The Educational Values of Trees and Forests

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When we think about the benefits provided by forests and trees, we tend not to think about how they contribute to enhanced learning ability, despite the mounting evidence (MEA 2005: Table 1).
Table 1. Services provided by ecosystems to the benefit of people (MEA 2005).

**Provisioning Services** (products obtained)

- Food
- Fiber
- Fuel
- Genetic resources
- Biochemicals, natural medicines, pharmaceuticals
- Ornamental resources
- Fresh water

**Regulating Services** (regulation of ecosystem processes)

- Air quality regulation
- Climate regulation
- Water regulation
- Erosion regulation
- Water purification
- Disease regulation
- Pest regulation
- Pollination
- Natural Hazard Regulation
Cultural Services (non-material benefits)

- Cultural diversity
- Spiritual and religious values
- Knowledge systems
- **Educational values**
  - Inspiration
  - Aesthetic values
  - Social relations
  - Sense of place
  - Cultural heritage values
  - Recreation and ecotourism

Supporting Services (necessary for the production of all other services)

- Soil formation
- Photosynthesis
- Primary production
- Nutrient cycling
- Water cycling
Objective

To review the literature on this topic with the intent of stimulating further research on the educational values of trees and forests and fostering the application of this knowledge in the learning environment.

Approach

Complexities of the learning process

Links of this process to nature, including ways of interacting with nature

Role of trees and forests

Conclusions
Complexities of the Learning Process

Three Major Modes of Learning (Kellert 2002)

1. Affective or Emotional
   Focuses on the formation of emotional and feeling capacities.
   
   Typically precedes cognition or intellect as a basis for maturation and learning.

2. Cognitive or Intellectual
   Stresses the formation of thinking and problem-solving skills.

3. Evaluative
   Emphasizes the creation of values, beliefs, and moral perspectives.
   
   Emerges from a synthesis of affective and cognitive perceptions and understandings.

(Additional References: Iozzi 1989a, 1989b)
Affective or Emotional Mode

There is some evidence that contact with the natural world, especially during middle childhood (ages 6-12), is important in a person’s emotional responsiveness and receptivity.

Seems to be due to its “dynamic, varied, often unique, surprising, and adventurous character.”

Elicits such responses as satisfaction, delight, joy, excitement, and curiosity.

Interactions with natural settings reduce stress or elicit positive feelings and thereby enhance cognitive functioning, creativity, and performance, especially regarding higher order tasks.

Attention Restoration Theory has been utilized to explain the restorative aspects of contact with nature following a period of directed or forced, focused attention and associated mental fatigue (Kaplan 1995).

There is both psychological and physiological evidence for the restorative value of nature.

Results in cognitive clarity and reflection, thereby enhancing creativity.

Cognitive or Intellectual Mode

Evidence that experiential contact with nature can have a positive impact on cognitive development comes from a number of sources.

Bloom et al.’s (1956) taxonomy of cognition has been used to frame this relationship (Table 2).

Table 2. Enhancement of various elements in Bloom et al.’s (1956) taxonomy of cognition by various forms of interaction or contact with nature (after Kellert 1997).

