



## **Environmental Literacy And Sustainability Values: A Content Analysis Of Environmental Education Standards**

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### ABSTRACT

*Addressing values may be an important aspect of environmental literacy and eco-centric paradigms. This mixed-methods content analysis compares five state environmental education standards, national environmental education guidelines and the Earth Charter for inclusion of sustainability values. Data were generated through traditional hand-coding, computer text analysis and document profiling through qualitative methods. Triangulation showed state standards and national guidelines adequately address ecological integrity principles, but not environmental justice principles. Although some documents addressed sustainability and reflection on environmental values through issue analysis, documents from the most populous states focused on the science of ecology, excluding terms such as values and sustainability.*



## INTRODUCTION

In 1990, the United States Congress passed the National Environmental Education Act with the goal of increasing environmental literacy among citizens; but environmental education has not achieved a core subject status in schools. Unfortunately, in many states, environmental education is an add-on to life and earth science courses. A report by the National Environmental Education and Training Foundation has found that Americans are both unformed and misinformed when it comes to basic ecological knowledge and environmental issues (Coyle, 2005). The lack of environmental literacy in the United States is evidenced by misunderstanding of human citizenship in the biotic community and a lack of ethical sense toward habitat (Leopold, 1949; Orr, 1992; Pyle, 2008). The fact that citizens of the United States have the largest per capita ecological footprint in the world is a reflection of our country's general lack of commitment to eco-centric values and sustainable behaviors (Jorgenson, 2003; Mostafa, 2010).

Environmental education has been a part of the curriculum for decades, yet dominant environmental paradigms, which tend to be anthropocentric or egocentric seem to persist (Kushmerick, Young, & Stein, 2007; Stevenson, 2007). Americans enjoy a history of rugged individuals who conquered, tamed and devoured the gifts of nature. Today, Americans are generally perceived to value consumerism, which is central to our economic system. These two types of lifestyles that portray our culture are unsustainable, yet these underlie the values that drive most people's behaviors. Values motivate the decisions each person makes regarding their resource consumption. Legislative and technological attempts to address environmental issues will not work without addressing the root of the problem—personal values related to the environment and a sense of global responsibility (Kushmerick, et al., 2007). Many believe that fostering the development of ecocentric values is central to changing behaviors that affect future sustainability (Greenwood, Manteaw, & Smith, 2009; Orr, 1992). To affect environmental paradigms for a finite planet, environmental education needs to address environmental literacy through values (Orr, 1992).

Transforming environmental paradigms require learners to have opportunities to question and examine their basic assumptions and core values related to natural environments, people's place in the web of life and responsibility to future generations (Orr, 1992). It is hoped that empowering students to find personal meaning and to discover their own values related to the environment and natural systems will extend beyond the classroom to action competence. Environmental education should be participatory, collaborative, experiential and inclusive of issues regarding ethics, values and eco-justice (Edelson, 2007; Greenwood et al., 2009; Gruenewald, 2004). Environmental education could be more than an add on to science class—it could be a catalyst around which transformative educational reforms could be initiated.

There is also the disturbing phenomenon that Louv (2005) describes as nature-deficit disorder. The unprecedented lack of connection with the outdoor natural world can affect basic knowledge, awareness and the value one places on the environment (Coyle, 2005). Many believe a personal relationship with nature is an essential element of caring about the environment (Chawla, 2006; Mayer & Frantz, 2004; Schultz, Shriver, Tabanico, & Kharzian, 2004). Values are influenced by feelings, and an area of emergent research is affective influences such as connectedness to nature on pro-environmental behaviors (Kals, Schumacher, &

Montada, 1999; Mayer & Frantz, 2004). An experiential component involving direct contact with natural environments is an essential element of environmental literacy. Yet, schools isolate students from the natural world and do not reinforce citizenship in the natural order (Leopold, 1949, Orr, 1992). Without basic knowledge and experience with natural systems, citizens do not value natural environments and cannot even begin to adequately address environmental issues. By using nature as a laboratory, students learn local knowledge of soils, flora, fauna and watersheds; they learn the art of living well in the places where they reside (Pyle, 2008; Orr, 1992). More importantly, because people value what they know and care about, students can build caring connections with natural places.

