

Senses of Wonder in Sustainability Education, for Hope and Sustainability Agency

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Abstract: Recent sustainability education theorists have identified a gap in the research literature regarding sensory entanglement and wonder in sustainability education. Sensory entanglement and wonder are requisite because they bring valuable shifts supporting a more critical and transformative kind of sustainability education by (1) awakening a compassionate connection with the living world, (2) nurturing alternative epistemologies, (3) providing a strengthening function for sustainability educators and their co-learners, for stamina and ongoing engagement, and (4) generating sustainability agency and an active and authentic hope to sustain a sense of the possible in the midst of the dire. This article focuses on how awakening the senses to foster a sense of wonder can nurture grounded, authentic, active hope and agency in sustainability education. It is authored collaboratively by sixteen graduate course participants and faculty co-researchers who discuss interrelated theories pointing to a need to foster senses of wonder in sustainability education. The researchers work in research teams to explore experiential and sense-based hope- and agency-building curricula. Findings include activities and reflections across the five senses as well as with the sixth sense, intuition. Sensing, listening, intimate observing, imagining, feeling, entangling, and wondering can shift unsustainability epistemologies and transform human and cultural engagement. The sense of sound can be immersive and resonant, lending learners to relational and multispecies sensing. Scent can catalyze wonder and inspire experiential, holistic growth and integration of time. Savoring in the sense of taste can extend learners from survival to joy, offering opportunities for mindfulness that can connect cultural and biocultural mutualisms and collaborative sustainability agencies. Pattern sensing for similarity using the visual sense of wonder can support connected knowing and ecological vision. The sense of touch can offer a continuous and mutual comfort and belonging. Visual pattern and texture scavenger hunts can cultivate these sustainability sense

capacities. The sixth sense, intuition, opens learners to imaginative, transformative, and connective ways of knowing as place and planet, stimulating hope-giving, integrative sustainability agencies.

Keywords: sustainability education, sustainability agency, hope, senses, sense of wonder, exploratory research

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Claire Lagerway is a Masters Candidate in the Leadership for Sustainability Education Program at Portland State University. As a graduate assistant, she is currently developing curriculum for *Science in the Learning Gardens (SciLG)*, a project funded by the National Science Foundation. With a commitment to social, ecological and economic justice, the project aims to increase motivation in STEM learning in underserved Portland Public Middle Schools by using gardens as living laboratories. She has extensive experience in the green schoolyard movement in San Francisco, California where she worked to integrate school gardens and outdoor classrooms with broader school and district science and sustainability goals. As a board member of the SOMA EcoDistrict in Portland, Oregon she is interested in the intersection of urban and natural spaces as catalysts for community building and place-making towards sustainable neighborhoods. Other areas of interest include bike and pedestrian advocacy in public schools, curriculum development, urban farming, and cultivating community partnerships.

Daniela Perez is a Mexican American woman with a strong passion for growing food and learning from nature. Daniela is Reiki healer, and practitioner of Kundalini yoga. She is also a sport bow shooter. She has B.A. in Sociology and Philosophy from the University of San Diego and is a current Graduate Student at Portland State University. She is a 2016 graduate candidate for the Leadership for Sustainability Education M.A. Daniela works at a non-profit called Growing Gardens in Portland, OR. She is the Community Involvement Coordinator. Through this work she gets to help people grow their own food by providing access, resources and education. She is passionate about food justice, intercultural competency, contemplative educational practices and community activism.

Richard Presicci has a Masters Degree in Education and a Bachelors Degree in Interdisciplinary Studies. He is the founder of a youth leadership nonprofit and a corporate training company, and

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Heidi Schmidgall is an educator at heart with dirt in her blood. She received her B.S. in Adventure Education from Fort Lewis College in Durango, Colorado, which led her to educate for a variety of alternative education programs locally and globally. She has been working as a garden-educator at the Learning Gardens Laboratory in Southeast Portland for the last two years and has recently made a transition to the Cascade Mountain School to teach place-based STEM education to teenagers. She is actively pursuing a Master's in Educational Leadership and Policy with a specialization in Leadership for Sustainability Education at Portland State University.

Jenka Soderberg is a community activist, media maker and aspiring educator with a Bachelor of Science in Foreign Service from Georgetown University and a certificate in Justice and Peace Studies from the Bancaixa Institute in Spain. She helped create the Indymedia network, and was one of the core organizers of Common Ground Relief in New Orleans following Hurricane Katrina. Soderberg was a 2011 Knight Fellow in Journalism at Stanford University, and is currently pursuing a Masters in Leadership in Sustainability Education at Portland State University.

Kaileigh Westermann received her B.S. in Environmental Science at Willamette University in Salem, OR where she focused her study on the impacts of stormwater best management practices on the water quality of the Willamette River. She is now a Master's candidate in the Leadership for Sustainability Education Program at Portland State University with a focus on education as sustainability, for a sustainable future.

Other authors included Tess Kreofsky and M. Zimdars.

Senses of Wonder in Sustainability Education, for Hope and Sustainability Agency

Active Hope is waking us up to the beauty of life
on whose behalf we act.
We belong to this world.
The web of life is calling us forth at this time...
Active Hope is a readiness to discover...
the liveliness of our curiosity,
the unsuspected deep well of patience and diligence,
the keenness of our senses, and our capacity to lead.
(Macy & Johnstone, 2012, p. 35)

Williams and Brown (2012) have identified fostering curiosity and wonder and awakening the senses as two of seven key strategies in sustainability education for reorienting the mechanistic quality of current pedagogical approaches, thereby “transforming consciousness...toward ecological partnership models” (p. 21). This article focuses on how awakening the senses to foster a sense of wonder can nurture grounded, authentic hope and agency in sustainability education. In this article, authored collaboratively by sixteen graduate course participants and faculty co-researchers, we offer grounding theories establishing a framework for learning senses of wonder in sustainability education, describe our experiential and sense-based exploratory methods, and then detail our findings including activities and reflections across the five senses as well as with the sixth sense. This project marks the culmination of an education graduate course in Sustainability Education at Portland State University in the spring of 2015 and has a companion website, www.sensesofwonder.org.

