# H.J. ANDREWS FOREST DISCOVERY: A CONCEPTUAL FRAMEWORK FOR INTERDISCIPLINARY INTERPRETATION AND EMPATHY DEVELOPMENT

Lissy Goralnik*[1,2] (lissy.goralnik@oregonstate.edu), Kari O'Connell[2,3], Mark Schulze[1,2], Michael Paul Nelson[1,2]
[1]Oregon State University Department of Forest Ecosystems and Society
[2] H. J. Andrews Experimental Forest
[3] Oregon Natural Resources Education Program

## Introduction

The H.J. Andrews Experimental Forest (HJA) in the Oregon Cascades is one of 24 sites in the Long-Term Ecological Research (LTER) Network. Currently hosting 85 research projects on forests, watersheds, natural resources management, and the humanities, the HJA also offers experiential training for undergraduate and graduate students, professional development for teachers, and programs for K-12 students. Since much of the terrain at the HJA is steep or occupied with sensitive research materials, school visits are limited to tours given by HJA staff or to designated areas within the forest.

The HJA Discovery Trail was developed in 2011 as a place for visitors (~1800 in 2014) to explore the forest from site headquarters, but it is not yet amenable to unguided educational exploration. An interpretive learning trail and fieldtrip support framework for the Discovery Trail would provide new opportunities for visitors to learn about the forest, site research, and personal responsibility for ecological systems. It would also facilitate more student visitors and provide teachers with the resources and confidence to take advantage of experiential learning opportunities in the forest.

## Project Description

We have designed a conceptual framework for an interpretive learning trail and field trip support framework (pre-trip curriculum suggestions, field trip activities, and post-trip curriculum and integration suggestions) (Rebar, 2010) that draws upon the long-term scientific and humanistic inquiry at the HJA. Research on ecological disturbance, resource management, and hydrology is woven with creative writing from the Ecological Reflections program (www.ecologicalreflections.com) and paired with personal reflection (Kolb 1984) and creative inquiry (Buddle, 2014). The trail is currently wired for intranet wifi access; content and assessment will be delivered by digital media (e.g., iPads).

Interactive trail stops will enable students to engage with the forest, ask questions, and create artifacts from multiple perspectives. Each stop will feature elements from two distinct curricula: 1) conservation science research and inquiry, and 2) place-based literature, Native American story, reflection and creative inquiry. Educators will also have access to two in-depth lesson plans and activity kits that will extend the trail learning with more targeted Next Generation Science Standards content (NRC, 2011) than the trail can facilitate. We are interested in two questions: 1) What is the impact of the reflective and creative curriculum on scientific learning, empathy for the forest, and personal responsibility for stewardship behavior? 2) How do the in-depth lesson plans impact student learning and empathetic shifts? Our objective is to increase students' knowledge about place and conservation science, while guiding them to reflect upon their own relationships with place and personal responsibility for stewardship behaviors.

At this stage, our project is a scholarly discussion about interdisciplinary field-based science learning with a focus on place relationships and moral development. The theoretical contribution lies in the emphasis on affective learning variables, the inclusion of arts and humanities alongside environmental science content, the use of digital media for content delivery and assessment, and the opportunity to research learning and moral development through four distinct field trip experiences:

| | Science and Reflective Curriculum | Science Only Curriculum |
|---|---|---|
| In-depth Trail Lessons | Group 1 | Group 2 |
| *No* In-depth Trail Lessons | Group 3 | Group 4 |

## Conceptual Framework

Literature in environmental and place-based education argues that direct experience with the natural world helps develop respect for nonhuman nature (Sobel, 2004). Scholarship in environmental philosophy emphasizes the importance of physical connections to the natural world to create appropriate relationships with the natural world (Moore, 2004), which are necessary for right action on behalf of the natural world. Further, Chawla (2009), citing Kals, Shumanacher & Mondtada (1999), explains that studies of adults and pro-environmental behavior show, "[T]ime in nature, often in childhood…, predicted emotional affinity with nature, which in turn predicted the intention to protect nature" (p. 12). When students explore their relationships with the natural world experientially, they can reevaluate these relationships in contexts where they matter, thereby developing the skills and awareness to manifest their values with action as stewardship behaviors. Environmental education scholarship refers to these actions as responsible environmental behavior (REB) (Marcinkowski, 1998) and their development requires both knowledge about natural systems and environmental issues, as well as care for these systems and a feeling that one can contribute to their wellbeing (Hines, Hungerford, and Tomera, 1986/87; Bamberg & Moser, 2007). Educating for REB requires an emphasis on both cognitive and affective learning objectives.

While field learning can develop cognitive skills (Dewitt & Storksdieck, 2008), so can the classroom, therefore bringing students to the field to focus on cognitive learning alone is not a wise use of resources. Field learning, however, does have a profound impact on affective learning (Proudman, 2002) and designing field experiences with a focus on the emotional and relational elements of environmental learning can facilitate the development of ethical decision-makers, who do not just know about environmental science, but also care about the natural world and are committed to acting on its behalf.