#### PURPOSE

The purpose of this study is to conduct a content analysis of national and state environmental standards for the inclusion of the international sustainability values stated by the Earth Charter. The Earth Charter is a declaration of fundamental principles and values for building a just, sustainable, and peaceful global society in the 21st century (Mukherjee, 2005). This document that includes issues of social justice, democracy and ecological integrity, claims that sustainable communities are not viable without equity and ethical responsibility to the environment and to one another (Kahn, 2008). Although including values in the classroom is contested over concerns of *whose values* or *which values* are being promoted, the values represented by the Earth Charter are international consensus core values that respect human dignity and affirm life (Earth Charter, 2009). This supports Orr's notion that educational goals should align with making the world more habitable and humane (Orr, 1992). These values underlie the decisions that affect the long-term health of the ecosystem and the needs of future generations (Earth Charter, 2009).

Evaluating existing environmental education documents, such as standards, will reveal the extent to which the values expressed by international consensus guidelines of the Earth Charter are included (Greenwood et al., 2009). The Earth Charter is designed to serve as a reference document for an educational framework, as well as development of policy, legislation and international standards and agreements (Earth Charter, 2009). Knowing the content of standards is a key to monitoring the implementation and effects of educational reform and the movement of policy toward sustainability (Porter, 2002). Standards are the reflections of educational policies and cultural indicators generated from policy documents constitute reliable data (Bazerman, 2006). Yet no studies could be found that have empirically confirmed the extent of inclusion of the Earth Charter international educational guidelines in standards (Kushmerick, et al., 2007).

#### RESEARCH QUESTIONS

1. To what extent do environmental education standards, Texas, California, New York, Wisconsin, Colorado, NAAEE's Guidelines for Learning, and AP College Board's Topic Outline for Environmental Science compare to the international guideline document, the Earth Charter, in expression of the presence, frequency and intensity of sustainability values?

2. What dominant discourse, general categories and patterns regarding ecological sustainability and environmental values are expressed in each individual document?

## METHODS

This investigation, which is rooted in the postmodern and critical theory conceptualization that language reflects power, seeks to investigate the dominant discourse and social meanings of environmental education documents through the critical pedagogy expressed in the Earth Charter (Hesse-Biber & Leavy, 2011). Content analysis is a research approach for analyzing text or documents for the presence, intensity or frequency of some characteristic (Shapiro & Markoff, 1997). A mixed-methods approach broadens the scope and increases the trustworthiness of the findings; therefore analyzing documents through quantitative and qualitative methods is a pragmatic and well-rounded approach. Generally, content analysis is applied in educational research to examine textbooks, but standards are foundational for textbooks, curricula and assessments.

Foundational to this critical theory research approach are several assumptions, beginning with the assumption that educational policy is saturated with text that reflects positions and power (Bazerman, 2006). From a critical theory stance, it is assumed that interrogating texts can reveal traces of the dominant worldview and cultural influences embedded in the text, as well as what has been marginalized, or left out of the text (Hesse-Biber & Leavy, 2011). Examining standards can reveal the prevailing values and positions that underlie them (Gall, Gall, & Borg, 2007). Another assumption is that eco-justice issues are related to social justice issues (Andrzejewski, Baltodano, & Symcox, 2009; Earth Charter, 2000). The same frame of cultural values that allows for destruction and domination of natural resources and wildlife allows for the devaluing of women and people of different color or from different cultures (Andrzejewski et al., 2009; Riley-Taylor, 2002). Finally, this work emerges from an ecocentric worldview and the assumption that one's quality of life and the quality of the lives of future descendants is dependent on the values and cultural norms of society regarding healthy ecosystems and sustainable communities (Orr, 1992).

