Building Future Environmental Stewards: An Investigation of Cognitive vs. Affective Education Domains

Does an affective domain designed environmental education lesson plan deliver a higher emotional response than the traditional cognitive approach?

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Abstract

A connection between traditional environmental education curriculum development and the lack of influence of the affective education domain may be generating less environmental stewards. The affective domain encourages emotional responsive learning that is theorized to drive personal attitudes and behavior. This study evaluates an affective designed environmental education lesson plan to determine if there is a measurable emotional response to nature. The Love for Nature Scale (LNS) assessments were utilized for two 5th grade elementary environmental education lessons to measure emotional responses to the affective and cognitive (control) lesson designs. Qualitative results indicated that students had equally inconsistent emotional responses to the affective and cognitive environmental education lessons. However, utilizing statistical analysis students quantifiably improved spiritual awareness along with a heightened emotional response to cognitive topic emotions. Results also indicate that traditional cognitive environmental education lesson design may already provide a heightened emotional response due to John Dewey’s experiential learning model. Further research is now needed to study the affective design within formal STEM education settings and its impact on emotional responses to environmental topics.

Keywords: (affective domain, cognitive domain, environmental stewardship, environmental education lesson design)

Introduction

Education in society has become institutionalized as the traditional pedagogical methods of time-schedules, schemes of classification, examination, and rules of order. Traditional education systems rob students of opportunities for holistic understanding by forcing them to regurgitate curricula that is overly focused on content rather than reflection, judgement and wellbeing of society. This traditional approach was challenged by John Dewey in the 1900’s in his theories of “new education” or the “theory of experience”. Dewey claimed that continuity of experience within education continues throughout a student's learning lifetime often influencing future educational experiences.

Dewey’s “theory of experience” is strongly accoladed and represented in the discipline of Environmental Education. Dewey claimed that, “experience [outside the school] has its geographical aspect, its artistic and its literary, its scientific and its historical sites. All studies arise from aspects of the one earth and the one life lived upon it”. This connection between experience and the environment evolved to the approaches of David Sobel, and John Elder’s “Place Based Education” (PBE) theory. According to Sobel, Place Based Education is, “the process of using the local community and environment as a starting point to teach concepts in language arts, mathematics, social studies, science, and other subjects across the curriculum [by] emphasizing hands-on, real-world learning experiences.”

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2 Ibid.
3 Ibid.
5 Sobel, D. ,(2005). Place-Based Education. The Orion Society
transforms Dewey's theories of experiential learning through an environmental lens giving a modern take to environmental education.

Both Experiential Learning and Place Based Education theories in pedagogy have the ability to support students problem solving, advocacy, and scientific skills all while in the environment. Yet, an underlying idea of Sobel's PBE is educating to learn an “appreciation for the world”. The use of the word appreciation is directly related to an individual's motivation for environmental stewardship and can be easily felt rather than taught. Appreciation can be defined as “the recognition of and enjoyment of the good qualities of something and is often joined with formulating positive attitudes and similar behaviors.”. Appreciation attitudes and behaviors towards a topic of subject like the environment--is often overlooked in modern education systems where traditional cognitive curricula of scientific investigation, calculations and memorization remain the norm. This “over looking” exposes the need for further research on the benefits of emotional or affective learning within environmental education or institutionalized school systems.

This lack of acknowledgement for “appreciation” learning in the Science Technology Mathematics and Environment (STEME) and Environmental Education (EE) is a concern. Emotions, like appreciation, are key to driving personal beliefs, attitudes and behaviors. Ultimately, these behaviors determine one's potential to contribute to society. For example, if a student feels an appreciation for the humanities they find interest to continue education within the fields of social work, education, or healthcare. Comparatively, this model could be projected onto environmental education to encourage the stewardship of natural resources, ecosystem services, or political advocacy.

The question here is how can environmental education professionals teach environmental appreciation or ensure future stewardship behavior? This investigation will attempt to answer the following question; Does an affective domain designed environmental education plan deliver a higher emotional response than the original cognitive approach?

Emotions

In the last 25 years emotions have been suggested as the underlying catalyst that supports the complexity of modern teaching and learning. This modern approach provides students with a foundation that affects the processes of cognition, psych, motivation, and expressive behaviors. While comparatively within our education institutions , the tradition of education it is known that a student's cognitive learning directly affects behavioral decisions. Immordino-Yang challenges this traditional education theory and suggest that emotion is the link between cognitive and behavior skills.

“as humans our ability to perceive the world with complex cognitive reasoning has allowed society to believe our behaviors are only controlled through the mind. Yet,

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9 Immordino-Yang M.H., (2011). Educational Philosophy and Theory, Vol. 43, No. 1,
it is forgotten that humanity's evolutionary survival traits of emotion given to us helps us survive with the gifts to process thoughts, ideas, making plans through imagination and create things”

This gift of survival [emotions] encompasses Immordino-Yang’s emotion theory of “We Think Therefore We Learn”. Immordino-Yang’s research sparks the need to explore students underlying emotional connections to topics and attitudes.

