Semiotic Ideologies Embedded In Environmental Education:

India and The United States

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A Thesis Submitted in Partial Fulfillment of the Requirements for the Degree of Bachelor of Arts
Environmental Studies Program
Concentration: Environmental Education
May 2013
Advisor: Liz Safran

Environment to each must be
All that is, excepting me.
Universe in turn must be
All that isn't me--and me.

Buckminster Fuller, 1980

Abstract

With a historically unprecedented call for the “environment” to be a topic taught about in schools on a global scale, entire nations are forced to put in ink what this subject is. India and the US have developed environmental education in response to the growing awareness of environmental problems. Comparing the environmental educational standards and self representations of these culturally and historically distinct countries provides interesting insights into how their conceptions of the environment frame approaches of environmental problems. I employ a dual methodology that systematically identifies, defines and analyzes each nation, state and local levels’ self-representations and standards of environmental education. Additionally I research the historical trajectory of environmental education of both countries. My results reveal how on a national level, India’s standards for environmental education do not include social science topics. Additionally, the national US standards for environmental education are not strictly reflected in the state standards. My implications section discusses how omitting social issues such as the economy or environmental justice implies an assumption that humans are not part of the environment and that the US system provides much leniency to states in writing educational standards. The ways in which actors such as India and the United States frame the environment reveal insights into the values and assumptions made by those who write standards of environmental education and those who teach environmental education.

Acknowledgments

I would like to acknowledge my thesis advisor Liz Safran, who has always pushed me to engage with the material richly and who inspired in me, a fierce infatuation with environmental studies. Thank you Liz for guiding me throughout my entire college career: helping me shape my methodological approach to my thesis, the innumerable hours you have worked with me, advised me and talked about “the environment” with me. I will always be indebted to you. Gregory Smith has played an immeasurably important role in shaping my thesis, working to give me the rich background knowledge I used in my project and will continue to use for my life. I also want to thank Sally, Emma, Hana, Carl, Rachel, Gus, Evan, Lu’u, Mali, Darya, Majel, Kay, Meghan, Ted, Amanda, Kelsey and Zach for learning with me, inspiring me and supporting me all four years. Thank you Anna Lofstrand for picking me up by my bootstraps. I also want to thank genuinely Rachel Orlansky for her life saving positive attitude, relentless care and kindness. Finally, I would like to thank my parents and my brothers for their unwavering support of me and respect for my path, for without them, I would not be where I am today.

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I. Introduction

The environmental education of a rapidly developing country like India and a developed country like the US make for an interesting comparison of the environmental issues being framed for the students in these important countries. Due to an increase of awareness of global environmental problems such as climate change in recent years, environmental education has developed rapidly.

A common approach that humans use to mitigate environmental problems is environmental education.[1] The solutions suggested to fix our environmental problems are combined with or based entirely on education. The conceptual models embedded in environmental education may present opportunities for the next generation to approach these complex issues but it also might limit types of approaches to environmental problems. However if education does not incorporate tools to approach the whole problem, it may result in the short sightedness of future decision makers.

The conceptual models used in India and the United States are different given that they arise from diverse cultural and historical contexts. One approach for improved education would be to hold up a mirror to our own conceptual models and compare ourselves with different models to glean fresh perspectives. A rich way to approach the comparison of India and the United States is to analyze their semiotic ideologies. The study of semiotics is the study of symbols, signification and how meaning is created.[2] Not just in India or the US, but in any society, the elements of the environment are laden with symbolic significances.[3]

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[1] Yrjö Haila, **"**Ecology: A New Discipline for Disciplining?," *Social Text* 42 (1995): 153-171
[2] Keane Webb, "Semiotics and The Social Analysis of Material Things," *Language & Communication*. (Department of Anthropology, 2003)
[3] Henri Lefebvre, *The Production of Space* (Oxford, UK ; Cambridge,Mass.,USA : Blackwell, 1991)