A traditional methods section would begin with a detailed description of the participants and the setting of an investigation. For this study, the *participants* are documents, environmental education guidelines and state environmental education standards. Specifically, the North American Association for Environmental Education Guidelines and the Advanced Placement Environmental Education Science Course Description will be analyzed as well as the state environmental high school education standards for Texas, California, New York, Colorado and Wisconsin. The state standards of California, Texas and New York were chosen because of the large populations in these states and the diversity of the geographic locations of west, south and east, respectively. Wisconsin represents the northern region of the United States and has been in the forefront of environmental education. Colorado represents the middle of the country and is known for the outdoor recreation opportunities available to its population. High school standards were chosen to narrow the analysis and because high school curricula are more likely than elementary curricula to present complex ecological and environmental

processes. The high school standards examined were found on state education websites.

For coding, the units of analysis were standards strands. Because of the brevity of standard and guideline documents, the entire documents were coded and random sampling of the text was not an issue. Three coders participated in a training session that involved discussions of the Earth Charter; rating a standard sample together that was not included in the study; rating another sample independently; comparison; and further discussion of any discrepancies. Often at this stage of the analysis, the codebook is revised based on the coders needs, but the Earth Charter was not revised for this study. Discussion of discrepancies continued until the coders achieved consensus of the meaning of the main principals. After training was completed, coding began on the documents that were included in this investigation. Reliability between the coders was calculated with Cohen's kappa on 30% of the total units of analysis. A reliability of 0.53 was established, which is considered fair to good (Chiappetta & Fillman, 2007). The coding was then completed on all the documents and a summarization of the coverage of the Earth Charter principles will be reported in the findings.

Provalis computer text analysis tools, Wordstat 6.1 and QDA Miner 3.2 were used for processing the texts. All texts were analyzed individually and compared to the other documents within the context of an eco-values dictionary found in Appendix A. Most document comparisons were carried out in the crosstab feature that allows the text to be compared to dictionary terms as nominal independent variables. Applying the dictionary feature of the software examines each document's inclusion of chosen words related to pro-environmental values and compares the similarities of all the documents within the dictionary's parameters. The eco-values dictionary was fashioned based on the literature review as well as proximity plots and cluster analysis of the text (multivariate analysis techniques that organize information based on similarities or dissimilarities and location of words in relation to other words or co-occurrence) surrounding the terms *values*, *sustainability* and *responsibility* (for texts that did not contain the words values or sustainability). In addition, different terms were tested in correspondence graphs, but the Bayes probability was reduced. Application of multinomial naïve Bayes to develop a dictionary, a classification probability model, calculates the average precision- probability that the texts are correctly classified, and the average recall or accuracy- probability that the documents are correctly identified in a class (Provalis, 2010). Even though the Bayes probability model assumes independence of terms in text, it results in good performance and can be used to refine the independent variables, the dictionary, used to model the data (Capdevila & Florez, 2009). The eco-values dictionary used for analysis had the highest Bayes probability values. The average precision was calculated at 0.8125 and the average accuracy was 0.8750 on a scale from zero to one. This reflects high precision and accuracy in categorizing the documents with the independent variables of the eco-values dictionary.

The qualitative examination and formation of profiles for each document began with the quantitative data provided by text mining. The flexibility of examining individual text or comparing documents helps to address the research questions of general characteristics, discourse of the documents individually, and how these documents align with the Earth Charter and each other. Determination of high-word frequencies for each document also assisted in creating general profiles.

Terms were categorized, categories were named, terms were reshuffled into different groups and categories were more accurately renamed. The researcher continually returned to the text and the varying perspectives of the quantitative data, interpreting, reflecting and refining throughout the process (Hesse-Biber and Leavy, 2011).

In addition, triangulation of hand-coding, computer text analysis and the qualitative profiles allowed cross-examination of the findings in an effort to increase the trustworthiness of the results (Creswell, 2007, Denzin & Lincoln, 2005). Interpretation of findings from multiple data collection sources crosschecks the soundness of the results. The quantitative-coding, qualitative profiling and computer analysis converge and corroborate similar results. This methodological triangulation improves the credibility of the findings from this investigation (Creswell, 2007).