Another example that supports emotions as a foundation for behavior is Makivirta’s Cognitive Emotional Pedagogy (CEP). Makivirta’s CEP suggests emotional-learning is broken up into four categories: achievement emotions, epistemic emotions, topic emotions, social emotions and incidental emotions. Specifically, topic emotions focus on the empathetic emotions and are often not directly related to cognitive learning and teaching. Makivirta theorizes that emotional-empathetic taught learning fosters a cascading transition to a permanent change in a learners behaviors. Makivirta’s topic emotions emphasized within EE program design may improve personal emotional connection to a student’s experience which then lead to behavior changes.

Emotions and the Environment

Leopold pioneered the importance of ethics within environmentalism through his compiled work of The Land Ethic. The Land Ethic was founded on the premise that individuals need to change to see the environment as interconnected and fundamentally change our socially constructed ideas of loyalties, affections, and convictions. Leopold expresses this connection of human emotion and environmental ethics in the following thought: “It is inconceivable to me that an ethical relation to land can exist without love, respect, and admiration for land and a high regard for its value. By value, I of course mean something far broader than mere economic value; I mean value in the philosophical sense.”

Seamon expands Leopold’s The Land Ethic to explore the relationship of an individual's fostered sense of emotional connectedness with the natural world and environmental ethics. Seamon notes there is significance in an individual's emotional relationship with nature and their ability to maintain a strong environmental ethic. Calliott also suggests that feelings rather than reason determine all morality and ethical systems in society. Clayton agrees and theorizes that “the emotion of caring about the environment may be the most important influence on human

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12 Ibid.
13 Ibid.
commitment to act on the interests of nature.”  Leopold, Seamon and Clayton's theories suggest the need for further research on the power of emotions driving environmental altruism and the possibility to increase environmentalistic behaviors.

This investigation research will reinforce how an affective domain designed EE lesson plan fosters an emotional response compared to traditional cognitive design. Thus, if proven true, such learned emotional responses may improve future progressive behaviors like environmental stewardship.

**Measuring Emotions in Environmentalism**

Scholars have noted the suggested need to study people's internalized feelings and how they impact an individual's connection to the environment. Measurement scale theories formulated around this idea began with Shultz’s Nature in Self Scale (INS). This conceptual model explored the human sense of interconnectedness with nature and the theory of psychological inclusion of nature in one’s self identity. This scale evaluated individuals utilizing a single pictorial measure and overlapping circles representing the nature and closeness of a person's relationship to natural environment. Schultz measurement scale suggests that a person's awareness of self-concept for nature predicts the strength and closeness of the relation with nature.

Mayer and Frantz joined the conversation supporting Schultz and developed the Connected to Nature Scale (CNS). The CNS extended the INS to measure an individual's affective and experiential connection to nature. The research conducted five separate studies in partnership with students from an environmental psychology course relating to Leopold's work. The scale held a 17 item survey designed to measure if individuals generally feel connected to nature. The results suggest that there are moderately high relationships with Schultz’ drawing model and other subjective indicators of value and beliefs within environmental altruism. Perrin and Benassi disagree with the CNS effort to model Leopold’s affective theories of environmental ethics. The argument is that the survey did not measure the affective dimensions but rather measured the cognitive aspects of connectedness. Specifically that the CNS measures an individual's behaviors rather than direct emotional response.

Schultz, Mayer, and Frantz scales depict the need for further understanding between an altruistic motive and emotional connection. The Love and Care for Nature (LCN) scale was created to directly measure emotional response. This scales intention was to solve the ambiguity of emotion or belief in creating a 15-item survey aimed to reflect the underlying construct of love and deep caring for nature. The results suggest that love and care for nature is a predictor of

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21 Ibid.
people's willingness to make sacrifices to protect the environment or act as environmental stewards. This includes the conclusion that one's’ feelings about nature impact the personal sacrifice needed to commit to greater environmental protection or stewardship.

The Love and Care for Nature scale is the best approach to understand how emotions for the environment enforce the need to perform altruistic behaviors. The LCN will be used to examine if students within the affective designed lesson had rational emotional response to the lesson.

**Environmental Education and the Affective Domain**

Lang defines the affective domain in education as a, “significant dimension of the educational process which is concerned with the feelings, beliefs, attitude and emotions of students”. Yet, this practice of education is heavily unseen within environmental education or (STEME) curriculums. Traditionally cognitive based lesson plans have been the dominant practice of the sciences lacking in the affective learning potential for many students.

A study exploring the connection of cognitive and affective learning by Littledyke claims that: “a central challenge of environmental education, therefore, is how to encourage and develop in children a sense of relationship with the environment, which may translate to pro-environmental behavior that follows through into adulthood”. Littledyke calls to attention “how to encourage and develop” youth to make conscious behavioral choices to formulate a relationship to place. Within Littledyke’s paper Science Education for Environmental Awareness: Approaches to Integrating Cognitive and Affective Domains, he explores the need to involve affective learning techniques in traditional science learning programs. Specifically, “an understanding of environmental relationship may be complemented by a love for and respect for nature with feelings of interconnectedness with living things that can lead to motivation to act from a sense of responsibility and concern for environmental protection”. This idea relates to Sobel’s appreciation theory of motivating positive environmental change in the future behavior of students. Littledyke examines how love, respect and feelings are core motivators to encourage a connection to place along with environmental advocacy. Littledyke concludes that in order to encourage love, respect and feelings, an affective learning technique may be more successful than a traditional cognitive lesson. Littledyke and Sobel both highlight the urgency and importance for further test that utilizing an affective design in science based educational programming improves emotional responses to environmental subjects.