Sensory entanglement and wonder are requisite because they bring valuable shifts supporting a more critical and transformative kind of sustainability education by (1) awakening a compassionate connection with the living world, (2) nurturing alternative epistemologies, (3) providing a strengthening function for sustainability educators and their co-learners, for stamina and ongoing engagement, and (4) generating sustainability agency and an active and authentic hope to sustain a sense of the possible in a time of sustainability crisis.

Grounding Theories Establishing Our Framework for Senses of Wonder for Hope and Agency in Sustainability Education

Recent scholarship has leveraged relational, embedded sensory embodiment that opens access to wonder, hope, and imagination. These embodied wonder approaches have fostered education for and as sustainability and nurtured an enduring, collective, agentic engagement. Judson (2015) confirmed how “a deeply rooted sense of wonder” (p. 206) sparks ecological understanding via relatedness and interconnectedness, thus fostering a sense of care, emotional engagement, imagination for new cultural possibilities, and wonder to sustain reciprocal action with sustainability possibilities (pp. 206-207).

Wonder, Caring, and Meaning

Awe and wonder awaken and encourage caring. Carson (1998) pointed out the importance of arousing an emotional connection through the senses to the beauty and excitement

of nature, which will set a child on a path to discover the knowledge to give those emotions meaning. “If facts are the seeds that later produce knowledge and wisdom, then the emotions and the impressions of the senses are the fertile soil in which the seeds must grow” (Carson 1998, p. 56).

A Sense of Wonder Widening the Sense of Self and Sustaining Strength and Resilience for Active Hope

Macy and Johnstone (2012) found active senses and a sense of wonder key to cultivating what they term “active hope” (pp. 2-3, 35). As described in the opening quotation, these scholars committed to sustainability agency found that embodiment and connection with the larger cycles and circles of life, which they described as “a wider sense of self” (p. 91), helped create space for learners to feel their own pain for/with/as the world (pp. 77-81) and also enabled learners to interconnect without merging (p. 92), to undermine affluenza (pp. 91-92), and to restore a connectedness with larger sources of strength (pp. 93-94). A sense of wonder, through opening up learners to this wider sense of self, sometimes also called the ecological self, provided resilience and strength (Judson, p. 206; Macy & Johnstone, p. 94). The work of looking and acting instead of denying required such strength and resilience.

Macy and Johnstone emphasized a critical connection between awakened senses, states of wonder, the emergent understandings of interconnectedness these produce, and sustained motivation for sustainability agency:

Recognizing ourselves as part of the living body of the Earth opens us to a great source of strength...We come from an unbroken lineage that has survived five mass extinctions. Life has a powerful creative energy and manifests a powerful desire to continue. When we align ourselves with the well-being of the world, we allow that desire and creative energy to act through us. (Macy & Johnstone, 2012, p. 94)

Wonder, Hope, and Agency

Wonder, awe, and noticing can open up this sense of wider connection, creating resilience, perseverance, and creative flow for active hope and agency. These could be considered a pedagogy of wonder. According to Kearns (2015),

to engage in a process of wonder with others could potentially lead us to reevaluate our treatment of others, our reactions to what we do not know or understand, what disciplines we value, and to search for solutions that take people’s whole beings, potentialities, and stories into consideration. (p. 117)

Recent research findings confirm this statement by showing that experiencing awe results in an increase in ethical decision-making, generosity, and prosocial values (Piff, Dietze, Feinberg, Stancato, & Keltner, 2015). Carabajo (2012) urged us not to ignore the subtle and intimate connections between hope and wonder (pp. 144). Frederickson (2009, para. 5) and Jacobs (2005, p. 800) both reminded us of the ability of hope to open us up, to help us reclaim agency, and collectively imagine and create a better future. Sustainability education that opens space for this wonder can be a very powerful catalyst for hope and agency.

Authentic, Grounded Hope Catalyzing Agency

Importantly, this hope catalyzed by wonder is grounded and authentic. Even for education on topics that can be overwhelming, such as climate change, Selby (2015) affirmed the need to engage in authentic hope, for “working through despair can be a powerful progenitor of

new vision and commitment” (p. 31). He defined authentic hope as “a pared down and realistically straightened optimism born of confronting the present and future earth condition” (p. 31). Selby particularly encouraged experiential engagements to cultivate this authentic hope. Freire confirmed that hope was necessary, and also required action to be agentic and effective:

The idea that hope alone will transform the world...is an excellent route to hopelessness, pessimism, and fatalism. The attempt to do without hope, in the struggle to improve the world, as if that struggle could be reduced to calculated acts alone, or a purely scientific approach, is a frivolous illusion. (Freire, 1996, p. 8)

Senses of wonder open up hope and agency in ways that are authentic, grounded, connected, and imaginative. The senses of wonder awaken the imagination, and imagination is critical for active hope, for possibility thinking and futures thinking. “Hope makes the leap for us between *critical education*, which tells us what must be changed; *political agency*, which gives us the means to make change; and the *concrete struggles* through which change happens” (Giroux, 2004, p. 38). In this way, the senses of wonder catalyze transformative visionary-activists who sense and change paradigms and possibilities as much as sense via primary senses.

The Sense(s) of Wonder

Sustainability scholars are bringing life to age-old insights about the sense of wonder and its relevance for hope and agency. Rachel Carson’s *Sense of Wonder* is still relevant in educational contexts today, for “if a child is to keep alive [her] inborn sense of wonder...[s]he needs the companionship of at least one adult who can share it, rediscovering with [them] the joy, excitement and mystery of the world we live in” (Carson & Kelsh, 1988, p. 55, gender terms updated). Wonder is not instilled, but kindled, and rekindled. Selby and Kagawa (2015) affirmed that a critical and transformative agenda for sustainability education requires cultivating and sensing wonder engaging the senses:

Learning needs to draw upon a more rounded epistemology if it is to attune and respond to the pain of the world and open up new vistas for being in the world. The under-dimensioned, stunted epistemology that characterizes much of sustainability-related education needs to be enriched through emotional, imaginative, and creative entanglement with the world, by spiritual and sensorial engagement with the close-at-hand world, by embodied and somatic learning, by deep listening and intimate observation, by action learning, by dialogic learning. (Selby & Kagawa, 2015, p. 278, emphasis as in original)

Sensing, listening, intimate observing, imagining, feeling, entangling, and wondering can shift unsustainability epistemologies and transform human and cultural engagement with/as the world/Earth.