## Literature Review

Behrendt and Franklin (2014) write, "[s]tudents who directly participate during a field experience generate a more positive attitude about the subject" (p. 235), while the National Research Council (2009) explains, "Informal science learning experiences are believed to lead to further inquiry, enjoyment, and a sense that science learning can be personally relevant and rewarding" (p. 11). In this way, field experiences can reinvigorate interest in science for underrepresented groups (NRC, 2009), as well as enhance student ability to understand ecosystems and impact student attitudes about nature (Kamarainen et al., 2012). Field learning contributes to: sharpened skills of observation and perception (Nabors et al., 2009), positive attitudes for learning and motivation (Hudak, 2003), greater interest in the outdoors (Hoisington, Savleski, & DeCosta, 2010), social skills (Michie, 1998), and empowerment (Farmer, Knapp & Benton, 2007). These are all important affective variables connected to the development of place and community relationships.

Chawla (2009) connects affective learning objectives—like empathy for other living beings (Berenguer, 2007), ecocentric perspective-taking (Schultz, 2000), or a sense of connection with nature (Hinds & Sparks, 2008)—to pro-environmental behaviors. This willingness and skill to act on behalf of nature connects affective learning variables to citizenship skills (Orr, 1991) and participatory virtues (Ferkany & Whyte, 2012), which in turn characterize ethical decision-making. Empathy is a participatory virtue tied to environmental decision-making (Berenguer, 2007) that is also associated with both natural history learning (Fleischner, 2011) and arts and humanities education (Gude, 2009; Schwartz et al, 2009).

Vucetich & Nelson (2013) define empathy as a "vivid knowledge-based understanding of another's circumstance, situation, or perspective" (p. 19). This is "a capacity that depends on objective, empirical knowledge...about the conditions and capacities of others." While often restricted to other humans, this kind of affective awareness is also possible with, and some might argue necessary for, wise action on behalf of the natural world (Chawla, 2009). Scholars link this kind of knowledge-based empathy to good ecological research that depends on a sensitivity to natural patterns and processes, an ability to listen to the natural world, and highly developed skills of observation, all of which are cultivated by place-based natural history learning (Cooper, 2000). These kinds of emotional connections to the natural world often manifest as inspiration, awe, and wonder (Dayton and Sala, 2011), responses that outdoor experiences facilitate (Agate, 2010) in ways rarely possible in the classroom. Creative inquiry also sparks similar affective responses to the natural world (Curtis, 2009), and when paired with scientific understanding, can enable knowledge-based empathetic relationships to place and nonhuman nature.

Stout (1999) writes, "The arts, with their inextricable ties to imagination, have the capacity to provide an unlimited source of possibilities for connecting self to other and for creating a disposition for sympathetic awareness" (p. 33). This ability to nurture the imagination is what allows arts and humanities learning to lead students to empathize with human and nonhuman others (Greene, 2008). Making and engaging art and stories, scholars argue, helps students connect to and express emotions, then prompts them to recognize the emotional lives of others and identify with the experiences of these others (Davis, 2008; Jeffers, 2009). The inclusion of art and story into scientific curriculum can have these same effects. Describing the use of visual art in the intern training program at a Los Angeles hospital, Reilly, Ring and Duke (2005) explain, "Incorporating the humanities in medical education has been shown to increase empathy, awareness, and sensitivity to the art of medicine….[and] offers participants a creative model for linking feelings with reasoned observations and for testing, articulating, and arguing these perceptions" (p. 251-252). In field-based science learning, this link to empathy and meaning-making enables students to both better understand and connect with place. Wattchow and Brown (2011) explain, "In doing art and creative writing, educators can guide learners in engaging knowingly with their subjective encounters with place," (195) so that, with student reflection, they might deepen participant connections to place. Place relationships, which facilitate empathetic awareness, can lead to pro-environmental behaviors (Walker & Chapman, 2003; Ramkissoon et al., 2012). For these reasons, our interpretive learning trail will incorporate art, ethics, and reflection alongside environmental science and natural history to educate about ecological systems, while also inspiring empathy and personal responsibility for these systems.

## Methods and Assessment

The use of technology in the field is a relatively new and promising technique for cognitive experiential learning (France et al., 2013; Kamarainen et al., 2012). Digitally-delivered content and assessment will enable curriculum to be modified to reflect changes in audience, scientific knowledge, learning objectives, or forest dynamics over time. The technology also offers interpretive opportunities that traditional interpretation cannot, including (a) real-time and archived video, (b) audio, (c) long-term data sets, and (d) student participation. In addition to the iPad-guided activities, we plan to build non-screen-mediated participation with the forest, group members, and self-reflection into the interpretation to balance the benefits of technology with the affective and interpersonal value of sensory engagement.