This thesis addresses about the potential limits of conceptual models is true for more than just education. Brian Walker and David Salt discuss the danger of conceptual models of environmental management that rely on a need for command and control. "

> [The] basic [human] mental model is that the ecological system around us can assimilate change unless we completely destroy it or convert it into a city. If management shifts the equilibrium considerably... the system will stay in this new state and human intervention can manage the situation to ensure the new equilibrium isn't causing too much trouble.[4]

What Walker and Salt are implying is that systems are already inclined to some equilibrium and our short sighted management of systems are inherently limited because no model can account for processes, feedbacks and timescales of the entire earth. Framing an environmental problem pertaining to "socio-ecological systems [that] are complex,...do not change in a predictable, linear, incremental fashion [and] have the potential to exist in more than one kind of regime in which function, structure and feedbacks are different" is an involved task.[5] Walker and Salt discuss letting go of the conceptual framework that needs to control and change our systems. Humans turn to environmental education to solve complex issues, however conceptual models are embedded in education as well. My thesis attempts to mine for and analyze places where these conceptual models are revealed.

Many interested parties, which I list below have conducted studies in order to know what students' perceptions of the environment are. For example, the New South Wales (NSW) Environment Protection Authority, the NSW Department of Education and Training, the National Parks and Wildlife Service, the Powerhouse Museum and the Department of Land and Water Conservation invest considerable resources in researching perceptions of the

[4] B. H. Walker and David Salt, "*Resilience Thinking: Sustaining Ecosystems and People in a Changing World*." (Washington, DC: Island, 2006) 29-31.
[5] Walker and Salt, "*Resilience Thinking: Sustaining Ecosystems and People in a Changing World*."

environment. An Australian study done in 1998 found that "primary students conceptualized nature as a pristine environment consisting of non-living and living components...[The students indicated a belief that] a place was no longer natural once it had been impacted or modified by human activity".[6]

The perception that humans are separate from the environment reifies the dichotomization of environmental problems and human problems when they are one in the same. At this point in time, there seems to be present, an international urgency to mitigate environmental problems, and a perceived lack of the education available to achieve that feat. A study done in 2001, concluded that "children perceive nature as a natural and non-human entity; that is, nature is viewed as a place for recreation, leisure, and solitude, as well as a place that is threatening and dangerous to people"..."Students construct mental models about environmental phenomena based on their existing ideas and that these mental models are rich in content but poorly structured". [7] Studies like this one show how students' beliefs are framed by educational models containing conceptual limitations of environmental education. If students cannot see their own fate tied to that of the natural environment, their environmental education is not doing everything it could for them.

My research looks at the semiotics of environmental education standards and self-representations that influence students perceptions of the environment. The semiotic ideologies revealed in the environmental education standards and self representations of India and the United States, reveal that India does not teach the environment as a social science, US national standards are not congruent with the state standards and that local level

[6]P. Payne."Children's Conceptions of Nature." (Australian Journal of Environmental Education, 1998) 19–26
[7]Daniel P. Shepardson, Bryan Wee, Michelle Priddy, and Jon Harbor. "Students' Mental Models of the Environment" *Journal of Research in Science Teaching* 44.2 (2007)

environmental schools provide largely multidisciplinary environmental education. The differences between India and the US point to the need for international collaboration in learning models. The standards and self-representations of Indian and US actors provide richly different perspectives that could inform each other and the world about improved environmental education.

First, my research provides a historical background of environmental education in the US and India. Then I provide background on how individuals throughout time have attempted to define the "environment". The methodology section will explain how I personally have taken on contextualizing the environment in my research. This section provides the information necessary to do my research by showing systematically how I sorted and analyzed each national, state, and local document reflecting environmental education standards and values from India and the US. My data reveals the particular ways in which the word "environment" reflects the assumptions and values of each hierarchical level of the US and India's standards. These patterns of values of particular components of environmental education produce interesting implications for discussion later on. My data will lead to discussion of these implications that relate back to the questions and concerns about environmental education I bring up in the introduction.