Addressing the Gap in the Literature Leveraging Frameworks for Sustainability Agency

Selby and Kagawa (2015) established a gap in the research literature regarding sensory entanglement and wonder in sustainability education. Their research argued that this sensory entanglement and wonder could bring three valuable shifts requisite to a more critical and transformative kind of sustainability education, by (1) nurturing an alternative epistemology that is critical and transformative, (2) providing a strengthening function for the sustainability educators and their co-learners, for stamina and ongoing engagement, and (3) generating an active and authentic hope function to sustain a sense of the possible in the midst of the dire.

Williams and Brown's (2012) research and framework on learning gardens and sustainability education reinforced these critical functions for awakened senses, wonder, and hope in sustainability agency. Williams and Brown countered seven deficiencies of industrial education with seven key principles of sustainability education, which they found evidenced in learning gardens. They extensively researched how fostering curiosity and wonder (Principle 2) and awakening the senses (Principle 7) helped innovate a pedagogy that brings schools to life and that could counter the deadening and de-activating effects of mechanistic and unsustainable educational approaches in which the student is passive and the learning is focused on mental activity rather than full embodiment and agentic capacity (pp. 46-48). They found these sustainability education principles of fostering wonder and awakening the senses to be interconnective, catalyzing understandings of interdependence, part of a process of somatic empowerment, and subversive to mechanistic education.

These informing theories fold into a model of sustainability agency. Rich sensory experience and a sense of wonder are a requisite part of building sustainability agency. Selby and Kagawa's (2015) critical and transformative senses framing of wonder and hope for sustainability education as well as Williams and Brown's (2012) framing of sensory awakening and the fostering of curiosity and wonder both fit well with Heft and Chawla's (2005) model of sustainability agency. Heft and Chawla (2005) offered a four-fold model for sustainability agency, including learning connected to affordances promoting discovery (in other words, direct immersive experiences supporting interconnected relationality) with access and mobility for students to engage, companioned with facilitated participation, connected to opportunities for community-based action (pp. 202-206). Heft and Chawla emphasized the importance of "primary or first-hand experience" in which the student "encounters a dynamic, dense, multisensory flow of diversely structured information" (p. 209) as part of this process of developing sustainability agency. This resonates with Goleman, Bennett, and Barlow's inclusion of the experience of wonder in learning interdependency and interconnectedness in community and cooperative learning contexts as one of the key practices of emotionally and socially engaged ecoliteracy (2012, p. 10).

The current research on senses of wonder fits within this emergent framework of sustainability agency. It aims to help fill a gap in the literature of sustainability education. In sum, sustainability education lacks sufficient attention to somatic, embodied, imaginative, entangled, and sensory dimensions of experience and learning. It does not pay sufficient attention to awakening a sense of wonder. By not paying attention to the senses and wonder, sustainability education misses its capacity to undermine mechanistic models and to drive critical and transformative change. This is a problem because sustainability agency requires immersive embodiment and the ability to feel and sense deeply and to feel wonder as part of a process of learning to effect change. Furthermore, a deep sense of wonder nurtures active, authentic, and grounded hope. Wonder's widening of the sense of self and strengthening of resilience can sustain these critical and creative capacities and can sustain active hope and sustainability agency. This research hopes to help fill the gap and foster a deeply critical and transformative sustainability education that creatively entangles senses of wonder to develop active, authentic, grounded hope and persevering sustainability agencies.

Methods and Overview

The exploratory research undertaken in this essay explores connections and develops initial descriptions and examples of relational, “dynamic, dense, multisensory flow” (Heft & Chawla, 2005, p. 209) to nurture active hope and sustainability agency. There is some focus on the senses in educational research (e.g., Auer, 2008), including as a methodology, but as Selby and Kagawa (2015) pointed out, more is needed, particularly in sustainability education contexts. In order to connect the senses to support activities of active hope and sustainability agency, each of the main senses within the senses of wonder was explored by a small group within the total research team.

Methods used included creative curation and original generation inspired by a review of the curricular literature within the frameworks described. The materials developed are intended to be exploratory and descriptive rather than proscriptive or comprehensive.

Research team process and activity selection. For each sense, a board of one to three researchers reviewed the literature using an evaluation heuristic and selected one or more exemplar educational practices that could further the integration of that sense into the sustainability education classroom. The criteria that were used for selection of the activities included the following:

1. That the activity was congruent with at least one of the aspects of the Williams and Brown (2012) 7-point framework for sustainability education (p. 46);
2. That the activity was congruent with the Selby and Kagawa’s (2015) call that “much of sustainability-related education needs to be enriched through emotional, imaginative, and creative entanglement with the world, by spiritual and sensorial engagement with the close-at-hand world, by embodied and somatic learning, by deep listening and intimate observation, by action learning, by dialogic learning” (p. 278);
3. That the activity was effective in catalyzing educational encounters explained by Carson’s (1998) experiential educational model for a sense of wonder;
4. That the activity might be adapted to be effective with learners of different ages, in both formal and informal learning contexts.

Additionally, the selection process was based on literature review of sustainability education material on a particular sense, other forms of educational research on that sense, and a heuristic from each research team’s experience. The decision-making process for selection of educational practice examples was consensus within each team. Each team selected their own way of exemplifying the exemplar practices. In some instances this included self-application or reflection on the practice.

The research teams were motivated by a pedagogy of generosity. They were driven by a desire to address the gap in the literature regarding sustainability education and sensory routes to experiences of wonder as part of sustainability agency. Their key intention was to specifically address the call from the *Journal of Sustainability Education* regarding hope and sustainability agency. Their intended audience was other sustainability educators, and their desire was to offer specific tools and exemplar activities to bring new practices to life.

A faculty-graduate student team synthesized the findings from the six different sense research teams, generated and refined the theoretical frameworks, and articulated the introduction, literature review, methods, and conclusions for the work.