## FINDINGS

### *Quantitative Coding*

The majority of alignment between the Earth Charter and the other documents was in the area of ecological integrity, principles five, six, seven and eight, which are listed in Appendix B. Beyond the principles associated with ecological integrity, the only other principles that aligned with the other documents were principles twelve, human health, and fourteen, which promotes integrating into formal education the knowledge, values and skills needed for a sustainable way of life. As anticipated, of the twelve Earth Charter principles coded, five were not aligned with any of the standards. These covered topics such as eradication of poverty, gender equality, transparency in governance, respect for all living beings, and nonviolence/peace. Perhaps these socio-cultural principles are addressed in social studies learning objectives. These tend to be part of the hidden curriculum or school policies rather than science learning objectives.

The AP, California, Texas and New York documents were the least similar to the Earth Charter principles. These documents tended to be topic-driven and mostly aligned to principles five, six and seven. The NAAEE guidelines, Wisconsin standards and Colorado standards had the most explicit statements that aligned with the Earth Charter. These same standards also have the fewest items that had no alignment with the Earth Charter. Table 1 displays data from the coding.

*Table 1*  
*Coding: State Standards and National Guidelines Compared to the Earth Charter*

Earth Charter Principle	NAAE		CO		WI		AP		NY		TX		CA	
	E	I	E	I	E	I	E	I	E	I	E	I	E	I
5	4	1	0	0	0	1	0	6	0	5	0	1	0	2
6	1	1	0	0	0	2	0	3	0	1	0	1	0	0
7	2	2	0	0	0	2	0	1 0	0	3	0	3	0	0
8	0	7	0	6	0	1	0	1	0	3	0	1	0	1
10	2	0	0	0	0	0	0	1	0	0	0	0	0	0

12	0	3	0	3	0	0	0	0	0	0	0	0	0	0
14	1	1	0	4	2	1	1	0	1	0	0	0	0	0
		1												0
None	1	1	0	9	6	3	1							
<b>Total units of analysis</b>	36	15	10	31	19	9	4							

Note 1: (No standards aligned with Earth Charter Principles 9, 11, 13, 15 or 16)

Note 2: E = explicit; I = implicit

### Computer Text Analysis

Research question one calls for comparisons of the documents to sustainability values. The correspondence analysis plot in Figure 1 shows the texts in relation to the eco-values dictionary. The eco-values dictionary provides the nominal independent variables and allows for a more accurate statistical analysis of the comparison of the texts. The graph shows the Earth Charter alone in the left upper quadrant and words such as *sustainable*, *protect*, and *promote*. The California standards are in the right lower quadrant and do not group with other texts. In the right upper quadrant, the AP, Texas and New York standards cluster near words that relate to environmental and ecological education terms such as *biodiversity*, *interdependence*, and *preservation*. The AP course description does not even contain essential eco-values terms such as: *values*, *ethics*, *responsibility*, *protect*, etc. In contrast, the NAAEE used the word *values* nine times. In the center lower area the NAAEE, Wisconsin and Colorado text cluster near words like *action*, *belief*, *consequences*, *behaviors* and *responsibility*.