II. Past to the Present: Environmental Education in India

In India, the environmental education movement began to emerge due to the enormous technological and industrial growth of the past decade.[8] Before one can understand the introduction of environmental education in present day India, they have to understand how the

[8]C.J Sonowal. "Environmental Education in Schools: The India Scenario". (Tata Institute of Social Sciences. 2009) 15-36

education system has been formed in the last century. Before colonization, India followed the Gurukula system. Anyone who desired to learn would seek out their own teacher or Guru at their own house and make a request to be their student. If the Guru accepts, the student then would stay with the Guru and learn about the activities of a home as well as Sanskrit, Holy Scriptures, math and metaphysics, often at the request of the student. When the Guru felt it was right, the student would leave their house. The lessons were linked to life and nature and did not involve memorization.[9]

In the 1830s, Lord Thomas Babington Macaulay, a British colonizer, introduced the an English medium, modern school system. This new educational model desired above all to reflect modernity, above all. Teaching was present only in the classroom. The subjects taught included science and mathematics; the subjects not considered to be modern like metaphysics and philosophy were left behind. According to Dr. V. Sasi Kumar this shift marked the moment when "the link with nature was broken, as also the close relationship between the teacher and the student".[10]

For a time, the Government of India (GoI) only coordinated and mandated the standards of higher education, but nothing more. The constitutional amendments of 1976 significantly changed India's education system. The amendment made it so the Government of India now creates education policies and programs on a national level at all ages. The National Council for Educational Research and Training (NCERT) is an organization that prepares a National Curriculum Framework and is key in developing policies and programs for India's schools. On the state level, each state has its own Department of Education that have their own textbooks

[9]Dr. V. Sasi Kumar "The GNU Operating System." *The Education System in India*. (Dr. V. Sasi Kumar, 2011)
[10]Kumar "The GNU Operating System."

and evaluation system. These departments are largely mandated by the State Council for Educational Research and Training (SCERT) who closely follows the national guidelines NCERT prescribes[11].

Within each state there are three kinds of schools currently following the state curriculum. There are government run schools where the government owns the land and buildings and pays for the staff. The fees paid for these types of schools are affordable for most low income families. Then there are privately owned schools that have the land and buildings. The fees are high and the management pays the teachers. Private schools are typically catered to urban middle class families. The third type of school is one that is provided grant-in-aid by the government, despite being started by a private agency on their own land and in their own buildings. These types of schools are more affordable for poor families to send their children.

India took the opportunity in 1976 with the 42nd Amendment, to incorporated environmental concern into the constitution. And since the establishment of a Ministry of Environment and forests in 1980, the Environment has become a priority in more policy statements and strategies. Environmental education was originally introduced into schools in the form of four groupings of topics: land degradation, degradation of forest, pollution of soil, water and air and the cluttering and fouling of landscape.[12] In 1988, NCERT made a framework called The National Curriculum for Elementary and Secondary Education. This framework has been marked to be the first systematic effort made to incorporate environmental education (EE) in school curriculum. Since 1988, efforts have been made to critique and alter the EE

[11] ibid
[12] C.J Sonowal. "Environmental Education in Schools: The India Scenario". (Tata Institute of Social Sciences. 2009) 15-36.

system in order to improve it. One critique has been that topics and themes of Indian environmental education are largely determined by Euro-American perceptions.

In 2000, Environmental Orientation to School Education (EOSE) sponsored by the Ministry of Environment and Forest, Government of India, Department of Education, made a scheme with the aim at harmonizing environmental education with local environmental situations. Agencies such as Centre for Environment Education (CEE), CPR Environmental Education and Uttarakhand Seva Nidhi were appointed by the Ministry to plan and implement strategies for environmental education in schools. CEE now coordinates educational programmes for school children, the training of teachers and develops educational materials.