**Affective Learning and Cognitive Learning in Environmental Education**

Developing an affective domain within environmental education curriculum is theorized to be an important opportunity to grow environmental stewardship or care. Specific studies by

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24 Ibid.
Gardner expose the importance of affective learning in environmental education in regards to individual attitudes and have laid the foundation that environmental education helps foster positive attitudes towards the environment. \(^{28}\)

While today, environmental education remains heavily focused on cognitive methodologies of teaching and learning despite its findings of fostering positive attitudes. Holton revealed within his study that students in traditional cognitive science courses indicated attitudes became less positive as pupils progress through school.\(^{29}\) Underpinning that this lack of continued studies is due to the style of cognitive education curricula given to the student population. The science curriculum did not support students interests and experience and resulted in a lack of involvement in the learning processes that relate to larger world complexities. This example of science curriculum explains that the cognitive approach does not support the success of student learning and behaviors within hard sciences.

Affective learning is often characterized as appropriate only for arts education, because of its focus on aesthetics, right-brained values, and irrational practice. While traditional cognitive science programs are stereotyped as left-brained, functional, and rational objectives. The strong juxtaposition of cognitive versus affective learning has isolated creative thinking within science platforms for centuries. Littledyke’s research aimed to support the construction of a new approach to science education and its ability to incorporate affective within traditional cognitive domains.

Environmental education traditional cognitive design includes place-based theories, fact-based activity, learning through play, self exploration and memory recall.\(^{30}\) John Dewey influenced much of the experiential and exploration design for environmental education but it possible that the addition of an affective design may improve students emotions towards nature.

**Implementing Affective Learning in Environmental Education Curriculum**

Affective learning is researched and known to create a fostering atmosphere for students in the sense of interest, enjoyment, and excitement in learning about science. It also establishes a learners sense of beauty, respect, reverence, and awe in approaches to the environment and understanding our place in the universe. This style of teaching within traditional science and environmental education has not been sufficiently researched. The opportunities to improve the integration of affective learning in science stems from the need to foster a sense of love or emotion with the environment.

Affective learning pedagogy recommendations for environmental education lesson plan creation was introduced by Louis A. Iozzi in the 1980s. Iozzi stressed the theory of affective as “the key entry point to the teaching learning process” to ensure thinking skills, creativity, and become reflective on topic emotions within environmental education\(^{31}\). Iozzo’s research suggests in order to ensure proper affective environmental education pedagogy, educators should focus on

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the awareness/identification of personal values, physical outdoor excursions, moral maturity activities, and reflection techniques.32

While Littledyke suggests to expose students to direct experiences in nature. This technique ensures students to introspectively find a sense of aesthetic appreciation and awe over biodiversity, beauty, and fascination with complex ecosystems. 33 Developing a sense of place within science curriculum is another affective technique that improves students emotional attachment to science education. Littledyke suggests local citizen science projects, community garden projects or trips to non-formal environmental education facilities in order to ignite “topic emotions” or feelings. Sense experiences are another educational opportunity to connect students to smell, vision, taste and touch to understand natural environments. A third suggestion is ecological investigations and their ability to link community to the place-based environmental impacts of real or imagined development plans. This encourages students to feel a sense of connectedness to place and fosters empathetic connection to a student's local environment. These traditional theories by Iozzi, along with Dewey, are applied to the lesson design for this research. This includes a focus on reflection techniques, sense experiences, experiential learning, topic emotions and self ecological exploration.

Modern Affective Environmental Education Learning Lesson Plan Techniques

Similar to Iozzi’s theory of outdoor exploration for environmental education curriculum development, Robertson, Laurence and Heath suggest the need for “abstracting meaning from experience”.34 Specifically positioning a participant's “rational reflection over their embodied experience of the lesson”35. Although debatable, reflection is considered a cognitive process but can connect students with what they observe and experience in the outdoors juxtaposed to their academics or cognitions.36 Also, reflection has the power to allow environmental education participates to step back and ponder one's internalized thoughts or meanings and overall generate meaningful learning.37 While this reflection curriculum technique fosters self-exploration it also introduces the importance of individualized emotions. Specifically explaining that emotions drive a student’s personal reflective narrative and improve awareness of place, presence, and appreciation.

According to Dewey, “Emotion is the moving and cementing force. It selects what is congruous and dyes what it selected with its color, thereby giving qualitative unity to material externally disparate and dissimilar”38. Dewey here along with Eyler and Giles emphasis that emotion is the catalyst for one's reflection of experience. Cohesively the ideas of many scholar

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32 Ibid.
34 Robertson, M.,Lawrence,R., Heath, G. (2015), Experiencing the Outdoors Sense Publishers p.51
35 Ibid.
support Robertson, Lawrence, and Heath’s modern approach of abstracting meaning or emotional reflections to outdoor educational experiences foster an affective learning result. Again in hopes to return the environmental education experience to foster emotional feelings for the participants potential stewardship for nature.

Reflection within environmental education is practiced through student field journals, opinion pieces, and advocacy projects. Recently, mindfulness practices have been supported to encourage reflection in the field of affective learning. Hanh believes, “mindfulness helps us look deeply into the depths of our consciousness [...] When mindfulness embraces our joy, our sadness, and all our mental formations, sooner or later we will see their deep roots [...]” Ultimately advocating for the use of mindfulness to invoke the intrinsic value of present moment being, awareness and activity. This idea of “present-moment reality” has been acknowledged by Langer as effective and enjoyable education psychology tool in various domains of learning. Mindfulness brings out an opportunity for internalized reflection that is paired with emotional thought. Overall suggesting that mindfulness and emotion are connected and bring value to an affective lesson design.