Overview. The products of this collaborative effort reflect the depth and breadth of theory, practice, and possibility in the senses of wonder for sustainability agency and hope. The sense of sound is immersive and resonant, lending learners to relational and multispecies sensing. Listening ceremonies, bird language, rainstick-making, and auditory environmental mapping over time can open learners to soundscapes, senses, and the vibrant vitality of embodied relationality. Scent can catalyze wonder and inspire experiential, holistic growth and integration of time, for example through keeping scent memory journals. Savoring in the sense of taste extends learners from survival to joy, offering opportunities for mindfulness that can connect cultural and biocultural mutualisms and collaborative sustainability agencies. Pattern sensing for similarity using the visual sense of wonder can support connected knowing and ecological vision. The sense of touch offers a continuous and mutual comfort and belonging. Visual pattern and texture scavenger hunts can help cultivate sustainability sense capacities. The sixth sense, of intuition, opens learners to imaginative, transformative, and connective ways of knowing as place and planet, stimulating hope-giving, integrative sustainability agencies.

Sound and the Vibrant Vitality of Embodied Relationality

Listening is immersive. As one begins to practice attentive listening, one begins to notice more and more how sound roots and orients us to a place. For this research group, by listening to an amplified version of our surroundings using a microphone and headphones, a hyper-awareness of that orientation began to emerge.

If we practice this kind of attention [to sound] in different contexts, we become more and more aware of the fields of relationship and interconnection that constitute our world. We also notice how we are ourselves ever-changing streams of sensations, thoughts, memories and feelings interacting with everything that is about us. (Danvers, 2009, p. 190)

Noticing how the confluence of sounds provokes and orients a person to their surroundings, our group reflected on how meaningful an experience it can be to facilitate this practice of aural awareness with a group of students. Deans, Brown, & Dilkes (2005) detail several strategies for working with learners to listen in on the sounds of place and acoustic ecologies.

One aspect of this auditory immersion that can be examined through facilitated listening exercises is the development of a spatial awareness that can connect learners in a profound way to a place, and to a sense of themselves within that place.

While the eye works with a visual cone, the ear perceives everything that is above, below, and all around us. What the ear perceives is thus not the unified and perspective space of the eye, but multidimensional space-time which is dominated by simultaneity and movement. (Ceppi & Zini 1999, p. 92)

When learners engage with the space around them through listening, they can experience a depth of perception that is otherwise absent, particularly in modern urban and suburban landscapes where people train their ears to shut out background noise.

Sound is an expression and gesture of movement, and contained within this movement, if we listen acutely, is an emotion. Aural sensing connects the learner to inner and outer information from the complex living systems within which the researchers and learners are immersed, and which they themselves are co-generating. Often, the first nature sound that students engaged in a listening exercise will hear is the sound of birds. The aural practice of

learning bird language demonstrates sound and emotion's interconnections. "Paying attention to the birds will tell you many things about what's going on in the world, and about your own state of being" (Starhawk, 2004, p. 88). As educators, if we facilitate a reflective practice of listening, we have found that an internal resilience begins to build in students. From what we observed in modeling reflective practices like those described below, close awareness to sound allows the listener to retain what is passing away, and to shape, in a way, their stream of awareness. What we choose to give our attention to is both powerful and fragile. To this end, we have outlined a few suggested exercises to inspire ways of interacting with sound to help inspire and awaken a sense of wonder and connection to the natural world.

Exercise 1: Soundscaping a Place

Materials:

- Microphone
- Headphones
- Audio recorder (or phone/device with audio recording app)

Lead the class into a natural setting -- even just the schoolyard if that's what's available. Wear audio recorders with headphones if possible, if not, have the students carry notebooks to jot down what they hear. If one student carries the microphone, have another one wearing the headphones as you walk together. Let the silence sink in - this should be at least a fifteen-minute slow walk to try to note whatever sounds they can hear.

After the walk, back in the classroom or outside, have a reflection circle, where students share what they heard while walking in silence. If possible, try to draw a sound map of the space you have just walked through. Play back the recording and have the students identify the locations of the different sounds. Mark these sounds on a map.

Exercise 2: A Ceremony of Sound: Rainstick Construction

Originally, rainsticks were built from a dried cactus, with spines that thread into the center of the plant. But students can construct one from cardboard which has a similar effect. According to Laczko (2006) of the Heard Museum, there are accounts of rainsticks originating in a number of different indigenous cultures, including the Cuna of Panama; the Colorado of Ecuador; the Macushí, Uachmiri, and Yauapery of northern Amazonia; and the Huichol of northern Mexico. There is also speculation that the addition of nails or thorns to bring about the sound of a rainstick may have been a practice in West Africa that was brought to Central and South America by enslaved Africans (Laczko, 2006).

Materials:

- Rice
- Cardboard tubing that is solid enough to stand up without bending
- Toothpicks
- Nails (to poke holes through the tubing)
- Duct tape or other thick tape

Using cardboard tubing (paper-towels or toilet paper) about a yard long, tape and seal one end using paper. Use nails to poke into the tube, following the spiral connecting point of the cardboard to make it easier to push through. Pour rice into the tube and seal the top. Experiment using this stick in different acoustic environments, inside, outside, large rooms and small and notice how our environment relates and changes the experience of this listening ceremony.

Exercise 3: Audio Environment Mapping Over Time

Visit one particular place over the course of a year, once a month or more where you can sit for 10-20 minutes of time. Listen and observe how the soundscape changes throughout the seasons. The idea is to build a rapport with this space, whether it be your backyard or near a public fountain. What patterns do you notice? How might you represent the different sounds on a map? What emotions arise in relation to different sounds?

Compose interviews about other people's experiences with their sense of sound.

Questions for an observation of place using the sense of sound:

1. What sounds do you hear in your microclimate: School, home, street, public park?
2. Do you hear birds? Can you identify the type of bird or from where they are singing?
3. What do the sounds tell you about this particular place?
4. How do you respond to the sounds? How do they make you feel about this place, yourself?
5. How do the birds or other sounds respond to your presence?