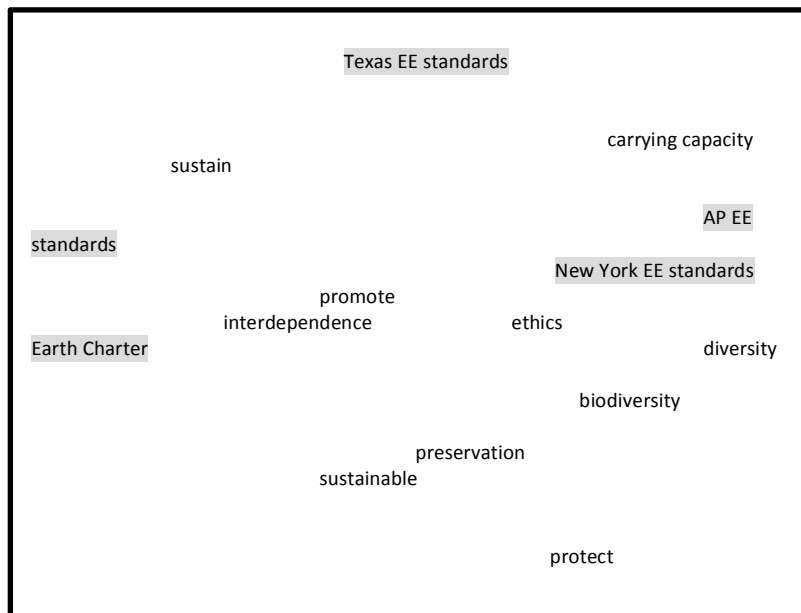


Figure 1 Correspondence Plot of Documents with Eco-values Dictionary

Research question one also asks how the documents compare to each other. A cluster analysis was applied to examine the relatedness of all the documents as a whole. The dendrogram shown in Figure 2 was formed with the crosstabs feature using the eco-values dictionary. Similarity decreases as the dendrogram is read from left to right. The findings align with the correspondence graph. The dendrogram clearly shows that the New York and Texas state standards are very similar and group with the AP course description. The NAAEE guidelines and the Wisconsin standards are similar and form a group with the Colorado standards. The correspondence graph and the dendrogram both clearly show that the Earth Charter and the California standards are the least similar to all the other text although the California tends to group with the AP group and the Earth Charter tends to be most similar to the NAAEE group

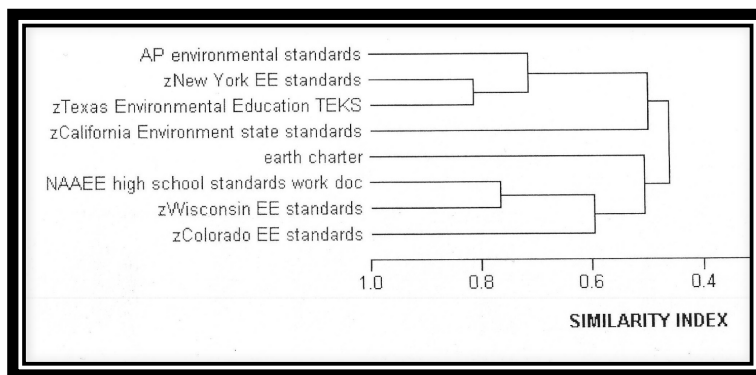


Figure 2. Dendrogram

### Profiling of Documents

Profiling the documents addresses question two regarding how the dominant discourse, general categories and patterns regarding ecological sustainability and environmental values are expressed in each individual document. This phase of analysis began with an examination of the top word frequencies of each of the texts. The following categories of terms were formed: general education, science education processes, ecology, environmental education, environmental agency, sustainability terms and life supporting terms. Each text was analyzed to see how high frequency words tended to group within the categories.

An examination of the most frequent words shows a definite contrast between the documents. The top five words in the Earth Charter are: *life*, *human*, *sustainable*, *promote* and *earth*. These words relate to sustaining life. The top five words in the NAAEE guidelines are: *issue(s)*, *learners*, *explain*, *evaluate* and *environment*. These are science-teaching terms and environmental agency terms. The top five words in the AP course description are: *energy*, *laws*, *population*, *global* and *systems*. These are ecological and environmental education terms. This aligns with the initial impressions from early readings of the documents that the AP text covers science topics; the NAAEE guidelines cover pedagogy and environmental agency and the Earth Charter is a call to action. For brevity, Table 2 provides a summary of the document profiles.



*Table 2*  
*Summary of Document Profiles*

Standard	Category	Format	Description
Earth Charter	sustainability eco-values; life-supporting	Non-traditional	Call to action, each statement begins with a verb
NAAEE	environmental agency; science education processes; ecology	Traditional	Issue analysis; multidisciplinary; inclusive of values
AP	ecology; environmental education	Non-traditional	List of science topics, no verbs; term value absent.
California	Ecology; science education processes	Traditional/embedded	Very few environmental topics
Colorado	General education; environmental agency	Traditional/not embedded	Focus on pedagogy; inclusive of values
New York	Science education processes; ecology	Traditional/embedded	Includes some sustainability values
Texas	Science education process; ecology	Traditional/not embedded	Managing rather than sustaining resources
Wisconsin	High frequency terms scattered into most categories	Traditional with inclusion of rationale/not embedded	Generalized, multidisciplinary approach; inclusive of values

It should be noted the NAAEE guidelines and the Colorado standards are the only documents that encourage outdoor learning. The Colorado standards include a section on environmental sensitivity-connection and awareness of the natural world. These objectives not only encourage learning locally, they address the concerns of nature-deficit among young people. Even though these documents do not explicitly address all the social justice issues included in the Earth Charter, they do strive to prepare students to address local environmental issues and connect to natural areas.