Since 1991, CEE's environmental education programs have taken the form of the "Cluster Approach". The Cluster Approach means that an NGO associated with twenty to twenty-five schools in a general area form a "Cluster". Each cluster is an autonomous unit that networks and horizontally communicates with CEE who provides training, material and monetary resources. Environmental education has existed in school curriculum for some time, long before December 18th, 2003 when the Supreme Court of India decided to impart EE in educational institutes as a compulsory subject.[13]

III. The Past and Present: Education in the United States

Environmental education in the US has been shaped by the federal government, national associations, and other levels of government all working together in the development of the U.S. National Education Policy .[14] Wilbur Jackman who wrote Nature Study for the

[13]Sonowal. "Environmental Education in Schools: The India Scenario".
[14] USNEI, "Organization of U.S. Education." U.S. Department of Education. (U.S. Department of State, 2008).

Common School created the nature study movement in 1891[15]. Later in the 1890s, John Muir and Enos Mills pioneered the Nature study Movement. In the 1930s "Dust Bowl" era, awareness of soil erosion and dust storms increased the need for conservation education programs. In 1969, the National Environmental Policy Act was passed "to declare a national policy which will encourage productive and enjoyable harmony between man and his environment".[16] Then in 1970, US Congress passed the National Environmental Education Act of 1970, which authorized the creation of an Office of Environmental Education within the U.S. Department of Health, the Education and Welfare, the establishment of National Advisory Council for environmental education and the establishment of a domestic grants program.[17]

In 1998, The North American Association for Environmental Education created the Definitions of Components of State-level Comprehensive EE Programs. The report says "comprehensive EE programs are a combination of structure, funding, and program components which serve to incorporate EE into educational institutions at the state and local level." The report is based on the *1998 Survey of the Status of Environmental Education in the United States.*[18]

In 2001, the No Child Left Behind Act was implemented by the Bush Administration in an effort to improve schools through drive standards-based reform. No Child Left Behind has sent the flow of funding in the direction of the schools who have the best standardized test scores. In 2009, a following act called No Child Left Inside stated "fewer and fewer students are

[15]Thomas E. Smith and Clifford Knapp. "Sourcebook of Experiential Education: Key Thinkers and Their Contributions. *New York: Routledge* (2011)
[16]Senate and House of Representatives of the United States of America in Congress assembled, "National Environmental Policy Act of 1969." *Council on Environmental Quality*, (1982)
[17]Edward J McCrea, "The Roots of Environmental Education: How the Past Supports the Future." *Environmental Education & Training Partnership* (2005)
[18]McCrea, "The Roots of Environmental Education: How the Past Supports the Future."

becoming involved in important environmental education courses, classwork, and field investigations as an unintended consequence of the No Child Left Behind Act of 2001".[19] This Act primarily focused on lowering obesity with the implementation of outdoor education.

IV. The Word "Environment"

My research is borne from the interesting discrepancies and omissions of the semiotic ideologies of the different educational model's use of the word environment. Discussing the word "environment" Young states:

> because ecology--including human ecology--is about the relationships between organisms and the environment, whatever the meaning, it seems not only appropriate but urgent to explore the various definitions of, and alternatives to, this difficult word[20]

The word "environment" is derived from the French word *environ* or *environner,* meaning "around", "to surround", "to encompass". The common etymologist conclusion is that, in English, environment is the total of things or circumstances around an organism (including humans). In 1970, anthropologist Loren Eiseley produced *The Invisible Pyramid* which states that humans have come "to look upon nature as a thing outside themselves--an object to be manipulated or discarded at will".[21] According to Young, evidence of the mental separation of humans and the environment is present in texts as influential as Genesis.[22]

In 1925, the sociologist L.L. Bernard tried to take a firm hold on the word environment in his piece *A Classification of Environments*, suggesting a provocative classification complete

[19]Sen. Jack Reed,"S. 866 (111th): No Child Left Inside Act of 2009, H.R. H.R.2054 (2009)