Personal Reflections on How Sound Influenced Their Sense of Wonder

Educator J. Soderberg:

My forays into nature as a child were often full of bright chatter, the little girls in my scout troop giggling nervously as we navigated past spider webs and stepped gingerly past patches of poison ivy. But as we hiked on, at a certain point a silence would fall over the group, and those brief respites from the continuous internal and external verbosity of our lives were moments I remember as deep and personal, in which the immensity of the ecosystem around me spoke a quiet but constant message of connectedness. The sounds that became easily apparent during those lapses into silence included distant woodpeckers, the rustling of the leaves in the trees by a breeze that itself was somehow audible, creeks gurgling and churning their way downhill and insects buzzing by. And occasionally a larger animal, a rabbit, groundhog or deer as it hurried away from us humans into the wild unseen.

As I think about how the sense of sound can be used to awaken the innate wonder that we all have (or had at one point in our lives) about the natural world that surrounds and supports us, I think about wave patterns surrounding us in the ether, vibrations that echo throughout ecosystems while tiny filaments on tiny leaves pick up the sound and pass along the message to roots and rhizomes and water sources which vibrate along down below. The sounds that surround us in the silence of the woods, if we can re-learn how to listen, are sounds that can return us to a sense of place on this planet. We can learn from teachers like the Huaorani people of the Amazon rainforest who have developed an acute sense of hearing, even at great distances. Sound is everywhere, and our ears in the cities are deafened to the intricacies of it all, as we have become so accustomed to blocking so much of the 'background noise' out of our heads. Reawakening our sense of sound provides an opening to the wonders of the world around us.

Educator M. Zimdars:

To feel at home I can escape into the dry backcountry where the purple wild flowers grow across rolling hills of dry grasses; Oh California -- you dreamscape of memory. My younger brother and I would go gathering these wild flowers amid the grasses. As soon as you bent down to pick one, you'd disappear from sight. Sometimes I would fully lie down and stare up at that big blue yonder. My sense of play would shift from my eyes to my ears. The grasses waving above me swaying to warm breeze; the birds -- gnatcatcher, quail, morning-dove, and the

black-birds caw; the trill of that familiar bug whose sight I wouldn't recognize and whose name I didn't know, but whose sound was synonymous with this space. A plane would pass overhead, unseen intermittent patterns. The power lines' incessant humming acted as a compass point orienting my sense of place.

That whole area, except the power lines, are tract-homes now. And returning there, many years later, I feel as though I can't find my home, that there is nowhere left to hide. Still, I must try. I close my eyes and let my ears orient me. The birds seem different, the bugs too, but there are still children at play in the streets and in the yards weaving their growth into place beneath the distant hum of power lines. Languages, like geography, evolve -- as must the song of soundscapes.

Educator H. Schmidgall:

My sense of sound is most alive while walking in the woods, the crushing of pine cones under my feet, the different songs and calls of birds as I begin the trail, the slow trickling of water as it cascades over rocks, the elegant wispings of leaves in the wind. Recently, while in the woods, the sound of the water invited me to sit on top of a log crossing the stream. While laying on the large, moss covered tree, my attention was quickly drawn to the song of a particular bird. I decided to sing back to its beautiful call. It ceased its song, but after a short break, it continued again with a different pattern. I am not sure what this difference was, but every time I sang, it responded to my sound vibrations and it felt like we were all of a sudden in a woodland duet. It was the first time I recognized a bird's response to my energy in the forest. I reflected on the idea that we are all interconnected through our consciousness and awareness. My sense of wonder is piqued by how we all subconsciously respond to one another -- not only in wild, natural settings, but in urban environments as well.

While living in the city, I have experienced the soothing sounds of bird language as a form of sanctuary. Birds have created a sound for me that brings me back to the calm and grounded feelings I experience while in the woods or at the ocean. The sound of cars, planes, constant buzzing occasionally distracts me and can lead to feelings of isolation. In those moments, I remind myself to come back to the wild, natural, telling songs of the birds and/or other sounds of the environment in which we inhabit. Listening to the birds while walking down the concrete sidewalks has reconnected me to the ecological patterns and rhythms that exist in busy urban areas. The birds of the city, as well as those of the forests, jungles, and sea, have a story to tell about their place and the environment in which they live. Listening to the different calls of the birds brings awareness, mindfulness, and attention to the interconnection we share with other beings, revealing a vast amount of information regarding our places.

Synthesis for the Sense of Sound

These reflections exemplify the immersive quality of sound and point to how many emotions, memories, and connections to the world around us can emerge by simply listening in silence. The activities outlined above can help educators trying to open students up to such experiences. Soundmapping the area, creating sound instruments, journaling, and simply listening deeply can connect learners to a sense of place and a sense of themselves within their environment. As our experiences as educators carrying out these exercises demonstrate, reflecting back on one's memories of sound in the landscape can bring back a sense of wonder that has, in some cases, been latent or dormant for years.

Scent: A Catalyst to Wonder

Moments of wonder may well be the times when we, as humans, know the most. For to wonder, to feel awe and curiosity, is for a fleeting moment to know how little we know. To feel inspired by this idea, rather than afraid can be the difference between embracing full bodied, experiential learning or clinging to an outdated, industrial model of education that values perfectly bubbled in answers on standardized tests more than it values the holistic growth of the learner. Those of us who have lived within the structures of conventional western education know how quickly and easily a sense of wonder can be squelched.

So how can we welcome wonder back into our lives? How can learners be inspired to embrace what Selby (2010) calls the “decidedly non-measurable ways of knowing and ways of connecting to the world—such as attunement, awe, celebration, enchantment, intuition, reverence, wonder, and the oceanic sense of connectedness” (p. 45-46)? The senses can act as catalysts to re-inspire wonder in learners by uniquely and intimately providing the elements of experience.

Though inextricably linked, even when explored individually, each sense can open learners up to what Williams and Brown (2012) call “bodily ways of knowing” (p. 148). The sense of smell, specifically, can play a powerful role in evoking emotions and memories (Holloway, 1999). Though science has recently confirmed the connection, lived experience has long understood that “the sense of smell, almost more than any other, has the power to recall memories, and it is a pity that we use it so little” (Carson, 1998, p. 83). When attuned, “scents bring memories of life-stories -- of place and communities” (Williams & Brown, 2012, p. 150). This emotional and storied aspect of scents can be used to encourage learners to explore and reconnect to memories of awe and wonder. By honoring the often overlooked sense of smell, learners can be re-inspired and opened up to new ways of knowing and wonder.