Schoeberlein and Sheth revealed that there is a positive correlation between mindfulness practices in traditional pedagogy and the successes of their students. Benefits included an increase in focus and awareness, strengthened attention and concentration, reduced anxiety and enhanced social and emotional learning. This study suggests that mindfulness and education are interwoven and improves a student's present concentration and inner experiences to their outer environment. Hooker and Foder suggest practicing visualized meditation for children can bring, “increased awareness to the external environment and to the internal experience of the body and the mind, children will likely benefit psychologically and emotionally, as well as through gaining a general sense of well being.” Common practices of visualized meditation generally encourage imagination or creativity and a common generative technique to focus the mind. Often known as “the inner eye”, visualization practices include narrative readings read aloud to students. This technique engages a student's imagination and helps students engage intuition, creative and affective aspects of thinking. Fisher claims guided visualization has the ability to form “waking dreams” that are controlled tightly or offer freedom for students to imagine. The waking dreams are offered through the practices of , “A focus such as a candle flame, picture or word stimulus can be used not only to focus the mind but also exercise the imagination by being led to a special place in the mind—for example a circular pool of water, utterly still, without a single ripple to disturb the surface.”

The practice of visualized meditation or mindfulness has the opportunity to further environmental education curriculum to develop effective learning techniques. Strich advocates for the use of “Sit Spot” curriculum additions to non-formal and formal environmental education.

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45 Ibid.
pedagogy. The technique is to allow students to be alone outdoors with their thoughts and feelings while creating a personal reflective piece of art or writing. Sit Spots have been utilized and not limited to the North Cascades Institute, the Wilderness Awareness School and part of the core curriculum at a private school in Stanwood Washington. Various scholars find the student benefits include science inquiry, personal growth, reflection and solitary time. Reflection learning specifically, noted by Richard Louv, is a lost art,

“as the pace of life, especially for children has quickened-- as we strive to improve schools, increase productivity, accumulate wealth, and provide a more technological education- the consequences of our intentions are not always what we intend. Our lives maybe more productive, but less inventive. In an effort to value and structure time, some of us unintentionally may be killing dreamtime.”

Louv connects the need to step away from traditional cognitive approaches of pedagogy and turn inward with affective learning techniques. This bigger picture alerts our need to drastically reform our so-ever new technology and productive schooling approaches in order to regain students “dream time” and emotional meaning to topics. The suggestion made by Strich to embrace the Sit Spot activity in environmental education creates a place-based lesson plan that supports affective learning in science.

Lesson Creation Agenda

The literature suggests that there is value and potential in an affective designed environmental education lesson to foster future environmental stewards. The EE community agree in the opportunity to involve the use of affective learning styles incorporated within traditional EE lesson plans has many benefits for students, teachers, and the encompassing possibility of a world understanding of environmental importance. Scholars describe the importance to engage STEME with affective lessons to develop the next generation of environmental awareness, attitudes and behaviors that allow all students to succeed within the hard sciences. This literary review provides the tools to test research question of , “Can an affective domain designed environmental education lesson plan deliver a higher emotional response than the traditional cognitive approach?” The scholars lesson design suggestions, to evoke affective emotional response, include; visual mindfulness, a sit spot activities, an affective scavenger hunt (which includes emotionally responsive language), the use of sight, smell, touch and sound, and self reflection along with drawing.

Methods:

48 Ibid.
Foreword

The preliminary research literary reviews provides insight into the need to investigate affective learning techniques within Environmental Education and other STEM programs. The research involved in this thesis involved New York City Public School 110 and the cooperation of the NYU Wallerstein Collaborative relationship with Fran Agone of The Wildlife Federation. All students identities are protected along with their responses.

Study Site

The field study was conducted within McGolrick Park. McGolrick Park is operated by the New York City Parks and Recreation Department and is well known for its 9.1 acreage. Within the park there are signs of modernity such as; benches, pathways, trash cans and structures. However the natural aesthetic includes massive plane trees, grassy lawns and an abundant wildlife population. The study was conducted within the center of the park within the grassy lawn with access to various Plane Trees, compost piles and room to explore.

Study Group & Survey Assessments

The field research focused on two 5th grade outdoor environmental education lessons. Class A received a cognitive domain lesson plan, while Class B received an affective domain lesson plan. Both the cognitive and affective student groups received a pre and post survey to evaluate the emotional response of the students. The assessment replicated Perkin’s Love And Nature Scale (LNS). This likert scale based assessment contained 18 curated questions to measure emotional response to the environment. A variation of Perkins survey was conducted instead of the original Likert numbered scale, emotional facial expressions replaced numbers. This variation was completed to accommodate a younger subject population compared to the adult subjects in the original LNS.

The survey was revised to range from “1 (angry face)= strongly disagree” to “8 (heart-eyed face) = strongly agree (see appendix). Questions replicated the traditional LNS questionnaire within the pre-assessment. However, due to students inability to grasp the abstract language, the questions were reworded to reflect their age group for the post survey. A sample of 32 5th graders at P.S. 110 participated in the field education lesson and completed assessment protocols. A researcher and two teaching assistants supported each field lesson. The number of students who participated could have been larger, however the sample size was smaller than expected due to public school day programming.