[20]Gerald L. Young. "Environnement: Term and Concept in the Social Sciences", *Social Science Information*. SAGE Publications (1986)
[21]Lauren C.Eiseley,"The Invisible Pyramid", *U of Nebraska* (1998)
[22]Eiseley,"The Invisible Pyramid"

with qualifiers. Bernard split the word into four groups with approximately six subgroups.[23] Bernard's classification has been largely ignored but his attempt is marked as the first to acknowledge the serious need for a definition of the environment. In 1964, J. Mogey presented ideas about the concept of the environment that were described as provocative and useful, but in less than one page, he was too undeveloped to make any large impacts on cultural consensus.[24]

Psychologists, anthropologists, philosophers and other academics grapple with the question of how the human being responds as an individual to that which is outside his/her body. The line drawn between organisms and environment has generally been perceived as where indoors stops and outdoors begins.[25] Heidegger is one of several phenomenologists to claim that ordinary life and experience make manifest the inseparability of environment and human, thereby exposing the duality [of organism and environment] as absurd.[26]

In 1957, Mason and Langenheim wrote a famous essay entitled "Language Analysis and the concept of the Environment".[27] Their results broke the environment up into four groups. Young claims that Mason and Langenheim's definition is limited because it ignores the fact that "examination of human ecology relationships also requires (as much or more) a conception of environment that is holistic, that incorporates all of the surroundings of the human organism, that impresses on people the need for concern and responsibility toward a larger world that that which immediately impinges on each person".[28] In 1940 H. Blumer argued against

[23]L.L Bernard. "A Classification of the Environments", *The American Journal of Sociology*.(1925): 313-332
[24]J. Mogey, "Environment", *Gould and W.L Kolb. Dictionary of the Social Sciences*. (New York, Free Press, 1964)
[25]Gerald L. Young. "Environnement: Term and Concept in the Social Sciences", *Social Science Information*. (SAGE Publications, 1986)
[26]Martin Heidegger. "The Idea of Philosophy and the Problem of Worldview", (Towards the Definition of Philosophy, 1919)
[27]Herbert L. Mason and Jean H. Langenheim, "Language Analysis and the Concept "Environment" (Ecological Society of America Vol. 38, No. 2 (1957): 325-340.
[28]Gerald L. Young. "Environnement: Term and Concept in the Social Sciences", *Social Science Information*. (SAGE Publications, 1986): 93.

Lundberg's dichotomous definition of the environment by saying the "question is whether the definition catches the scope of 'empirical reality' that is demanded by the problem with which one is dealing".[29] The reality of the environment for humans covers a wide range from proximal or vicinal to global, depending on the problem.[30]

Loughland, Reid, and Petocz (2002) found that primary and secondary students in Australia conceptualized the environment in six distinct ways: (1) the environment as a place; (2) the environment as a place containing living things; (3) the environment as a place containing living things and people; (4) the environment does something for people; (5) people are part of the environment and are responsible for it; and (6) people and the environment are in a mutually sustaining relationship. In recent history, discussion of the word environment, is fraught with disagreement and ideological conflict.

V. Methodology

The first section of the methodology is geared towards answering three questions: 1) how is the word "environment" used in India and the US's national, state and local level curriculum standards and self representations? 2) how do the different uses of the word environment in the curriculum standards indicate different methods of teaching the environment, for each nation for each state and for each school? 3)what assumptions values and models are embedded in the ways that guidelines for environmental education are crafted and the ways in which individual schools that teach environmental materials represent themselves.

[29] H. Blumer. "The Problem of the Concept in Social Psychology", (The American Journal of Sociology)(1989): 707-719.
[30] Gerald L. Young. "Environnement: Term and Concept in the Social Sciences", *Social Science Information*. (SAGE Publications, 1986): 93.