<table>
<thead>
<tr>
<th>Name of Cognitive Ability</th>
<th>Definition</th>
<th>Enhancing Activity in Nature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge Acquisition</td>
<td>Assembling facts and figures</td>
<td>Identifying and classifying various aspects of the natural world</td>
</tr>
<tr>
<td>Comprehension</td>
<td>Interpreting and understanding empirical realities</td>
<td>Translating specific knowledge of nature into categories of related functions and processes</td>
</tr>
<tr>
<td>Application</td>
<td>Putting knowledge to use in various situations</td>
<td>Distinguishing one environmental feature from another</td>
</tr>
<tr>
<td>Analysis</td>
<td>Teasing apart elements or patterns nested within an overall structure</td>
<td>Dissecting elements in nature</td>
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<tr>
<td>Synthesis</td>
<td>Integrating distinctive elements into an overall whole</td>
<td>Integrating elements and processes in nature</td>
</tr>
<tr>
<td>Evaluation</td>
<td>Discerning worth and importance</td>
<td>Judging the relative significance of particular aspects of the natural world</td>
</tr>
</tbody>
</table>
Burrowing from the work of Mednick (1962), it has been argued that higher order cognitive functioning, which involves integration or association of diverse and seemingly unrelated information or concepts in novel ways, is likely enhanced by exposure to nature (Ulrich 1993).
Kellert (1996) formulated nine values of the natural world that contribute significantly to human well-being (Table 3).
<table>
<thead>
<tr>
<th>Name of Value</th>
<th>Definition of Value</th>
<th>Benefits</th>
<th>Stage of Prominent Development (yrs.)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dominionistic</td>
<td>Urge to master and control nature</td>
<td>Safety and protection; independence and autonomy; the urge to explore and confront the unknown; and willingness to take risks, be resourceful, and show courage</td>
<td>3-6</td>
</tr>
<tr>
<td>Negativistic</td>
<td>Avoidance, fear, and rejection of nature</td>
<td>Avoiding harm and injury; minimizing risk and uncertainty; and respect and awe for nature through recognizing its power to humble and destroy</td>
<td>3-6</td>
</tr>
<tr>
<td>Utilitarian</td>
<td>Material and commodity attraction of the natural world</td>
<td>Physical and material security; self-confidence and self-esteem through demonstrating craft and skill in nature; and recognition of human physical dependence on natural systems and processes</td>
<td>3-6</td>
</tr>
<tr>
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<td>------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
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<tr>
<td>Aesthetic</td>
<td>Physical attraction and appeal of nature</td>
<td>Perceiving order and organization; developing ideas of harmony, balance, and symmetry; and evoking and stimulating curiosity, imagination, and discovery</td>
<td>6-12</td>
</tr>
<tr>
<td><strong>Humanistic</strong></td>
<td>Strong affection and emotional attachment to nature</td>
<td>Developing intimacy, companionship, trust, and capacities for social relationship and affiliation; and enhancing self-confidence and self-esteem through giving, receiving, and sharing affection</td>
<td>6-12</td>
</tr>
<tr>
<td><strong>Symbolic</strong></td>
<td>Nature’s role in shaping and assisting human communication and thought</td>
<td>Classifying and labeling abilities; language acquisition and counting; resolution of difficult aspects of psychosocial development through story and fantasy; and enhanced communication and discourse through the use of imagery and symbol</td>
<td>6-12</td>
</tr>
<tr>
<td></td>
<td>Empirical and systematic study and understanding of nature</td>
<td>Intellectual competence; critical thinking; problem-solving abilities; enhanced capacities for empirical observation and analysis; and respect and appreciation for natural process and diversity</td>
<td>6-12, 13-17</td>
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<td>----------------</td>
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<tr>
<td><strong>Scientific</strong></td>
<td></td>
<td></td>
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<tr>
<td><strong>Moralistic</strong></td>
<td>Ethical and spiritual affinity for nature</td>
<td>Sense of underlying meaning, order, and purpose; the inclination to protect and treat nature with kindness and respect; and enhanced sociability from shared moral and spiritual conviction</td>
<td>13-17</td>
</tr>
<tr>
<td>Naturalistic</td>
<td>Desire for close contact and immersion in nature</td>
<td>Inclination for exploration, discovery, curiosity, inquisitiveness, and imagination; enhanced self-confidence and self-esteem by demonstrating competence and adaptability in nature; and greater calm and coping capacities through heightened temporal awareness and spatial involvement</td>
<td>13-17</td>
</tr>
</tbody>
</table>
Those that contribute most strongly to the development of learning skills include the **naturalistic** and **scientific**, and to a lesser extent the **symbolic**, the latter mostly through the development of language skills.
Gardner’s (1999) inclusion of naturalist intelligence among the (ten) multiple intelligences he formulated to represent the entire spectrum of human cognition lends support to the importance of the naturalist perspective as a fundamental way of learning.
Ways of Interacting with Nature Can Make a Difference
Three ways in which (young) people’s experience of nature occurs (Kellert 1996, 2005)

Direct
Actual physical contact with nature in a spontaneous and unstructured way, including play

Indirect
Actual physical contact with nature, but more structured and planned.
  e.g., zoos, arboreta, botanical gardens, science museums, and nature centers; contacts with domesticated plants and animals; [outdoor lab instruction ? (TLS)]

Vicarious or symbolic
--Representations or depicted scenes of nature
--Principally through the mass media (classroom? TLS)
Considerable conceptual and empirical support for the argument that direct experience of nature plays a significant role in affective, cognitive, and evaluative development in humans that is not replaced by indirect and vicarious experiences, which are on the rise.