Suggested Activity: Scent Memory Journal

Similar to the environmental autobiography activity suggested by Corcoran (1999), which prompted students to recall and write about their first connections to place and how natural settings shaped their lives, a scent memory journal can be a powerful way to encourage learners to explore the connections among scents, memories, and wonder.

Ask learners to recall a moment in their lives when they truly felt a sense of wonder. Then ask them to build the memory through the recollection of the scents that were present during this moment of wonder. You may wish to prompt students to dig deeper to further rebuild the memory by recalling other senses and emotions that they experienced in the moment. Alternatively, students may decide to journal about specific scents that always trigger deep memories for them and link these scents to moments of wonder throughout their lives.

Two Short Scent Memory Journals

Sweet Bark by Kristy Gonyer

Outside the library at Reed College stands a solitary ponderosa pine. Despite its wide girth the tree doesn't call attention to itself with its sparse foliage and branches well above eye-level. However, on a warm day, I always pause. A familiar aroma drifts from the tree and invites me closer. As I draw near, perhaps even pressing my nose into the cracks in the bark, I am transported back to my earliest memories in the woods.

I am transported back to my first hikes in the forest. The warm scent, that reminds me of vanilla and sweetness, draws me back to the first time my father and I hugged a Ponderosa pine tree and drew in the warm scent of the tree. I can remember the feel of the rough bark on my cheek and the warmth of the sun on my head as we drank the smell in.

The memory blends with the memories of many other times in the forest with my family, or even by myself, when I couldn't resist the urge to embrace a ponderosa. The scent and the memory form a link with my family and with the Black Hills of South Dakota. For me it is a scent of connection and contentment.

The Beach on 26th Avenue by Elise Baker

Sitting with my oldest sister, cuddled and bundled against her.

The crash of the ocean against the shore, remaining in my ears even after we've left.

Feeling the pink in my cheek from the wind.

The incessant need to explore the texture of sand, never able to stop even for a moment.

Seeing the energy of the waves. The power never truly expressed through words or pictures.

And the scent, the scent of salt and dampness clinging to our hair, our blankets, the rocks and the sand.

The scent of the beach is something all together its own. I can't describe it.

But I remember the feeling of sitting there. Of being quiet, because it seemed the right way to be.

Savoring Taste

As memorable as the sense of scent is the evocative wonder of the sense of taste. Every day communities around the world come together to experience the innumerable joys of taste. Many of us wince at a sour slice of lime, daydream about the indulgent pleasures of sweets and fats, or feel a bitter punch at a bite of horseradish. We experience a salivating rush with the crunch of a salty potato chip, and harness the deep cravings for savory meats, fish and dark greens! There are five recognized taste sensations including sweet, salty, sour, bitter, and umami (savory) that help us navigate our relationship with each of these foods. Receptors on the tongue recognize molecules in food and this mingling of chemical reactions sends a signal to the human brain. This signal is processed as the multitudes of taste combinations we experience (Ginsburg, 2014).

The miracle of taste has evolved over 500 million years and acts as the first defense against dangerous foods. Dr. O'Connell of Dublin City University writes, "In our ancestral human population, those who had the ability to perceive dangerous compounds in their food could better avoid them, and those who could better assess the nutritive and caloric value of their food could get a good supply of energy" (O'Connell, 2014, para. 8). The variety of tastes we know today are careful products of evolutionary complexity and therefore directly connects us with the biological world, to awaken our primal instincts (Breslin, 2013).

Not only can taste intimately connect us with the biological world, our sense of taste is strongly connected to almost all of our other senses. Smell and sight both play a large role, chemically and psychologically, on our sense of taste (Breslin, 2013). Taste can also be deeply connected to specific memories or time periods, bringing a strong emotional element to the foods

that we consume. In this way, each of our senses strongly connects us to the bonds of our evolutionary past.

Today, in increasingly fast-paced modern societies, many forget to savor the wonders of taste. In a world often filled with disconnection, taste is one way to connect modern humans with their evolutionary past and to their current ecological surroundings. As an inspiration of hope, taste opens the door for connections to daily wildness, cultural histories, and the potential energy or dangers harnessed in the foods that surround us. It reminds us that cross-culturally, we are in steady relationship with the ecological world, as our bodies naturally inform us of the diversity housed within our food and as our body and mind mutually inform one another as we continue to evolve throughout time. To deepen connections with our sense of taste and therefore our ecological selves, we can practice mindfulness. Mindfulness can help us “wake up to the miracles of everyday life” (Michaelson, 2008, para. 1). By focusing on something as simple as taste, we can begin to connect to the abundance of life that surrounds us. If we are able to be mindful and pay attention to the simple messages our tongue is sending to our brains, and approach that interaction with a child-like wonder, curiosity will be ignited within.

Taste Mindfulness Activity

For this meditation, choose a morsel of food. Select foods that demonstrate the five different tastes (sweet, sour, bitter, salty, umami). The facilitator can guide participants through this exercise with questions similar to these:

1. Look at the food item, what colors is it? Does it have any patterns? Why might it have that color? Is it natural or are there artificial colorings?
2. Feel the food item, what does it feel like? What texture does it have? Is it hard, soft, rough, bumpy? Why might it have that texture?
3. Why might the food item have evolved in such ways?
4. Can you listen to it? What happens when you squeeze it? Scrape it? Tap it?
5. Smell the food. Smell is so connected to taste, can you imagine what the food might taste like?
6. Your food item is part of a larger, interconnected web. Think about where this food might have come from. Did any part of it come from the earth? How did it grow? Under the soil? What kind of soil? From the branch of a tree? Did it need sun? How much water do you think was required for this food? Where does that water come from? Who grew the food? How did it travel to you?
7. Take a few breaths and allow your mind to calm.
8. Put the food on your tongue and let it rest there for a few moments. Focus on the sensations. How is your mouth reacting? Your tongue? Are any other parts of your body stimulated? Are any memories coming up for you? How do you feel?
9. Start to chew the food. Notice it as it changes states. Where will the food go from here? How will it return back to the earth?

Another Version

Try selecting the same food but different varieties or types from different bioregions. For example, choose three varieties of apples and note the similarities and differences. Or, choose honey from three different bioregions or floral varieties and note their similarities and differences. Use this opportunity to talk about local foods, connections to place, and the taster's connection to place through food.

