The Value of Place-Based Education

Diane Dittrick, Department of Environmental Science, Barnard College

What's the source of that intangible something that makes teaching and learning in the field very special and very powerful? Does it originate in that undeniable force that we experience when we go outside—the one that invigorates our body, mind, and spirit, letting us know we're alive? And does this 'force' become even more strongly felt when the outdoor experience is shared with others? Who knows its source, or what it is—really? Yet, we do know there is something that engages both students and faculty alike when they work in the field together—in a place where their imaginations and creativity are stirred (Cobb, 1977; Crane, 2001; Moore & Wong, 1997) and emotions charged (Burgess, see **Appendix A**), moving them to reflect on the magic, mystery, and compelling power of a place, its surrounding landscape, and its all-embracing environment. While being awakened, what engages the learning community and immerses them in a place-based experience also seems to facilitate, motivate, and heighten all levels of knowing in the context of learning (Pyle, 202; Taylor, Kuo, & Sullivan, 2002; Wells, 2000), bringing forth an almost limitless array of enduring values that lasts long after the immediate place-based encounter is over. For example, studies have shown that direct exposure to nature is essential to children who are diagnosed with attention disorders, depression, and obesity--enhancing their ability to learn (Taylor, Kuo, & Sullivan, 2001; Louv, 2005). In addition, being in the out-of-doors promotes healthy development in children and nurtures the physical and emotional health and learning in both children and adults (Louv, 2005).

The source of the 'force' from which the power of place-based education is derived may be impossible to determine but clearly three characters play crucial roles in the place-based educational scenario, namely, the place, the individual (including the student or teacher, or both), and the community—each of which are key players (or the other 'forces') in the learning experience. Some questions raised in this article include the following: What contributions are provided by 'the place' and 'the community' to create value for 'the individual' in place-based education? What of value is offered to the individual (both student and teacher) in the field experience? What are some core values gained from teaching in the field? And in what way does place-based education provide very effective teaching and learning tools and strategies?

How 'the Place' and 'the Community' Provide Value for an 'Individual' in Place-Based Education

Educators who bring learning to students in the field have countless casually-scripted anecdotal stories to illustrate the value of teaching in the field, yet scientific research in educational psychology has yet to fully document the extent of the value that's provided in the out-of-doors experience (Crimmel, 2003). This article provides some of the many comments made by educators who know the value of teaching in the field and understand the unquestionable benefits derived from the outgrowth of the learning community in the acquisition of knowledge--developed in tandem with each moment of the field learning experience. The lists below provide feedback from educators in the field on the role of 'the place' and 'the community' in the educational experience and the value that it brings to 'the individual.'

Role of the Place

Teaching in the field brings students into the out-of-doors to a natural place where they are given the opportunity to see things in their wholeness (Thomashow, 2001; Burkholder, 2003), where they can merge landscape (the natural world) with mindscape (the mental world) (Orr, 1992), and where they can deepen their connection with nature (Cuthbertson, Dyment, Curtnoys, Potter & O'Connell, 2003). This way of teaching provides students with a way to unify theoretical book knowledge with personal direct experience (Orr, 1992; Wilson, 1998). It is a way to move students toward a middle ground where the self, nature, and theory overlap and are integrated. (Burkholder, 2003). Overall, this process elevates the role of nature (or place) from something to observe to the role of teacher. This way of learning encourages students to see nature as a primary source of information and inspiration, as motivator and classroom, and, primarily, as home—a place that provides comfort, protection , and gives meaning to life—all of which supports the process of learning and creates a meaningful and memorable learning experience (Cuthbertson, Dyment, Curthoys, Potter, & O'Connell, 2003). Below are some key values offered by 'the place' in the out-of-doors learning/teaching experience:

- adds a physical dimension that grounds the individual in an actual geophysical bioregion--heightening the vitality of the learning experience (Crimmel, 2003);
- provides an opportunity to directly experience nature and landscape in concert and witness the unity, or wholeness, of nature and the environment--encouraging the study of the natural history, and the biological and physical cycles of life (Burkholder, 2003; Christensen, 2003; Chandler, 2003; Naban & Trimble, 1994; Wilcove & Eisner, 2000);
- highlights the role of nature as motivator and teacher--engaging the individual more directly in the learning experience (Cuthbertson, Dyment, Curtnoys, Potter, & O'Connell, 2003);
- provides a location in which the individual can partake in a holistic, hands-on, out-of-doors experience--bridging both theoretical and experiential learning (Orr, 1992);
- stimulates and nurtures enduring links between self, place, and others--enabling the development of bonds unlikely to mature within the confines of the four walls of the indoor classroom (Burkholder, 2003);
- provides a location that frees the individual from the pressures and distractions of everyday life--nurturing personal growth and development, strengthening spiritual values, and offering a health-giving, out-of-doors experience (Orr, 1994);
- provides a unique, effective pedagogical tool--stimulating both learning and retention of learned material and fostering a meaningful commitment to stewardship of the environment (Chandler, 2003), and
- provides a context for self-directed fieldwork--stimulating the sense of adventure, exploration, and mystery (Wingfield, 2003).