This methodology seeks to systematically reveal what values and assumptions alternative, holistic and environmental schools use. Looking at six schools is not entirely representative. However, the diverse locations of each of the six schools help to account for an array of social, economic and political contexts from which environmental education is crafted and taught. The data collected on the schools, the states they are in and the nations of the US and India are a sampling of rhetorical strategies and self representations.

I found the six schools by sorting through lists of different schools and choosing to study the ones that defined themselves as alternative and environment schools but that were also very diverse from one another. I specifically found Nirman and VGKK by visiting them and working within their science classrooms in India in 2011.

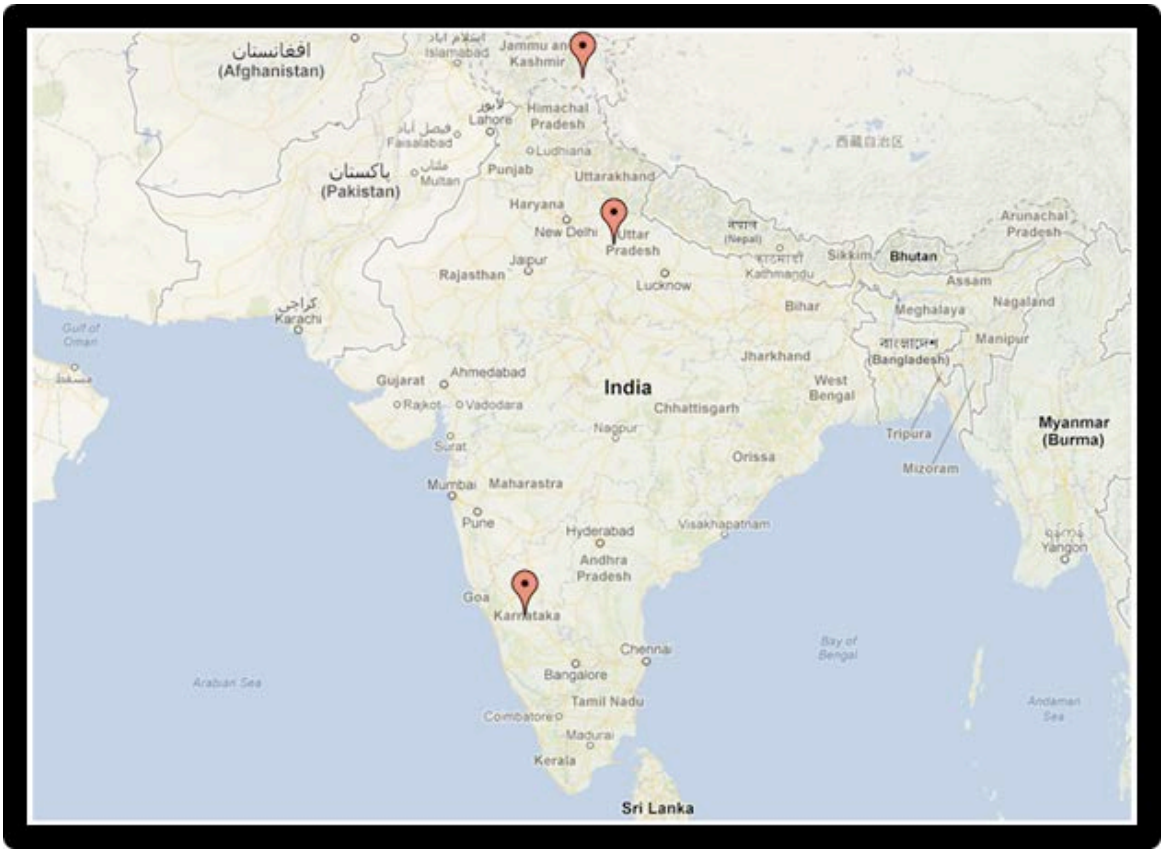

Figure 1. Location of Case Study Schools in India

Figure 2. Locations of Case Study Schools in USA

i) The Six Schools

The schools in India are Nirman, a not-for profit NGO located in the northeast in Varanasi, Druk White Lotus School, which exists under the patronage of his holiness the 14th Dalai Lama, located much farther north in Ladakh, in the region of Jammun & Kashmir and VGKK (Vivekananda Girijana Kalyana Kendra), a tribal school within a tribal community located in the southeast of India, in Karnataka. The US schools are Crellin, a magnet school within a public school system located in Oakland, Maryland, in the northeast part of America, Lawrence Barnes Sustainability Academy, a magnet school with a sustainability theme in Burlington, Vermont and the 6th school is Sunnyside Elementary, a public school with approval to write

their own environmental curriculum in Portland, Oregon. All schools are either an environmental school or have an environmental focus in their school's ethos and curriculum.

ii) Standards and Representations

The next part of my methodology is a content analysis of the documents listed in the Table 1. below. For the national level, I coded India's National Council of Educational Research and Training standards book and the United States' national environmental education standards as prescribed by the EPA (Environmental Protection Agency). For the state level standards, I analyzed India's Center for Environmental Education standards which are mandated by NCERT and the US's SEPUP (Science Education For Public Understanding Program) educational standards which every state adheres to for environmental education. The local school in India and the US were individually assessed for personal representations of environmental ethos using their websites, their communities websites' pertaining to the school, articles about environmental awards the schools won, letters from principals and the creators of the schools, mission statements, and newsletters.