Attributed to diversity and variability in space and time of the natural world, together with its unpredictiveness and challenges.

Considerable evidence that children (and adults) are spending increasingly less and less time experiencing high quality natural environments.

Due to a number of factors, including habitat destruction, species loss, environmental contamination, natural resource depletion, urban sprawl, human population growth, “videophilia,” and fear of violence.

Parental concern for the health and safety of their children, in turn related to increased violence in our society, real and imagined, is an increasingly important factor.

Louv (2005) labeled the health syndrome associated with this diminished experience of nature in children today as “nature-deficit disorder” as a way of creating heightened awareness of the problem.

Has had a major impact on the development of impending federal legislation on “no child left inside.”

Key point concerning children’s direct contact with nature is that it be *ongoing and highly accessible*, which in turn implies that it be “nearby.”

Has important implications for regional and urban planning.

Contributions of Trees and Forests to Learning

The first scholarly treatment of the origins of the fundamental relationship between trees and people was that of the psychologist J. O. Quanz (1897).

Created the term “dendro-psychoses” to represent this relationship.

Provided several lines of biological and psychological evidence of an adaptive nature to support the argument that the earliest humans dwelled in trees.

Examples of psychological evidence included the fear of wild animals, thunder and lightning, high winds, and falling; “hide and seek” games; rocking babies to sleep.
Considerable evidence that trees have played a central role in everyday life throughout human history, including:

- Source of food and shade
- Safe sleeping and eating places
- Vantage points for surveying the landscape
- Escape from predators
- Provision of shelter, weapons, tools, and medicine
- Inspiration (TLS)

Orians (1980) hypothesized that tree forms that were most important in the survival of early humans in African savannas should be most preferred by humans today from the standpoint of aesthetics.

Referred specifically to the “acacia” form, with canopies broader than tall, trunks terminating and branching considerably below half the height of the tree, small leaves, and layered branching.

Argued that such trees are easy to climb and their canopies offered greater protection from sun or rain.

Hypothesis was tested on preferences of Americans for trees cultivated in Japanese gardens and for various dimensions of the dominant East African tree, *Acacia tortilis*.

Hypothesis was not rejected.

(Additional References: Orians 1986, Heerwagen and Orians 1993)
Preference for the acacia tree form over other tree forms was subsequently investigated by utilizing college students from all major continents except Antarctica.

In all cases, students preferred the acacia form over other forms (eucalyptus, oak, conifer, and palm).

Moreover, they tended to prefer the most common tree experienced in their respective childhoods more so than students who grew up with other tree forms as most common, indicating that experience also shapes one’s preferences of tree form.

(References: Sommer and Summit 1996, Sommer 1997)
At the stand or landscape level, the evidence suggests that people prefer natural environments over built environments and savanna-type natural environments over other natural environments (Kahn 1999).

Young children (age 8-11 years) from the eastern U.S. preferred East African savannas over mixed hardwood forest (their home environment), boreal forest, rain forest, and desert, while older children showed an equal preference for savannas and mixed hardwood forest.

Suggests the influence of both genetics and environment (familiarity) in such preferences.

(Additional Reference: Balling and Falk 1982)
Preference for the savanna-like environment seems to be the result of being able to acquire new information (mystery) without becoming disoriented or lost (legibility).

May help explain the appeal for closed-canopy forest stands that have been thinned or for urban or suburban open spaces that are planted with scattered trees in a grassy matrix, i.e., are park-like.

May also help explain the tendency of European settlers in North America to open up forested landscapes and plant trees in prairie landscapes.

(References: Kaplan and Kaplan 1989, Kaplan 1992)
Conclusions

The development of learning skills, especially in children, and the realization of creativity and productivity in adults, seem to be enhanced significantly by direct and informal contact on a regular basis with natural settings, especially those that are savanna- or park-like.

These findings may have important implications for the teaching and learning process in our society.

In particular, the notion of less structured and more emotions- or value-laden environments for learning seem to run counter to traditional institutional approaches.
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