#### *Triangulation of Data*

It is very obvious from the coding, crosstab dendrograms, the correspondence graph and document profiles how the documents align or group. The Wisconsin and Colorado state standards are aligned with the NAAEE guidelines and the New York and Texas standards align with the AP course description. Clearly the Earth Charter has a low similarity to all the documents analyzed. In the correspondence graph, the Earth Charter is in a separate quadrant from the other standards. The dendrogram in Figure 2 shows that the Earth Charter and California standards are the least aligned with all the other documents. The quantitative coding showed that one-third of the Texas standards, one-fourth of the California standards and nearly one-third of the AP course description do not align with the Earth Charter. These three documents contained very few terms from the eco-values dictionary.

The NAAEE, Wisconsin and Colorado standards are the most aligned with the Earth Charter, but the overall similarity is very low. The dendrogram and correspondence graph of the documents show that Wisconsin standards and the NAAEE guidelines are aligned to each other. This finding is similar to the results of the quantitative coding; Wisconsin had a very similar coding pattern to the NAAEE guidelines. The profiles of the documents also show that the NAAEE guidelines and the Wisconsin standards have terms that group in most of the categories; they are both very general and cover many important EE topics and skills. The NAAEE, Colorado and the Wisconsin standards explicitly address the examination of personal and societal values.

The quantitative coding pattern of the New York standards, Texas standards and the AP course description were very similar and the dendrogram showed that the New York and Texas standards are highly aligned to each other and to the AP course description. The correspondence graph in Figure 1, show these three documents clustered in the same quadrant. The AP course description, the New York and Texas standards all have profiles that focus on ecological and environmental terms and do not address environmental agency. Both the AP and New York standards address sustainability in an implicit manner, but generally do not address eco-values. The qualitative profile of the New York standards was not reflected in the computer analysis because the term *sustainability* was not used, even though the document has a section that describes sustainability. Still, generally the interpretations of the findings from several methods of data collection converge on similar conclusions.

#### SUMMARY AND CONCLUSIONS

The NAAEE guidelines, Wisconsin state standards and Colorado standards explicitly address examination of one's personal environmental values and using these guidelines for state standards would surely advance environmental literacy that is inclusive of environmental agency and sustainability values. Wisconsin and Colorado are not as highly populated as the other states in this analysis. The environmental education standards from states with the highest populations are California, Texas and New York and these documents do not explicitly address environmental values. These state standards tend to be science topic-driven similar to the AP course description. California, Texas and New York standards focus exclusively on scientific inquiry as a pedagogical approach rather than the STS, issue analysis and environmental agency approach of the NAAEE, Wisconsin and Colorado documents. In addition, if experiences in natural environments are foundational to environmental literacy as the literature suggests, only the NAAEE and Colorado guidelines specifically include experiential, outdoor education approaches.

Although the AP course description is limited to scientific topics, it has lent credibility to the study of ecology and environmental science in American schools. If inclusion of environmental education in high schools is rationalized by the existence of an AP environmental education offering, then it would follow that many state standards would be based on the AP course description rather than the NAAEE guidelines. Although the AP course description includes objectives related to sustainability, it presents a rather one-dimensional approach to a socio-cultural,

economic, political and ecological topic. Research on pro-environmental agency indicates knowledge about the environment is not enough to inspire behavioral changes (Chawla, 2006; Mayer & Frantz, 2004; Schultz et al., 2004). There is an affective dimension that arouses action; what an individual values is foundational to their decision-making and what motivates them to take action or change behaviors (Mukherjee, 2005). Therefore, establishing one's personal values in relationship to the environment is essential to environmental literacy. Environmental values and the integrated, transformative approach to environmental education supported by the literature are not explicitly addressed if state environmental education learning objectives are based on the AP course description.