Materials

Students were provided with makeshift clipboards, writing utensils, paper and crayons.

Study A : Cognitive Lesson
Field Lesson Plan Design Development

Dewey’s experiential learning techniques were incorporated for the Cognitive Lesson plan to create a control and replicate a traditional cognitive environmental education lesson. This lesson acting as a cognitive control incorporated Bloom’s Taxonomy of Learning Domains. The design encouraged knowledge, evaluation, and comprehension. In the first activity, the scavenger hunt, students were given scientific statements such as, “Something that an organism needs to survive.”. This statement encourages knowledge based investigation, evaluation and comprehension. The second activity, the meditative reading, encouraged students to listen and focus on recalling specific details of the reading. This supports Bloom’s idea of recall and retrieval of information and is a classic example of traditional scientific methods of learning. (appendix for lesson plan.)

Study B: Affective Lesson

Field Lesson Plan Design Development

Modern affective learning techniques were utilized for the affective lesson plan design. The design is supported through the literature review with the addition of affective response bait, visualization, reflection, art and sit spots. The design encourages emotional responses to the students experience being in nature and learning with the traditional experiential learning techniques of environmental education. The first activity, scavenger hunt, students were asked to find a noun that fit an effective statement. An example, “Something you think is beautiful”. This statement acts as “bait” to evoke an emotional response when thinking about an environmental space. The second activity, meditative reading, provided a modern educational tool of fletching on a visual description of a natural space. Students were encouraged to use imagination, reflection and visualization to emotionally connect to the environmental reading.

Analysis - Quantitative & Qualitative

Data was taken from the assessments and drawing responses in Class A and Class B. Means were calculated from the post and pre assessments for all 18 questions (see appendix). This is considered qualitative despite the statistical technique and determines the differences in students responses after the given lesson. Additionally, qualitative data was gathered from students written responses from the meditative lesson. Quantitative analysis was curated with the statistical t-test and p-value for the 18 question assessment.

Results

Qualitative Results on Emotional Response

The qualitative mean comparison between Class A (Cognitive) and Class B (Affective) are listed in Table 1. This table compares and demonstrates the questions that were greatly affected by the affective lesson design. Each question within the the Love and Nature Scale (LNS) is compared
between their specific means that relate to the trending changes between the post and pre assessments of both cognitive and affective lesson plans. The data shows that the affective lesson and the cognitive lesson each had nine questions that supported an increase in emotional responses. Although this is an even representation of emotional learning in both lesson plans, comparing the means side by side some results were too close to possibly assume a completely strong correlation to either lesson design.

<table>
<thead>
<tr>
<th>#</th>
<th>Question</th>
<th>Class (A) Cognitive Mean</th>
<th>Class (B) Affective Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>I feel joy just being in nature</td>
<td>-0.266</td>
<td>0.266</td>
</tr>
<tr>
<td>2</td>
<td>I feel that closeness to nature is important for my well being</td>
<td>0.266</td>
<td>0.1764</td>
</tr>
<tr>
<td>3</td>
<td>When I am close to nature, I feel a real sense of oneness with nature</td>
<td>0.533</td>
<td>0.64705</td>
</tr>
<tr>
<td>4</td>
<td>I feel Content and show how at home I am when I am in untouched nature.</td>
<td>0.133</td>
<td>0.5294</td>
</tr>
<tr>
<td>5</td>
<td>I feel a deep love for nature.</td>
<td>0.266</td>
<td>-0.588</td>
</tr>
<tr>
<td>6</td>
<td>Playing video games is more fun than being outside.</td>
<td>0.133</td>
<td>-0.764</td>
</tr>
<tr>
<td>7</td>
<td>I often feel emotionally close to nature</td>
<td>1.33</td>
<td>1.1167</td>
</tr>
<tr>
<td>8</td>
<td>When I spend time in nature I feel that my day-to-day worries seem to dwindle away in the face of the wonder of nature</td>
<td>1</td>
<td>0.41176</td>
</tr>
<tr>
<td>9</td>
<td>Protecting the wellbeing of nature for its own sake i important to me.</td>
<td>-0.6</td>
<td>-0.1176</td>
</tr>
<tr>
<td>10</td>
<td>I feel spiritually bound to the rest of nature.</td>
<td>-1</td>
<td>0.1764</td>
</tr>
<tr>
<td>11</td>
<td>I often feel a strong sense of care towards the natural environment.</td>
<td>-0.066</td>
<td>-0.3529</td>
</tr>
<tr>
<td>12</td>
<td>I need to have as much of the natural environment around me as possible.</td>
<td>-0.78</td>
<td>-0.647</td>
</tr>
<tr>
<td>13</td>
<td>Squirrels in NYC are part of nature</td>
<td>-1.266</td>
<td>0.11764</td>
</tr>
<tr>
<td>14</td>
<td>When in a natural setting I feel emotionally close to nature.</td>
<td>0.066</td>
<td>0.0588</td>
</tr>
<tr>
<td>15</td>
<td>I enjoy learning about nature</td>
<td>0</td>
<td>0.0588</td>
</tr>
<tr>
<td>16</td>
<td>I often feel a sense of awe and wonder when I am in untouched nature.</td>
<td>1.33</td>
<td>0.2352</td>
</tr>
<tr>
<td>17</td>
<td>I feel a personal sense of interconnectedness</td>
<td>0.933</td>
<td>0.647</td>
</tr>
</tbody>
</table>
with the rest of nature

<table>
<thead>
<tr>
<th>18</th>
<th>I feel a deep love of nature</th>
<th>-0.266</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total number of questions supporting:</td>
<td>9</td>
<td>9</td>
</tr>
</tbody>
</table>

Table 1. Question and means for Cognitive & Affective Lesson comparison for qualitative analysis.