Role of the Community

Another valuable outcome of teaching in the field is derived from the compassionate exploitation of a common human behavioral trait, which is the inclination to learn from one another—an attribute that is magnified even more when the individual is part of a group. Given this human predisposition, teaching in the out-of-doors optimizes the benefits derived from group interaction, which can motivate, sustain, and reinforce learning. More specifically, basing this experience in the out-of-doors provides a natural context in which individuals are instinctively drawn together to form groups and engage in more meaningful, intimate conversation, which supports the development of community based on a group learning experience (Burgess, see **Appendix A**)—a very valuable outcome of place-based education.

Through the formation of a learning community everyone in the group—both students and faculty alike—are on par in the learning experience (King, 1994), giving all the opportunity to get to know one another in a deeper way, expanding one's sense of self, community, and membership in community (Burkholder, 2003; Grumbine, 2003) while sharing their passions, personal knowledge and experiences, and expertise (Brew. 2003). All of this serves to positively reinforce the development of a learning community that's sustainable and creates a meaningful learning/teaching experience for all participants (Brower & Detting, 1998; Zhao & Kuh, 2004). Combining the out-of-doors and group aspects of the learning experience, students are able to understand and embrace the notion of nature as home, make the link between healthy human interactions and sustainable community development, and go away with a deepened commitment to their role as stewards of the environment. Listed below are some of the key values offered by 'the community' in the field learning experience:

- encourages individuals to share knowledge with one another and broaden their reach to include communities back home--creating learning communities both near and far (Burkholder, 2003));
- builds bridges between human and ecological communities by making meaningful connections with the community, the environment, and the learning process--providing incentives for lifelong learning (Burgess, see **Appendix A**);
- requires individuals to focus on both inter- and intra-personal development and to expand one's sense of self and community—instilling a greater sense of belonging (Grumbine, 2003);
- creates a classroom in which both students and faculty can come together on a more level playing field--raising the overall quality of the human experience (King, 1994);
- links environmental education and ethics--deepening an individual's personal commitment to environmental stewardship and community leadership (Cuthbertson, Dyment, Curthoys, Potter, & O'Connell, 2003);
- enables students to see nature as home--fostering the development of communities that are more sustainable (Stone & Barlow, 2005); and
- provides a highly effective pedagogical framework--stimulating both learning and the retention of learned material (Son, Kenna, & Pfirman, see **Appendix B**).

Value to the Individual

The value, variety, and extent of the benefits gained by those who participate in the learning/teaching process in a place-based educational program are staggering and seemingly without end. Specifically, the fruits of this endeavor are shared by each individual but the overall effects are felt--in the more abstract sense--by the learning community that was created through the combined efforts of each member of the group.

Broadly and simply speaking, the benefits gained are in the areas of learning, personal growth and development, and connections to the natural world (Tallmadge, 2003). In particular, teaching in the field combines learning gained in the classroom with the out-of-doors experience, which fundamentally provides the context in which the individual is better able to make and understand the critical link between theory and practical experience—creating a more meaningful and memorable learning experience (Orr, 1992). Teaching in the field also fosters beneficial personal transformation, invites the integration of the mind, body, and spirit toward wholeness and wellness, and deepens an individual's connection to the natural world and commitment to stewardship of the environment (Orr, 1994). The following list highlights several ways in which value is offered to 'the individual' in place-based education:

- provides the individual with an opportunity to view oneself within the larger context of the environment and to witness the random fluxes that occur in nature, most of which go unstudied in the classroom (Burkholder, 2003);
- allows the acquisition of a new set of practical skills and problem-solving know-how uniquely gained through a hands-on learning experience (Cuthbertson, Dyment, Curthoys, Potter, & O'Connell, 2003);
- encourages independence, builds self-confidence, and deepens self-awareness, which when combined increases maturity, furthers leadership development, and supports commitment to environmental stewardship (Grumbine, 2003);
- fosters personal growth and development and an adventurous learning experience that is meaningful, challenging, and rewarding—transforming theory into a practical learning experience (Hutchings & Wutzdorff, 1988; Jakubowski, 2003); and
- shows the significance of the role of the observer in field work, namely, in research

Core Values Gained From Teaching in the Field

Some of the core values gained from teaching in the field are shown in the Figure below (Powers, 2004), which has been considerably adapted to illustrate the point. The dotted lines indicate changes that have the opportunity of occurring when the learning experience is place-based.