### *Limitations*

The political nature of the Earth Charter and its inclusion of social justice issues go beyond the scope of science class. The literature supports an integrated approach to environmental education, but standards embedded in science laboratory courses are specific to ecological and environmental science objectives rather than inclusive of the broader social and economic concerns of environmental studies. The Earth Charter principles go beyond ecological integrity and caring for the environment, to include caring for each other. Economic, racial and gender equality are essential to environmental ethics and flourishing, sustainable communities. This international consensus document will not achieve consensus among all Americans; the United States has not signed the Earth Charter.

### *Future Research*

The next logical step for this line of research would be comparison of other nations' environmental standards to the Earth Charter and to the NAAEE guidelines. The Next Generation of Science Standards was recently released. If this national document becomes as influential as the national Language Arts and Math standards, a content analysis of this document may be predictive of how environmental education will be taught in the future. Social studies standards could be included to gain a more holistic understanding of the socio-cultural aspects of environmental education. Perhaps social studies issues would have some alignment with the environmental justice issues not found in environmental science courses.

Moving beyond the content analysis approach to a more experimental approach, environmental literacy could be measured and comparisons between states could be conducted. These measurements could be associated with environmental educational approaches endorsed by state standard documents. Although standards reflect what should be taught, what and how teachers actually teach can only be accurately assessed by direct observation. Environmental science classes could be observed to see how instructors are actually implementing standards and environmental education approaches.

### *Final Thoughts*

So why is this important? Why does it matter that the most populated state environmental education standards do not include topics regarding sustainability or

suggest experiential learning pedagogies such as using the outdoors as a learning context. Transforming the non-sustainable ecological paradigm of Western society, of countries with the highest ecological footprints, would have a major effect on the quality of global environmental systems. Without basic knowledge, citizens are not aware of environmental problems and cannot even begin to adequately address them. Because Western society is lulled by comfort, convenience and the arrogant belief that technological solutions can fully address issues of overreaching carrying capacity, there is a refusal to face the social-cultural root of the problem that lies in how the environment is understood, perceived, valued and experienced by individuals and societies (Kushmerick, Young, & Stein, 2007). Most people are out of touch with the daily ways in which lifestyle choices affect the ecosystem and, for that matter, where it all comes from and where it all goes when we are done with it (Coyle, 2005). Non-renewable resources are finite and incompatible with unlimited resource consumption. Because the majority of citizens in the United States are far removed from life-sustaining systems, the importance of these systems is given little thought (Orr, 1992). If people were more aware of their local bioregion and how the ecosystem supports life, perhaps they would be more willing to make efforts to make lifestyle changes (Pyle, 2008). Changes are needed to avoid collapse of critical ecological systems and decline of environmental quality that could lead to social and economic upheaval (Union of Concerned Scientists, 1992; 1997). Sustainable community is foundational for human survival.

In *Earth in Mind*, David Orr (1994) states the goals of education should align with the notion of making the world more habitable and humane. He asserts that the worth of education should be measured against the standards of human decency and human survival (Orr, 1994). Ethical values that include responsibility toward each other and the environment are the basis of human decency and these social justice values are integral to the Earth Charter. Beliefs that individuals hold about the relationship between self and nature are a core element of environmental value and behavior (Schultz et al., 2004). Reflection on one's personal values related to the environment and sustainability, as well as nature connection, should be included in the goals of environmental education. If environmental literacy, sustainability and green behaviors had greater value in our society, these literal facts of life on planet Earth would become central to our lifestyles and what we teach in our schools (Orr, 1992, Stevenson, 2007).

The lack of environmental literacy, sustainability values, connectedness to nature and environmental education as a core subject need to be addressed through educational reforms. The best approach to environmental education requires transformation of an entrenched, standardized educational system. Environmental education contrasts with the goal of schooling which is to conserve, rather than transform existing cultural norms and values (Stevenson, 2007). Practical educational reforms that encourage authentic activity, encompass multi-disciplinary approaches, cultivate scientific and civic literacy, foster community involvement and develop understanding of moral systems involving personal responsibility would improve students' educational experiences (Saylan & Blumstein, 2011). Schooling is discipline-based and focused on pre-determined specific learning objectives that are easily assessed, but environmental education should be authentic, interdisciplinary and focused on divergent problem-solving (Stevenson, 2007). Because the consideration of personal values and student-centered, discipline-integrated instructional reforms challenge traditional

educational norms, sustainability education is transformative in nature and has transformative potential for students, teachers, educational practices, communities and the non-sustainable ecological paradigm of Western society (Gruenewald, 2004; Lange, 2004; Leigh, 2005; Sipos, Battisti, & Grimm, 2008).