Vision and Connective Agency

Resonant with the attention-opening capacities of the savoring and slowing of the sense of taste, the sense of vision has the capacity to connect, open, sustain, and inspire action. Sight, for this project, can be defined as an awareness of the physical surroundings outside of one's body sensed through looking. Typically perceived through vision (though this perception can be gained through other senses), the outside world presents itself to us, through shape, line, color, and contrast. Using our sense of sight to observe, notice, recognize, and analyze our surroundings can support our journey through building ecoliteracy and an activated sense of wonder and hope.

In the past year, one of the authors of this research team (hereafter "I") has become inspired by the concept of ecofractals (Hauk, 2014), the different kinds of patterns found at different scales in nature. The different forms include flowing, as found in watershed systems and rivers, branching, such as trees and leaves, and cracking, as found in mountain ranges and rock formations. Once I learned about these concepts, I am unable to escape them. When I go hiking outside of the town I live in, Portland, Oregon, I am amazed by the patterns, shapes, colors I come across and the different scales in which they are present. This happens when I find the repeating patterns of ferns and other plants, where the leaves mimic the shape of the entire plant, or when I find a tiny cube-like rock, and look up to find a cliff with giant, blocky outcroppings.



Figures 1 and 2. Branching Ferns with different colors and tones yet similar shapes, from (Figure 2) the Sonoran Desert outside of Tucson, Arizona and (Figure 3) the Central Willamette Valley outside of Salem, Oregon. Photographs by co-author Katelyn Hale, 2015, used with permission of the artist.

In the dominant culture in which I live, I can find these repeating patterns, too. Rectangles are everywhere; the computer, books, and phone I use are rectangles, and my backpack was designed in a rectangular shape to fit them all inside. Once we open our eyes, both metaphorically and literally, we can recognize the patterns existing in our world.

Sight is possibly the most overworked sense in the United States' digitally-driven culture. We use our eyes to read, watch, look, and scan, all to absorb and consume information at high rates in order to complete a task or gain entertainment. This is usually considered necessary for a successful lifestyle. A shift towards ecological literacy requires a subtle shift in awareness towards using sight to observe, recognize, and analyze. Sewall (1999) echoed Goethe's method for developing organs of perception through intensive observation of the patterns of becoming that "reanimate the world with meaning" and greater wholeness that is imaginative, associational, emergentist, and metamorphosing (pp. 148-150). Sewall found that "the world is made richer and denser by our patterned visions" (1999, p. 151). When one uses a sense of sight to observe shapes and recognize patterns, the larger world becomes more known and one can deepen their sense of place.

On a recent hike, I saw cracking in a burnt Doug Fir snag, and then noticed how those shapes are echoed in my handprint (Figures 3, 4, and 5).



Figures 3, 4, and 5. Recurrent ecofractal patterns of cracking echoed in (Figures 3 and 4) a burnt Douglas Fir snag and (Figure 5) artist's handprint. Photographs, 2015, by co-author Katelyn Hale. Used with permission of the artist.

Activity: Scavenger Hunt for Repeating Patterns

Needed resources: Sight & mode of recording and communication (writing utensil & paper to write with, other people to discuss this with, etc.)

1. Take 5-10 minutes to observe the different shapes and/or patterns in your surroundings. Are you inside of a building, in a streetscape, or in a landscape? Time yourself and record as many shapes as possible, making a sketch of each. Even if these shapes seem weird and you do not see a pattern, record that too; you might find an overarching pattern later. Notice these shapes on different scales, from the size of one's thumbnail to the size of your bioregion.
2. Advanced: if you are doing this for a second time in the same place, you could search for the answers to the following questions: Of what are the things surrounding you made? What colors are prevalent? What functions do you observe?
3. When time is up, what patterns emerged for you? If each group of patterns had a title that was representative yet not limiting, what would you title each group? How do you think these larger patterns affect how these things work? Why are these shapes and patterns so prevalent? What does that mean?

Touch and Immersive Mutuality

Similar to how perceptive vision can open learners to the deep patterns of our embedded connectivity, the sense of touch offers a bodied sensitivity to the context that sustains learners and life. Around eight weeks gestation, the human fetus experiences their first sensation of touch (Montagu, 1978). Touch receptors in the lips of a newborn allow them to suckle their first taste of nourishment from their mother. In this moment the simple touch of the mother's warm skin provides her newborn with its first emotional bond and sensation of comfort. The first sense to develop, touch allows us to experience our surroundings in a way that is unlike any other sense (Ackerman, 1991).

Although touch is complemented by the use of the other senses, touch is unique in that it involves the entire body. Five types of touch receptors exist on the human body, four of which are scattered across the body's largest organ, the skin.

Sensory receptors in the skin provide information to the brain about the size and shape of objects held in the hand. These receptors allow us to perceive whether objects appear hard or soft, smooth or rough in texture, heavy or light in weight, hot, cold or neutral in temperature and whether the overall sensation produces pain or pleasure. (Gardner, 2010, p. 1)

This complex system of receptors allows us to read our three-dimensional environment through a simple touch. Our skin becomes a vast field of information that helps us map out our surroundings, and enables the world to be our playground of textures (Ackerman, 1991).

This playground of textures we experience daily can enhance our sense of wonder and curiosity if we are attuned. Our sense of touch connects us with the world around us. It is the only sense that we cannot turn off at will. Touch is always there. Ingold (2011) emphasized in environmental perception how touch includes not only manual touch but our continuous gravitated touching of the earth or other surface with our pedestrian feet, carrying the weight of the body (p. 45) and serving as a vital connective interface of our embodied and continuous contact with earth. He suggests how "a more literally *grounded* approach to perception should help to restore touch to its proper place in the balance of the senses" (p. 45, emphasis as in original). Unlike other senses, we cannot shut it off to experience what it is like to have no touch. Touch is not only persisting but also inherently and persistently relational. Olsen (2009) states, "As we touch, we are touched. When we touch a tree, we also feel that tree's bark touching us. In this way, touching connects us directly to place but also to ourselves" (pp. 63).