Role of Place, Community, and Individual in Creating Value in Place-Based Education

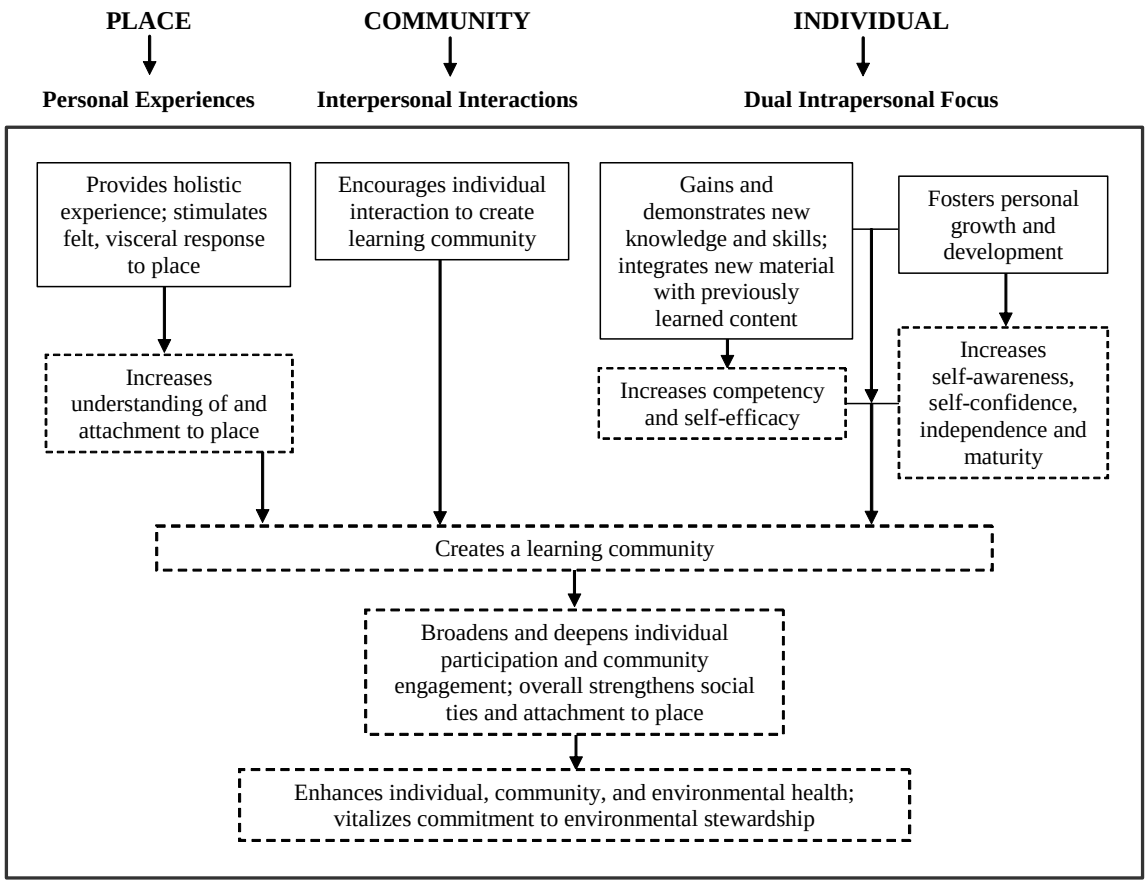

Figure. A working model of change theory in place-based education suggests that an individual is more inclined to be actively involved in his or her community and committed to stewardship of the environment when one has acquired a deeper understanding of and attachment to place and has accrued sufficient knowledge, skills, and expertise to proceed. Adapted by D. K. Dittrick from Powers A. L. (2004). *An Evaluation of Four Place-Based Education Programs*. The Journal of Environmental Education, v. 35, no. 4, p. 20.

