quality science teachers, we should explore every avenue that supports their well-being while strengthening their pedagogical skills. I aim to continue to build a research base that demonstrates how practices rooted in wonder and connection can address our profession's most pressing needs. Nature journaling practices in science teaching and learning support both rigorous scientific inquiry and student social, emotional, and mental well-being.

As science teacher educators, we have the power to send teachers into classrooms who know that authentic scientific inquiry and their students' well-being are not competing priorities, but complementary practices. The future of science education is supported by our own willingness to slow down, step outside, and remember that in teaching others to observe nature, we invite them into mindfulness and scientific inquiry that can fuel a lifetime of learning.

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