Touch can help us feel grounded when we interact with nature. According to Sachs, touching soil may even make us feel better:

A strain of bacterium in soil, *Mycobacterium vaccae*, has been found to trigger the release of serotonin, which in turn elevates mood and decreases anxiety. And on top of that, this little bacterium has been found to improve cognitive function and possibly even treat cancer and other diseases. (2011, para. 2)

Touching nature is an intimate way of interacting with our environment. It requires us to engage and respond to our stimulus and to measure the reaction of what we are touching. However, if we do not have the awareness of this small act, we take for granted that intimate moment and lose the opportunity for wonder.

Activities for Cultivating a Sense of Wonder Through Touch

Place Visit: Attention to Touch. At your place, eyes closed: Begin touching -- the bark of the trees, the soil, rocks. Remember that as you touch, you are being touched. Try touching with different parts of your body: your hand, the side of your face, your lips, bare feet, and your back. There are receptors for light touch, deep pressure, temperature, vibration, and pain in all parts of your body. Add vision to your experience of touch and movement; notice that the motor impulses to change attention are also movement (20 minutes). Write about your experience (10 minutes) (Olsen, 2009, p. 68).

Scavenger Hunt for Textures. Activity adapted from Reimer (2013, para. 1-14). Go on a scavenger hunt for various textures. Provide a list of textures to participants, send them out into nature with the list and see who can find the most. Possible textures might include:

Smooth

Rough

Hard

Soft

Fuzzy

Pokey (or prickly) (2013, para. 5)

After everyone has gathered their scavenger hunt items, spend time passing around the items and sharing observations about the texture and how it feels.

The Sixth Sense: Follow your Intuition

Beyond touch and the other five senses is another sense of sustainability that cultivates grounded, active hope. Intuition, intelligence, synchronicity, communication, resiliency, wonder, humility, and creativity are just a few words that have been used to describe what we call the sixth sense. In more than one way the sixth sense *is* common sense. Consider the following questions:

- Have you ever *heard* a bird whistle a song and know that it sings about seeds forgotten?
- Have you ever *seen* a vegetable grow and know that its purpose extends further than the debts of your nourishment?
- Have you ever *smelled* a cool breath of air after an unforgiving rainfall and know the wild flowers it caressed?
- Have you ever *felt* your fingers throw a ball of soil to the air and know the direction it was heading?
- Have you ever *tasted* the salt of the deep sea in a bite of mustard greens?

The sixth sense is our intuition and it is often spoken in a language that is not loud, or commonly expressed. Through our intuition we experience all of our other senses and find wonder in the mundane. The earth speaks to us in colors that taste, smell, and feel like messages of hope. Margolin (2005) speaks about our intuitive powers as a connection to the larger web of

Remote Viewing Activity

Activity Part 1: Image Selection

This exercise will attempt to allow space for the group to use intuition to guide them into a knowing. It is always effective to start this activity by guiding yourself and the group through a breathing meditation. Simply take deep breaths and connect to your body. Do this for about 5 minutes.

- Use magazines, articles, old books, and online image searching to select many images that call out to you. If you are doing this alone select more than ten. If you are doing this in a group setting have at least two images per person.
- Lay out all the images in front of you or the group facing down. People should not be able to see the image.

Activity Part 2: Image Sensing

- Select one of the images in the center and don't look at it. In fact, close your eyes and put your hand on top the image. Try to sense the messages behind the image. Explore ideas in your mind about what you think this image is.
- In your notebook write down what comes to your mind.
- Questions to explore: Do you see any colors? Lines? Images? Abstract ideas?
- Remember to explore every message and let go.
- The goal of this activity is to help you reconnect to your intuition. Do not feel pressured to get the image right. The activity is completely about the process of exploring and listening to yourself, and not about the image.
- Share your experiences... in a circle one by one describe the process what you felt and how well were you able to connect to feel what the image was saying to you.

Poem about Intuition:

As Earth,
working on behalf of Earth,
we trust and are at ease

Aligning ourselves
with the upwelling vitality
which is bluestem, the
focused intelligence which
is heron,

we are hopeful
in the present moment -- a fountain
of sufficiency.

Doug Hitt (unpublished poem, 2008, in Macy & Brown, 2014, p. 216)

Hitt's poem suggests connections to expanded relational consciousness through intuition and how this consciousness can nourish "upwelling vitality" and "focused intelligence" with other species to generate a hopeful presence and energy to "work... on behalf of Earth." Cultivating intuition through subtle noticing and imaging can help open these capacities. Relational, sustainability perception and intuition via each of the senses cultivate action and resilience.

Conclusion

This essay reflects how exploratory curricular research to extend the senses of wonder can fill a gap in critical and transformative sustainability education. Engaging and entangling with the sensory and nurturing a sense of wonder are key parts of the process of catalyzing sustainability agency and sustaining hope. Engaging the senses of wonder within the larger contexts of critical and transformative education for and as sustainability agency (Selby & Kagawa, 2015) are consonant with Heft and Chawla's model for providing facilitated engagement in the context of community action to exercise agentic capacity built by immersive and dynamic, sensory wonder (2005).

The senses of wonder can be powerful catalysts for active hope and sustainability agency. The senses of wonder can be hope-healers, agency-activators, sustainability sanctuaries, care-kindlers, possibility-imaginings, resilience-regenerators, immersion-extenders, kindred-connectors, and emotion motivators. With the senses of wonder, learners are connected and stretched, expanded into larger emergence, relationality, embedment, and connection that offer resources for endurance, resilience, and hope.

The limitations of this exploratory research, by the nature of its stage, include its development of suggestive possibilities rather than evidentiary confirmation. Further directions could include designing research to explore in greater detail the possible links between the activities outlined here and the senses, wonder, hope, and agency. Further research could also explore the possible sense-specific authentic hope and sustainability agency effects of such activities.

In this time of seeding out transformative sustainabilities, cultivating our capacities for awe and wonder are ancient cultural technologies of slow, lively, mindful, and care-ful perception, immersion, and savoring that open up learners and activists to relational, mutual, embodied, embedded, and biocultural hope, action, flourishing, and caring. Senses of wonder can inspire and sustain collective agencies and authentic engagement with regenerative, somatic presence. These possibilities can be further explored at sensesofwonder.org. We look forward to hearing how you and your co-learners catalyze sustainability agency through these and other senses of wonder.

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