Final Comments on the Value of Place-Based Education

In conclusion, when the learning experience occurs out in the field, the individual is fully immersed in the experience, the learning and ecological communities, and the local culture, which when nested together seem to meet some basic human emotional needs and invigorates learning--making the experience more meaningful and the connection to the learning process more evident (Burgess, see **Appendix A**). So as the individual makes more meaningful connections and takes a more active role in his or her own learning process, the more conscious the individual can become of how one's educational choices affirms life's meaning. This affirmation can instill the joyful habit of lifelong learning and deepen one's commitment to stewardship of the environment, all of which supports the health of the individual, the community, and the environment, which thus reinforces the value and power of place-based education (Edwards, 2005; Hautecoeur, 2002; Orr, 1992; & Smith, DiLafruz & Williams, 1999).

Appendix A

How can the field experience provide "the greatest potential for rapid, profound learning"?

Tony Burgess, ecologist, evolutionary biologist, and educator contributes to our understanding of how value can be attributed to teaching/learning in the field. Burgess does this by first defining learning as "changed thinking": an outcome of the learning process that appears to occur most rapidly when associated with intense emotions, such as strong pain or exuberant pleasure. He then goes on to say what is well understood by all--learning requires practice and repetition--but adds an interesting twist, which is that the discipline to practice is sustained through personal meaning and experienced through feelings—feelings that trigger strong emotions. Overall, Burgess explains, one works because it is meaningful—for a wide range and variety of reasons. But how does one know what is meaningful? It is felt! Meaningful experiences—the grist that motivates learning--triggers strong emotions that are immediately felt and engage the individual in a memorable event—an event that reinforces the learning experience.

Burgess underscores that it is reasonable to assume that those teaching practices most likely to engage personal meaning and trigger strong emotions offer the greatest motivation and inspiration for learning. He suggests that field learning (or place-based education) is more effective than traditional classroom teaching because learning in the field is a way of learning/teaching through immersion—a process that requires a deep involvement of both students and faculty on multiple levels of engagement (including the mental, physical, and spiritual aspects of the individual), supports and encourages the development of a learning community, and is embedded in the context of the environment studied. All dimensions of this process invoke meaning and deeply felt emotions—vital factors, or motivators, in "rapid, profound learning." Here are some characteristics of the immersion process that invoke emotion and meaning:

- it's authentic--lessons are set in the place studied and not taught solely within the four confining walls of a classroom, making the impact of the experience more expansive yet direct and, overall, more personally meaningful and less focused on the bells and whistles of technology and, perhaps, the restricting influences of a teacher's personality and ego;
- it usually involves all three modes of learning: visual, auditory, and kinesthetic, providing multiply ways of knowing to enhance learning;
- it's often experienced in groups, stimulating conversation and enlisting peer pressure to reinforce the content of the lessons—here students essentially are teaching one another as they themselves are learning; and
- it's a complex learning environment, creating an opportunity for each individual to integrate and interpret the information in one's own unique way, giving personal meaning to the experience (which, thus, motivates learning).

Currently, Burgess is Professor of Professional Practice at Texas Christian University, Fort Worth, Texas, where he is working on the development of an Institute for Environmental Studies and an innovative, local field studies program. (The above text has been adapted from an email by Tony Burgess to Bronwen Konecky, June 15, 2005.)

Appendix B

How does innovative pedagogy and teaching in the field interact to create value in place-based education?

The term metacognition is aptly defined by Jennifer Livingston as a method by which an individual takes active control of one's own cognitive processes, or the acquisition, organization, and application of knowledge, while engaged in learning, or "thinking about thinking" (Garner & Alexander, 1989; Livingston, 1997; Yussen, 1985). It's a term that has its origins in the field of educational psychology with the publication of Flavell's paper in 1979 (Flavell, 1979; Flavell, 1987). There he identifies and explains a process commonly put into practice to maximize learning, that is, "cognition of cognition," or metacognition. In other words, metacognition describes a way of putting under conscious control the cognitive skills that we use in the acquisition of knowledge, or in the process of learning (Flavell, 2000; Hart, 1965; Janowsky, Shimamura, & Squire, 1989; Metcalfe & Shimamura, 1994; Shimamura & Squire, 1986; Tulving, 1994; Tulving & Madigan, 1970) Some consider metacognition a special kind of cognitive skill (Kluwe, 1982; Nelson & Narens 1994); others associate it with intelligence (Borkowski, Carr, & Pressley, 1987; Sternberg, 1986). Using a metacognitive approach to teaching—encouraging students to identify learning goals and choose the most appropriate strategies for reaching those goals—improves an individual's ability to understand, retain, and transfer knowledge to new situations (Brown, 1987; Flavell, 1976, 1979; Kluwe, 1982; Nelson & Narens, 1990, 1994; Son , 2005) and brings value to the out-of-doors experience.