Unfortunately, this study demonstrates that the most highly populated states do not base their environmental education standards on the NAAEE guidelines and do not explicitly address sustainability values, environmental agency or learning in nature's laboratory. It presents a rather pessimistic outlook for environmental literacy and sustainability values as a core goal, but examining the content of educational standards, which reflect positions and power, is a starting point for effecting change in a standards-driven climate. Environmental education may be a long way from achieving its goals, but long-term systems thinking is the hallmark of environmentalists.

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APPENDIX A

ECO-VALUES DICTIONARY

Action	Future
Beliefs	Interdependence
Biodiversity	Preservation
Behaviors	Principles
Carrying capacity	Promote
Choice	Protect
Consequences	Resources
Communities	Responsibility

Consumer	Rights
Consumption	Societal
Cost	Society
Decisions	Sustain
Dependence	Sustainable
Diversity	Sustainability
Ethics	Values

## APPENDIX B

### *Earth Charter*

#### *II. ECOLOGICAL INTEGRITY*

**5. Protect and restore the integrity of Earth's ecological systems, with special concern for biological diversity and the natural processes that sustain life.**



- a. Adopt at all levels sustainable development plans and regulations that make environmental conservation and rehabilitation integral to all development initiatives.
- b. Establish and safeguard viable nature and biosphere reserves, including wild lands and marine areas, to protect Earth's life support systems, maintain biodiversity, and preserve our natural heritage.
- c. Promote the recovery of endangered species and ecosystems.
- d. Control and eradicate non-native or genetically modified organisms harmful to native species and the environment, and prevent introduction of such harmful organisms.
- e. Manage the use of renewable resources such as water, soil, forest products, and marine life in ways that do not exceed rates of regeneration and that protect the health of ecosystems.
- f. Manage the extraction and use of non-renewable resources such as minerals and fossil fuels in ways that minimize depletion and cause no serious environmental damage.

**6. Prevent harm as the best method of environmental protection and, when knowledge is limited, apply a precautionary approach.**

- a. Take action to avoid the possibility of serious or irreversible environmental harm even when scientific knowledge is incomplete or inconclusive.
- b. Place the burden of proof on those who argue that a proposed activity will not cause significant harm, and make the responsible parties liable for environmental harm.
- c. Ensure that decision making addresses the cumulative, long-term, indirect, long distance, and global consequences of human activities.
- d. Prevent pollution of any part of the environment and allow no build-up of radioactive, toxic, or other hazardous substances.
- e. Avoid military activities damaging to the environment.

**7. Adopt patterns of production, consumption, and reproduction that safeguard Earth's regenerative capacities, human rights, and community well-being.**

- a. Reduce, reuse, and recycle the materials used in production and consumption systems, and ensure that residual waste can be assimilated by ecological systems.
- b. Act with restraint and efficiency when using energy, and rely increasingly on renewable energy sources such as solar and wind.
- c. Promote the development, adoption, and equitable transfer of environmentally sound technologies.
- d. Internalize the full environmental and social costs of goods and services in the selling price, and enable consumers to identify products that meet the highest social and environmental standards.
- e. Ensure universal access to health care that fosters reproductive health and responsible reproduction.
- f. Adopt lifestyles that emphasize the quality of life and material sufficiency in a finite world.

**8. Advance the study of ecological sustainability and promote the open exchange and wide application of the knowledge acquired.**

- a. Support international scientific and technical cooperation on sustainability, with special attention to the needs of developing nations.
- b. Recognize and preserve the traditional knowledge and spiritual wisdom in all cultures that contribute to environmental protection and human well-being.
- c. Ensure that information of vital importance to human health and environmental protection, including genetic information, remains available in the public domain.