Below, Graph 1. supports this data by visually demonstrating the mean comparison between the affective and cognitive results of the structured LSN scale 18 question survey. The traditional bar graphs depicts the questions numbers (1-18) along the x axis, and statistical means along the y-axis.

![Graph 1. Visual comparison of mean results of post-pre assessment data](image)

Quantitative Results

Despite the small sample size of 32, quantitative results still apply to this research. After statistical analysis question 10 and 13 provide consisted strong correlations in favor of heightened emotional response within the affective lesson. Question 10 which stated, “I feel spiritually bound to the rest of nature.”, favored the affective lesson with a P-value of .0539. In addition, Question 13 “Squirrels in NYC are part of nature” statistically favored the affective lesson with a P-value of .0365. Both showing significant relationships with the students positive answer changes in response to an affective planned lesson.

Discussion
The purpose of this study was to determine the effect of an affective environmental education lesson plan on a population of student’s ability to improve emotional response to nature. The qualitative results indicate that subjects had an inconsistent emotional response to the affective environmental education lesson. When considering these result, it seems possible that a traditional cognitive based environmental education lesson plan may cause a heightened emotional response to the environment. This conclusion may be due to John Dewey’s experiential learning theories that break way from traditional education. Although the cognitive lesson did not use affective learning, it did however, provide a hands-on, self exploration and place-based experience. This indicates that a traditional environmental education cognitive lesson design that provides an outdoor space, free play, and individualization can improve students emotional response.

Another theory is that the second lesson, meditative reading, may have had an affective effect despite the cognitive directions to recall, remember and regurgitate information. Evidence of this is seen within students written response to the meditative reading. Figure 5, shows an example of two students who followed the direct cognitive instructs to engage cognitive skills to recall information in the reading. While in Figure 6., you notice that students not only wrote information from the reading but also felt an individual urge to draw pictures. This difference in student behavior indicates that the meditative reading activity may have skewed the controlled cognitive group to develop an unconscious emotional response to nature.

A quantitative investigation of LSN scale questions resulted with significant p-value correlations for two specific questions. It is possible that question 10, “I feel spiritually connected to nature” (P value .053) had a supported heightened emotional response because the language of the question specifically the use of the word “spirituality". “Spirituality” can be defined in various ways, however within the study it was intended to be represented as, “the quality of being concerned with the human spirit or soul as opposed to material or physical things”\(^5\). This heightened emotional response may be due to students seeing the word “Spiritually” a topic emotion word, drove students to improve their emotional response. This strong correlation (P value. 053) possibly directly related to the meditative nature reading. This theory is supported with the evidence from the affective students drawing responses to the reading (Figure 7& 8). The responses display consistent theme of emotional thought and feelings. Common emotional themes included the use of emotional words; calm, relaxed, excited, curious, and happy. This written response supports the theorization that the introspective affective meditation heightened a spiritual connection in the affective student population versus the cognitive.

The second question to resonate with the students was questions 13, “Squirrels in NYC are part of Nature”(P value .0365). This strong correlation of an affective lesson increasing an emotional response is unique in this case. Specifically because question 13 was placed within the survey to act as a cognitive control and to demonstrate a higher correlation to a cognitive designed EE lesson plan. This unexpected result of cognitive control acting in opposition of expectation can be attributed to two factors. Firstly, the language and use of the word “squirrel” could have triggered an emotional response because the word is a topic emotion. In other words, students may have an existing emotional response to the word “squirrel” which drew attention during the assessments. The second possible reasoning behind this quantitative result is the idea

\(^5\) Spirituality - Oxford Living Dictionaries
that an affective lesson increases cognitive thought. Overall suggesting that the affective lesson partnered with traditional environmental educational programming can improve value of a students cognitive learning processes.

The results do not consistently go in one direction which suggests that both affectively-centered and cognitively-centred lessons can have different effects on learning. In fact, that the traditional experiential learning of environmental education may influence unconscious affective emotional responses already. While an addition of a meditative affective nature design tap into students spirituality, heightened emotional response and provide affective response even with cognitive domain expectations.

The assessment and written response data acted as an interesting investigation of students emotional response to a traditional cognitive-based EE vs. affective-based education. The qualitative data suggests it is difficult to analysis and truly measure emotions. The complexity of the human brain, behaviors and attitudes are forever interconnected that aiming to understand an individual's reasoning may be entirely impossible. Ultimately, the cognitive and affective domains rely heavily one one another and may not exist without one another.

**Conclusion**

With the current political climate there is a cause of concern for the future of environmentalism. In education there is an opportunity to foster the ethics, emotion and stewardship. Since the 1960’s environmental education has pioneered the need to impact youth on the importance of conservation and stewardship. However, today with new distractions of social media, technology and generational perspectives, the environment is becoming an afterthought. This fear of low environmental attitudes and appreciation will lead to a generation of professionals specialising outside the environmental sector. This pressing desire to steer the next generation toward environmental stewardship is the driving force behind the research into emotions.