The research in cognition and metacognition shows that individuals learn best when they take control of their own learning. Using well-know data from the field of cognitive psychology an environmental program, *River Summer*, was jointly developed as a learning experience on the Hudson River by Barnard College and Pace University on behalf of the Environmental Consortium of Hudson Valley Colleges and Universities. This innovative, interdisciplinary field-learning project--launched in the summer of 2005--was based on principles of cognitive psychology and immersive field-, place-, and inquiry-based learning (Son, 2005; Pfirman et al., 2006) and designed to implement effective metacognitive teaching and learning strategies, while it promoted an awareness and appreciation for the Hudson River as a natural resource and cultural environment. *River Summer* demonstrated that field work can reinforce learning and teaching through the various natural settings and diverse perspectives offered in a multi-disciplinary, out-of-doors program (Pfirman et al., 2006).

(continued—**Appendix B**)

The list below provides some examples of cognitive strategies used to promote long-term learning in the *River Summer* curriculum (Bahrick et al., 1993; Birnbaum & Eichner, 1971; Dempster, 1996; Hirshman & Bjork, 1988; Melton, 1970; Slamecka & Graf, 1978:).

.

- Students exert a measure of control in defining and organizing the content of what they learn, often by asking questions. By contrast, teachers serve as "scaffolding," facilitating the discovery and learning process.
- Teachers encourage and request different views and forms of expression; for example, debate help learning.
- Students sense that the results of their work are not predetermined or fully predictable.
- Students feel a sense of ownership in what they do—more effort is put in when the materials are interesting, or more meaningful, to the student.
- Struggle, stress, and spontaneity, are the key to long-term maintenance of knowledge: learning is improved when unexpected events happen, and topics featured evoke questions.
- Learning is faster and retention is better if learning experiences are reinforced regularly over time.
- Contextual variety aids learning: (1) if the learner experiences are reinforced regularly over time, and (2) if the learner studies the to-be-learned materials in a large variety of situations, then, in the long term, regardless of the context, performance will remain high.
- Active generation of previously-learned material is better for retention than repeated passive reading: it is important for students to take some action as a result of their study and learning.
- Students create original and public products that enable them to be "experts."

(The above text has been adapted from an unpublished document by Son, L. K., Kenna, T., & Pfirman, S. (2005). *A metacognitive pedagogy: The "River Summer" project.* Barnard College/Lamont-Doherty Earth Observatory/Columbia University.)

References

Ahl, V. & Allen, T. F. (1996). Hierarchy theory: A vision, vocabulary, and epistemology. New York: Columbia University Press.

Altman, I., & Wohlwill, J. (Eds.) (1983). *Behavior and the natural environment*. London: Plenum Press.

Andruss, V., Plant, C., Plant, J., & Wright, E. (1990). *Home: A bioregional reader*. Gabriola Island: New Society Publishers.

Bahrick, H. P., Bahrick, L. E., Bahrick, A. S., & Bahrick, P. E. (1993). Maintenance of foreign language vocabulary and the spacing effect. *Psychological Science*, 4, 316-321.

Bell, A.C. (1997). Nature study from a learner's perspective. *Canadian Journal of Environmental Education, 2*, 132-144.

Birnbaum, I. M., & Eichner, J. T. (1971). Study verses test trials and long-term retention in free-recall learning. *Journal of Verbal Learning and Verbal Behavior*, 10, 516-521.

Borkowski, J., Carr, M., & Pressley, M. (1987). "Spontaneous" strategy: Perspectives from metacognitive therapy. *Intelligence*, 11, 61-75.

Brew, A. (2003). Teaching, Literature, and the Outdoors. In H. Crimmel (Ed.), *Teaching in the field: Working with students in the outdoor classroom*, (pp. 63-76), Salt Lake City, UT: The University of Utah Press.

Brower, A. A., & Detting, K. M. (1998 / November/December). What is a learning community? Toward a comprehensive model. *About Campus*, 15-21.