Field trip learning assessment presents logistical challenges, as well as issues with identifying, isolating, and controlling the variables that impact what students learn during the field experience (Hofstein & Rosenfeld, 1996). Therefore we plan to employ a diverse assessment strategy to understand the broad student experience. Cognitive assessment will include an evaluation of conceptual learning according to the Framework for the Next Generation Science Standards (NGSS, 2013). Teachers will administer a pre-post summative learning questionnaire in the classroom, and we will collect formative assessment during the student experience. Interpretive stops will be designed in Google Forms as multiple choice or short answer (written or voice response) questions; students will also have opportunities to take photographs and draw pictures. We will archive responses for qualitative analysis.

Results will be provided to the teachers for use in curriculum planning and assessment, as well as used by the researchers to observe affective changes in sense of place (Wattchow & Brown, 2011); student empowerment (Hungerford, 1996); expressions of care or empathy for self, others, or nonhuman nature (Goralnik & Nelson, 2015); and statements of intended transference (Holman & McAvoy, 2005). Affective shifts will also be observed with personal meaning maps (PMM)(Falk et al., 1998) completed by students before the interpretive trail experience and revised after finishing the trail. Groups that participate with the in-depth activity kits will again revise the PMMs following this experience to understand how attitudes, knowledge, and emotions about the forest shift as a result of each activity. In addition, researchers will conduct telephone interviews with the teachers about the pre- and post-trip curriculum suggestions and the activities and concepts the teachers covered in their classes.

## Conclusion

An interpretive trail and field trip framework in the HJA would allow students to learn about conservation science in a storied landscape where science is actively taking place. Field-based learning cultivates curiosity about and connections to the natural world; weaving arts and humanities into the field experience sparks imagination, facilitates empathy, and can develop pro-environmental behaviors. Digital media provides exciting options for content delivery and assessment in the field learning environment.

**References**


Agate, J. 2010. Inspiring awe in the outdoors: A mechanistic and functional analysis. (Unpublished dissertation.) Clemson University: South Carolina. Accessed from http://tigerprints.clemson.edu/all_dissertations/607/.

Bamberg, S., & Moser, G. (2007). Twenty years after Hines, Hungerford, and Tomera: A new meta-analysis of psycho- social determinants of pro-environmental behavior. *Journal of Environmental Psychology, 27*, 14-25.

Behrendt, Marc & Franklin, Teresa. (2014). A review of research on school field trips and their value in education. *International Journal of Environmental & Science Education*, 9, 235-245.

Berenguer, J. (2007). The effect of empathy in proenvironmental attitudes and behaviors. *Environment and Behavior,* 39(2), 269-283.

Buddle, C. (2014). Science, art, and personal reflection: Field journals as an assessment tool in higher education. *SciLogs (*Jan. 9 2014). http://www.scilogs.com/.

Chawla, L. (2009). Growing up green: Becoming an agent of care for the natural world. *Journal of Developmental Processes*, 4(1), 6-23.

Cooper N. S. (2000). Listening to nature: ethics within ecology. *Biodiv.Conserv*. 9, 1009–1027.

Curtis D. J. (2009) Creating inspiration: the role of the arts in creating empathy for ecological restoration. *Ecological Management Restoration* 10(3), 174–184.

Davis, J. H. (2008). *Why our schools need the arts*. NY, NY: Teachers College Press.

Dayton P. K., Sala E. (2001) Natural history: the sense of wonder, creativity and progress in ecology. *Scientia Marina* 65(Suppl 2),199–206.

DeWitt, J. & Storksdieck, M. (2008). A short review of school field trips: Key findings from the past and implications for the future. *Visitor Studies* 11(2), 181-197.

Farmer, J., Knapp, D., & Benton, G. (2007). The effects of primary sources and field trip experience on the knowledge retention of multicultural content. *Multicultural Education, 14*(3), 27-31.

Ferkany, M., & Whyte, K.P. (2012). The importance of participatory virtues in the future of environmental education. *Journal of Agriculture and Environmental Ethics*, *25*(3), 419-434.

France, D., Whalley, W. B., & Mauchline, A. L. (2013). Mobile devices to enhance undergraduate field research. *Council on Undergraduate Research* 34(2), 38-42.

Greene, M. (2008). Commentary: Education and the arts: The windows of imagination. *LEARNing Landscapes*, 2(1), 17-21.

Gude, O. (2009). Art education for democratic life. *Art Education*, 62(6), 6-11.

Hinds, J., & Sparks, P. (2008). Engaging with the natural environment: The role of affective connection and identity. *Journal of Environmental Psychology, 28*, 109-120.