Emotions are an elusive component to learning, influencing attitudes/behaviors and acting as an evolutionary component to humanity's existence. Then why do traditional school systems in the United States not hold any standards for incorporating emotions in school programming? This lack of affective learning supports the sad narrative within science education. Which is that the students compatible to thrive in the traditional cognitive learning world are put on a successful track while the population of students who lack cognitive motivation are left behind. The population of students not engaging in STEmE are often the individuals of tremendous value. Consisting of students with learning disabilities, creative outlookers, problem solvers and big picture thinkers. This percent of students who should be included in the conversation are then placed to feel that science education is too difficult, not important or not within their personal attitudes. This scenario is where this research of the affective domain can change the current paradigm of STEmE education.

This study focused on the role of students emotional responses in a designed affective environmental education lesson. Although the findings supported the hypothesis of increased emotions from affective domains, there also was findings that emotional responses are still present within cognitive learning based EE lesson plan. For example, within the cognitive lesson the use of John Dewey’s experiential techniques and the cognitive practices created a subconscious affective response to the students emotional connection to environmental topics.
(This finding did not correspond with the research question but revealed the possibility that traditional EE lesson plan may be affective as is.)

As theorized the power of emotional affinity toward nature has, in studies, explained nature-protective behavior or environmental stewardship.\textsuperscript{51} This study demonstrates that within environmental education the creation and implementation of an affective lesson plan may not directly impact one's emotional connection with nature. Although the qualitative results support a similar impact on emotions within the affective and cognitive lessons there was evidence that the affective lesson capitalized on improving a student's emotion for the natural world.

**Further Research**

Utilizing this studies affective learning techniques and implying them to a traditional public school STEME cognitive curriculum may find different results. Such future research has an opportunity to explore formal cognitive environmental science lesson design with an addition of the affective techniques used in this study. This opportunity could explore the difference of the cognitive and affective domains without John Dewey’s affective influence of experiential learning. Ultimately giving a stronger correlation towards student emotional response without the influence of subconscious affective learning.

An Environmental Education Cognitive & Affective Lesson Plan Comparison

**Purpose of Lesson:**

- Educate 5th graders on the concepts of autumn environmental ecology through experiential place-based and emotional learning techniques. Each lesson is to focus on cognitive or affective domains.

**Essential Questions:**

- What forms of educating evoke emotional connection or awareness to environmental places?
- How do students compare in their assessments from one lesson comprised of traditional environmental education techniques and one with emotional learning aspects?
- Does stewardship arise from emotional connection to nature?

**Environmental Experience:**

- Class A - Cognitive Lesson Plan
- Class B - Affective Lesson Plan

**Materials:**

- Clipboards, crayons, markers, narrative nature reading and scavenger worksheets
<table>
<thead>
<tr>
<th>Introductions</th>
<th>Students are introduced to educator as an NYU Environmental Educator. Students introduce themselves by name.</th>
<th>Students are introduced to educator as an NYU Environmental Educator. Students introduce themselves by name. Along with their favorite animal and why … how it makes them feel.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Activity 1: Scavenger Hunt</td>
<td>Students will explore the park with a guided scavenger hunt worksheet. The purpose of the exploration is to find natural nouns that relate to the cognitive statements of nature.</td>
<td>Students will explore the park with a guided scavenger hunt worksheet. The purpose of the exploration is to find nouns that relate to the affective statements regarding nature.</td>
</tr>
<tr>
<td>Activity 2: Reflective Reading &amp; Response (Sit spot)</td>
<td>Students will return together and share some of their scavenger finds.</td>
<td>Students will return together and share some of their scavenger finds.</td>
</tr>
<tr>
<td></td>
<td>Once in a circle students will ask to sit, close their eyes and listen to a narrative reading about nature. Students are instructed to listen for names of plants, types of trees, or any cognitive vocabulary.</td>
<td>Once in a circle students will ask to sit, close their eyes and listen to a narrative reading about nature. Students are instructed to listen for how the reading makes them feel, what they thought was beautiful or made them excited. Specifically focusing on the emotional responses.</td>
</tr>
</tbody>
</table>
|               | After listening to the reading students will be given a piece of paper and asked the same question, “Please write down what you remember from this” | After listening to the reading students will be given a piece of paper and asked the same question, “How did this nature reading make
Love For Nature Scale (LNS) Resource:

Name:__________________

<table>
<thead>
<tr>
<th>Statement</th>
<th>How Do You Agree With This Statement? Please Circle.</th>
</tr>
</thead>
<tbody>
<tr>
<td>I feel happy and feel comfortable in untouched nature.</td>
<td>![Emoji Options]</td>
</tr>
<tr>
<td>When I spend time in nature I feel that my worries seem to go away.</td>
<td>![Emoji Options]</td>
</tr>
<tr>
<td>Playing App games on phones is more fun than being in nature.</td>
<td>![Emoji Options]</td>
</tr>
<tr>
<td>When I am close to nature, I feel a real sense of connection to the outdoors.</td>
<td>![Emoji Options]</td>
</tr>
<tr>
<td>I feel a deep love for nature.</td>
<td>![Emoji Options]</td>
</tr>
<tr>
<td>I feel spiritually connected to nature.</td>
<td>![Emoji Options]</td>
</tr>
<tr>
<td>I feel joy just being in nature.</td>
<td>![Emoji Options]</td>
</tr>
<tr>
<td>I need to have as much of the natural environment around me was possible.</td>
<td>![Emoji Options]</td>
</tr>
<tr>
<td>Statement</td>
<td>Emojis</td>
</tr>
<tr>
<td>--------------------------------------------------------------------------</td>
<td>----------</td>
</tr>
</tbody>
</table>
| Squirrels in New York City are part of nature.                            | 😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞 снижен
| When in natural settings I feel emotionally close to nature.               | 😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞 снижен
| I often feel a strong sense of care towards the natural environment.     | 😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞 снижен
| I enjoy learning about nature.                                           | 😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞😞سعد
| I often feel curious or inspired when I am in untouched nature.           | 😞😞😞😞😞😞😞😞😞😞سعد
| I feel a personal connection with the rest of nature.                    | 😞😞😞😞سعد
| Protecting nature is important to me.                                   | 😞😞😞😞سعد
| I feel that closeness to nature is important for my wellbeing.           | 😞😞😞[strlenished]
| I often feel emotionally close to nature.                                | 😞😞😞[strlenished]
| I feel a deep love for nature.                                           | 😞😞😞[strlenished]
### Scavenger Hunt PDF Resource:

**Nature Scavenger Hunt!**

**Directions:** Find and write or draw.

<table>
<thead>
<tr>
<th>Something You think is an herbivore</th>
<th>Something that eats worms</th>
<th>Something that uses sunlight for energy</th>
<th>Something that is a predator</th>
<th>Something that is alive</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Something that is a decomposer</th>
<th>Something that an organism needs to survive</th>
<th>Something with a short life span</th>
<th>Something that takes in nutrients</th>
<th>Something that is a mineral</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Something that could be shelter for an organism</th>
<th>Something that eats meat</th>
<th>Something that has an adaptation</th>
<th>Something that is in the food chain</th>
<th>Something that relates to the fall season</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Something that could be in an experiment</th>
<th>Something you observe as a scientist</th>
<th>Something humans use to survive</th>
<th>Something you could investigate</th>
<th>Something that is in the sky</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

*Figure 2. Cognitive Scavenger Hunt*
Nature Scavenger Hunt!

Directions: Find and write or draw.

<table>
<thead>
<tr>
<th>Something that feels rough to touch.</th>
<th>Something that brings you excitement.</th>
<th>Something that you find beautiful.</th>
<th>Something that you feel is important.</th>
<th>Something that makes noise.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Something that is soft.</td>
<td>Something that reminds you of someone.</td>
<td>Something that brings you joy.</td>
<td>Something that you are curious about.</td>
<td>Something that makes you happy.</td>
</tr>
<tr>
<td>Something that you can hear.</td>
<td>Something you care about.</td>
<td>Something you think you can relate to.</td>
<td>Something that is small but courageous.</td>
<td>Something that speaks to you personally.</td>
</tr>
<tr>
<td>Something that smells earthy.</td>
<td>Something that surprises you.</td>
<td>Something worth protecting.</td>
<td>Something that is fascinating.</td>
<td>Something that is loveable.</td>
</tr>
</tbody>
</table>

Figure 3. Affective Scavenger Hunt
Meditative Nature Narrative Reading Resource:

It's autumn and the air feels crisp. The tip of your nose itches with the cold, but the sun shines down on you, and you can feel the warmth of its touch as it spreads across your cheeks and forehead. Around you are tall pines, their heights are lofty and their lower branches bare. They break up the light and dapple the forest floor with reds, yellows and oranges.

There is a damp earthy smell if you breathe in deeply, but it is mixed with the sweet freshness of the pine needles. It settles over you, and with it comes the chittering sounds chipmunks. One pauses in front of you, its hands halfway to its mouth and it stares at you for a moment before cocking its head and skittering up a tree.

To your left you can hear the bubbling of a stream. You turn to look into it; there are mossy stones and clumps of leaves clotted on its edges. You watch as one dislodges itself from its cluster and slips down the stream. It parts the water with its trail and for a moment the ripple shimmers with silver.

You lean back against a tree, the bark cuts into your back, but not painfully, so you relax letting the weight of your body go. There is an ooze of sap on the trunk and you press it with your finger. It is hard at first but then it breaks and inside is a gooey, sticky mess; but it smells wonderful. It's that same sweet piney smell that hangs in the air around you, but more; it is stronger and sharper. You breathe it in and you can almost taste it.

The sun on your face still sprinkles with warmth. You feel as though you could drift off to sleep here, you close your eyes, listening only to the sounds of the stream and your own breath. Until from up above you somewhere a blue jay screeches. It startles not only you, but a smaller bird as well. The bird takes off, its wings fluttering passed you before it is gone. - @Samantha Winnifred Schlein

Figure 4. Reflective Nature Reading
Figure 5. Cognitive Lesson Meditative Reading Response
Figure 6. Cognitive Lesson Meditative Reading Response
Figure 7. Affective Lesson Meditative Reading Response
Figure 8. Affective Lesson Meditative Reading Response
References:


Immordino-Yang M.H, (2011). Educational Philosophy and Theory, Vol. 43, No. 1,