Brown, A. L. (1987). Metacognition, executive control, self-regulation, and other more mysterious mechanisms. In F. W. Weinert & R. H. Kluwe (Eds.), *Metacognition, motivation, and understanding*, (pp. 65-116). Hillsdale, NJ: Erlbaum.

Burgess, Tony. E-mail to Bronwen Konecky, June 15, 2005. See **Appendix A.**

Burkholder, R. E. (2003). To see things in their wholeness: Consilience, natural history, and teaching literature outdoors. In H. Crimmel (Ed.), *Teaching in the field: Working with students in the outdoor classroom*. (pp. 17-32). Salt Lake City, UT: The University of Utah Press.

Christensen, L. (2003). Writing the watershed. In H. Crimmel (Ed.), *Teaching in the field: Working with students in the outdoor classroom.* (pp. 172-202). Salt Lake City, UT: The University of Utah Press.

Chandler, K. R. (2003). Can't find the forest or the trees: Finding focus. In H. Crimmel (Ed.), *Teaching in the field: Working with students in the outdoor classroom.* (pp. 172-202). Salt Lake City, UT: The University of Utah Press.

Cobb, E. (1977). *The ecology of imagination in childhood*. New York: Columbia University Press.

Crane, W. (2001). How nature helps children. *Montessori Life*, 13, 22-24.

Crimmel, H. (2003). Teaching in the field: An introduction. In H. Crimmel (Ed.), *Teaching in the field: Working with students in the outdoor classroom*, (pp. 1-16). Salt Lake City, UT: The University of Utah Press.

Cronon, W. (1996). The trouble with wilderness; or, Getting back to the wrong nature. In W. Cronon (Ed.), *uncommon ground*. New York: W. W. Norton and Company.

Cuthbertson, B., Dyment, J., Curtnoys, L. P., Potter, T. G., & O'Connell, T. (2003). Engaging nature: A Canadian case study of learning in the outdoors. In H. Crimmel (Ed.), *Teaching in the field*, (pp. 77-98). Salt Lake City, UT: The University of Utah Press.

Dempster, F. N. (1996). Distributing and managing the conditions of encoding practice. In R. Bjork & E. Bjork (Eds.) *Memory*. New York: Academic Press, pp.317-344.

Edwards, A. R. (2005). *The sustainability revolution: Portrait of a paradigm shift*. Gabriola Island, BC: New Society Publishers.

Elder, J. See *In pursuit of a bioregional curriculum: An interview with John Elder*.

Elder, J. (1998). Teaching at the edge. In *Stories in the land: A place-based environmental anthology. (pp. 1-15). Nature Literacy Series 2*. Great Barrington, MA: Orion Society..

Flavell, J. H. (1976). Metacognitive aspects of problem solving. In L. B. Resnick (Ed.), *The nature of intelligence*, (pp. 231-235). Hillsdale, NJ: Erlbaum.

Flavell, J. H. (1979). Metacognition and cognitive monitoring: A new area of cognitive development inquiry. *American Psychologist*, 34, 906-911.

Flavell, J. H. (1987). Speculations about the nature and development of metacognition. In F. E. Weinert & R. H. Kluive (Eds.) *Metacognition, Motivation and Understanding* (pp. 21-29). Hillsdale, NJ: Lawrence Eribaum Associates.

Flavell, J. H. (2000). Development of children's knowledge about the mental world. *International Journal of Behavioral Development*, 24, 15-23

Fleischer, T. L. (1999). Revitalizing natural history. *Wild Earth 9* (2); 81-89.

Garner, R., & Alexander, P. A. (1989). Metacognition: Answered and unanswered questions. *Educational Psychologist*, 24, 143-158.

Glendinning, C. (1994). *My name is Chellis and I'm in recovery from western civilization*. Boston: Shambhala Publications, Inc.

Golleg, F. (1998*). A primer for environmental literacy*. New Haven: Yale University Press.Gordon, Greg (1999). Wilderness U. *Orion Afield 3* (2): 10-14.

Grumbine, R. E. (2003). Going to Bashō's Pine & wilderness education for the twenty-first century. In *H. Crimmel (Ed.), Teaching in the field: Working with students in the outdoor classroom*, (pp. 49-62). Salt Lake City, UT: The University of Utah Press.

Hart, J. T. (1965). Memory and the feeling-of-knowing experience. *Journal of Educational Psychology*, 56, 208-216.

Hautecoeur, J. P. (Ed.) (2002). *Ecological education in everyday life*. Toronto, Canada: University of Toronto Press.