Hines, J. M., Hungerford, H. R., & Tomera, A. N. (1986-7). Analysis and synthesis of research on responsible environmental behavior: A meta-analysis. *Journal of Environmental Education* 18(2), 1-8.

Hofstein, A. & Rosenfeld, S. (1996). Bridging the gap between formal and informal science learning. *Studies in Science Education*, 28(1), 87-112.

Hoisington, C., Sableski, N.,& DeCosta, I. (2010). A walk in the woods. *Science and Children*, 48(2), 27-31.

Holman, T., & L. H. McAvoy. 2005. Transferring benefits of participation in an integrated wilderness adventure program to daily life. *The Journal of Experiential Education* 27(3), 322–325.

Hudak, P. (2003). Campus field exercises for introductory geoscience courses. *Journal of Geography*, 102(5), 220-225.

Hungerford, H.R. 1996. The development of responsible environmental citizenship: A critical challenge. *The Journal of Interpretation Research* 1(1), 25-39.

Jeffers, C. S. (2009). Within connections: Empathy, mirror neurons, and art education. *Art Education*, 62(1), 18-23. DOI: 10.2307/27696326

Kals, E., Schumacher, D. & Montada, L. (1999). Emotional affinity toward nature as a motivational basis

to protect nature. *Environment and Behavior, 31*(2), 178-202.
Kamarainen, A. M., Metcalf, S., Tutwiler, S. M., Grotzer, T., & Dede, C. (2012). EcoMUVE: shifts in affective beliefs and values about science through learning experiences in immersive virtual environments. American educational research association (AERA) conference, Vancouver, BC, Canada. April, 2012.
Kolb, D. A. (1984). *Experiential learning*. Englewood Cliffs, NJ: Prentice Hall.
Marcinkowski, T. (1998). Predictors of environmental behaviour: A review of three dissertation studies. In H.R. Hungerford, W.J. Bluhm, T.L. Volk, & J.M. Ramsey (Eds.), *Essential readings in environmental education* (pp. 227–236). Champaign, IL: Stipes.
Michie, M. (1998). Factors influencing secondary science teachers to organise and conduct field trips. *Australian Science Teacher's Journal*, 44(4), 43-50.
Moore, K. D. (2004). *Pine Island Paradox*. Minneapolis, MN: Milkweed Editions.
Nabors, M. L., Edwards, L. C., & Murray, R. K. (2009). Making the case for field trips: What research tells us and what site coordinators have to say. *Education,* 129(4), 661-667.
NGSS (2013). *Next generation science standards*. DC: The Nat'l Academies Press.
National Research Council (NRC) (2009). Learning science in informal environments: People, places, and pursuits. Washington, DC: The National Academies Press.
National Research Council (NRC) (2011). A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas. Committee on a Conceptual Framework for New K-12 Science Education Standards. *Board on Science Education, Division of Behavioral and Social Sciences and Education*. Washington, DC: The National Academy Press.
Orr, D. (1991). What is education for? *In Context, 27*, 52–55.
Proudman, B. (1992). Experiential education as emotionally-engaged learning. *Journal of Experiential Education* 15(2): 19-23.
Ramkissoon, H., Weiler, B. & Smith, L. D. G. (2012). Place attachment and pro-environmental behavior in national parks: The development of a conceptual framework. *Journal of Sustainable Tourism*, 20(2), 257-276.
Rebar, B. M. (2009). Evidence, explanations, and recommendations for teachers' field trip strategies. (Unpublished dissertation). Oregon State University: Corvallis, OR.
Reilly, J. M., Ring, J. & Duke. L. (2005). Visual thinking strategies: A new role for art in medical education. *Family Medicine*, 37(4), 250-252.
Schultz, P. W. (2000). Empathizing with Nature: The effects of perspective taking on concern for environmental issues. *Journal of Social Issues* 56(3), 391-406.
Schwartz, A. W., Abramson, J. S., Wojnowich, I. Accordino, R., Ronan, E. J., & Rifkin, M. R. (2009) Evaluating the impact of the humanities in medical education. *Mount Sinai Journal of Medicine*, 76, 372-380.
Sobel, D. (2004). *Place-based education*. Barrington, MA: Orion Society.
Stout, C. E. (1999). The art of empathy: Teaching students to care. *Art Education*, 52(2), 21-24 and 33-34.
Vucetich J. A., Nelson M. P. (2013) The infirm ethical foundations of conservation. In: M. Beckoff (Ed.), *Ignoring nature no more: The case for compassionate conservation* (pp. 9-25). University of Chicago Press, Chicago.
Walker, G. J. & Chapman, R. (2003). Thinking like a park: The effects of sense of place, perspective-taking, and empathy on pro-environmental Intentions. *Journal of Park and Recreation Administration*, 21(4), 71-86.
Wattchow B. & Brown M. (2011). *A pedagogy of place: Outdoor education for a changing world*. Victoria AUS: Monash University Press.