Hirshman, E., & Bjork, R. (1988). The generation effect: Support for a two-factor theory. *Journal of Experimental Psychology: Learning Memory and Cognition*, 14, 484-494.

Hutchings, P., & Wutzdorff, A. (1988). Experiencing learning through the curriculum: Assumptions and principles. In P. Hutchings & A. Wutzdorff, A. (Eds.), *Knowing and doing: Learning through experience* (pp. 5-19), San Francisco, CA: Jossey-Bass Publishers.

Jakubowski, L. (2003). Beyond book learning: Cultivating the pedagogy of experience through field trips. *Journal of Experiential Education*, 26: 24-33.

Janowski, J. S., Shimamura, A. P., & Squire, L. R. (1989). Memory and metamemory: Comparisons between frontal lobe lesions and amnesic patients. *Psychology*, 17, 3-11.

Kaplan, R., & Kaplan, S. (1992). *The experience of nature: A psychological perspective*. Cambridge: Cambridge University Press.

King, A. (1994). Inquiry as a tool in critical thinking. In D. F. Halpem et al. (Eds.), *Changing college classrooms*, (pp. 13-38). San Francisco: Jossey-Bass Publishers.

Kluwe, R. H. (1982). Cognitive knowledge and executive control. In D. Griffin (Ed.), *Human mind – animal mind* (pp. 201-224). New York: Springer.

Leslie, C. W., Tallmadge, J., & Wessels, T. (1995). *Into the field: A guide to locally focused teaching.* Great Barrington, MA: The Orion Society.

Lieberman, G. A., & Hoody, L. L. (1998). *Closing the achievement gap: Using the environment as an integrated context for learning*. Ponway, CA: Science Wizards.

Livingston, J. A. (1996). *Effects of metacognitive instruction on strategy use of college students*. Unpublished manuscript, State University of New York at Buffalo.

Louv, R. (2005). *Last child in the woods*. Chapel Hill, NC: Algonquin Books of Chapel Hill.

Melton, A. W. The situation with respect to the spacing of repetitions and memory. *Journal of Verbal Learning and Verbal Behavior*, 9, 596-606.

Metcalfe, J., & Shimamura, A. P. (1994). *Metacognition: Knowing about knowing*. Cambrige, MA: MIT Press.

Miller, J. (1988). *The holistic curriculum*. Toronto: OISE Press.

Moore, R., & Wong, H. (1997). *Natural learning: Rediscovering nature's way of teaching*. Berkeley, CA: MIG Communications.

Nabhan, G. P., & Trimble, S. (1994). *The geography of childhood: Why children need wild spaces*. Boston, MA: Beacon Press.

Nelson, T. O., & Narens, L. (1990). Metamemory: A theoretical framework and new findings. In G. H. Bower (Ed.) *The psychology of learning and motivation* (Vol. 26, pp. 125-141), New York: Academic Press.

Nelson, T. O., & Norens, L. (1994). Why investigate metacognition? In J. Metcalfe, & A. P. Shimamura (Eds.), *Knowing about knowing* (pp. 1-25). Cambridge, MA: MIT Press.

Orr, D. W. (1992). *Ecological literacy: Education and the transition to a postmodern world*. Albany: State University of New York Press.

Orr, D. W. (1994). *Earth in mind: On education, environment, and the human project*. Washington, DC: Island Press.

Pfirman, S., Kenna, T., Son, L., Cronin, J., Land, M., & Kelsey, R. (2006). *An interdisciplinary learning experience: "River Summer" in the Hudson*. Unpublished document. Barnard College/Lamont-Doherty Earth Observatory, Columbia University.

Powers, A. L. (2004). An evaluation of four place-based education programs. *The Journal of Environmental Education,* 35 (4), 17-32.

Pyle, R. (2002). Eden in a vacant lot: special places, species and kids in community life. In: P. H. Kahn & S. R. Kellert (Eds.), *Children and nature: Psychological, sociocultural and evolutionary investigations*. Cambridge, MA: MIT Press.

Reed, P., & Rothenberg, D. (1993). *Wisdom in the open air*. Minneapolis: University of Minnesota Press.

Roszak, T. (1992). *The voice of the earth: An exploration of ecopsychology* . New York: Touchstone, Simon and Schuster, Inc.

Sanders, S. R. (1993). *Staying put, making a home in a restless world*. Boston: Beacon Press.

Shepard, P. (1998). Nature and madness. Athens: University of Georgia Press, Original Edition, San Francisco: Sierra Club Books, 1982.

Shimamura, A. P., & Squire, L. R. (1986). Memory and metamemory: A study of the feeling-of-knowing phenomenon in amnesic patients*. Journal of Experimental Psychology: Learning, Memory, and Cognition*, 12, 452-460.

Slamecka, N. J., & Graf, P. (1978). The generation effect: Delineation of a phenomenon. *Journal of Experimental Psychology: Human Learning & Memory*, 4, 592-604.

Smith, G. A., DiLafruz, R., & Williams, R. (Eds.) (1999). *Ecological education in action: On weaving education, culture, and the environment*. New York: State University of New York Press.

Son, L. K. (2005). Metacognitive control: Children's short-term versus long-term study strategies. *Journal of General Psychology*, 132, 347-363.

Son, L. K., Kenna, T., & Pfirman, S. (2005). A metacognitive pedagogy: The "River Summer" project. Unpublished document. Barnard College/Lamont-Doherty Earth Observatory/Columbia University. See **Appendix B.**

Stables, A. & Bishop, K. (2001). Weak and strong conceptions of environmental literacy: Implications for environmental education. *Environmental Education Research, 7* (1), 89-97.

Stables, A. (1998). Environmental literacy: Functional, cultural, critical. The case of the SCAA guidelines. *Environmental Education Research, 4* (2), 155-64.

Stone, M. & Barlow, Z. (2005) *Ecological literacy; Educating our children for a sustainable world*. San Francisco, CA: Sierra Club Books.

Sternberg, R. J. (1986). *Intelligence applied understanding and increasing your intellectual skills*. Orlando, FL: Harcourt Brace Jovanovic.

Tallmadge, J. (2003). Urban nature as a scene of instruction. In H. Crimmel (Ed.), *Teaching in the field: Working with students in the outdoor classroom*. (pp. 17-32). Salt Lake City, UT: The University of Utah Press.

Taylor, A. F., Kuo, F. E., & Sullivan, W. C. (2001). Coping with attention deficit disorder: The surprising connection to green play settings. *Environment and Behavior*, 33 (1), 54-77.

Taylor, A. F., Kuo, F. E., & Sullivan, W. C. (2002). Views of nature and self-discipline: Evidence from inner city children. *Journal of Environmental Psychology*, 22, 49-63.

Thomashow, M. (2001). A biospheric natural history. *ORION 20* (4): 24-37.

Tulving, E. (1994). Foreward of J. Metcalfe & A. P. Shimamura (Eds.), *Metacognition: Knowing about knowing. Cambridge*, MA: MIT Press.

Tulving, E., & Madigan, S. A. (1970). Memory and verbal learning. In P. H. Mussen & M. R. Rosenzweig (Eds.), *Annual review of psychology* (pp. 437-484). Palo Alto, CA: Annual Reviews.

Van Matre, S. (1990). *Earth education: A new beginning*. Greenville, WV: The Institute for Earth Education.

Wackernagel, M., & Rees, W. (1996). *Our ecological footprint*. Gabriola Island, BC, Canada: New Society Publishers.

Watershed Writing Collective (2000). *Recovering Pine River*. Alma, MI: WTW Publications.

Wells, N. M. (2000). At home with nature, effects of "greenness" on children's cognitive functioning. *Environment and Behavior*, 36 (6), 775-795.

Wheatley, M. (2002). *Turning to one another: Simple conversations to restore hope to the future*. San Francisco: Berrett-Koehler Publishers, Inc.

Wilcove, D. S., & Eisner, T. (2000). The impending extinction of natural history. *The Chronicles of Higher Education*, *15* (September): B24.

Wilson, E.O. (1998). *Consilience: The unity of knowledge*. New York: Alfred A. Knopf.

Wingfield, A. (2003). *Self-directed field work as a learning journey*. In H. Crimmel (Ed.), *Teaching in the field: Working with students in the outdoor classroom.* (pp. 172-202). Salt Lake City, UT: The University of Utah Press.

Yussen, S. R. (1985). The role of metacognition in contemporary theories of cognitive development. In D. L. Forret-Pressley, G. E. MacKinnon,& T. G. Waller (Eds.), *Metacognition, cognition and human performance*. Vol. 1. New York: Academic Press.

Zhao, C-M., & Kuh, G. D. (i2004). Adding value: Learning communities and student engagement. *Research in Higher Education*, 45 (2), 115-138.

.