I chose to look at curriculum standards because they reflect the official minimum of environmental education standards that schools would follow. The standards documents have jurisdiction over thousands of schools. Studying the national standards for the US and India nationally means that my data produces legitimate implications about the country's students. My data also gives an idea of the kind of effect the environmental education system is having on the children of those nations. I took the hierarchical approach to education because the rich narrative created simply by comparing national, state and school level provides valuable comparisons. I chose to look at self representations of these environmental schools because

their mission statements and websites go beyond self identifying as an environment school and go into detail about the school's ethos and values associated with the specific environmental topics they teach.

iii) Sources of Standards and Representations

	US	India
National	-Excellence In Environmental Education: Guidelines for Learning (K-12). Publication. United States Environmental Protection Agency, 2010.	-National Council of Educational Research and Training. Project Book in Environmental Education for Class VI. -National Curriculum Framework 2005 NCERT India. National Council of Educational Research and Training, 2005.
State	-Lab-Aids Correlations for A Framework For K-12 Science Education: Practices, Crosscutting Concepts and Core Ideas. Science Education for Public Understanding Program -Lab-Aids Correlations for The 2009 Oregon State Science Standards Grades 6-8. Science Education for Public Understanding Program -Lab-Aids Correlations for The 2009 Vermont State Science Standards Grades 6-8. Science Education for Public Understanding Program	-CEE Across India by CEE North Jammu & Kashmir and Center for Environmental Education. Ministry of Environment and Forests, Government of India. -CEE Across India by CEE Uttar Pradesh and Center for Environmental Education. Ministry of Environment and Forests, Government of India, -CEE Across India by CEE Karnataka and Center for Environmental Education. Ministry of Environment and Forests, Government of India,
Local	**Crellin**: -school website their community blog called "One Small School Makes a Difference"	**Nirman**: -school website -Times of India Article: Threats to Environment Discussed.

	-Crellin's Principal Dana McCauley's school description letter titled "Repairing and Using the Environment". - the description of their school and school projects on the webpage for President's Environmental Youth Award (PEYA) Winners. **Lawrence Barnes**: -school website -Mission statement in an article titled "Experimenting With iSchools" - Strategies to Develop a School-wide STEM Culture (Science Technology Engineering Math). **Sunnyside**: -Sunnyside School Calendar 2012-2013 -school website	**Druk White Lotus School**: -school website -Mission statement letter from principal: Prasad Eledath: "Druk White Lotus School Shey, Sets out the Ambitious Educational Agenda Ahead" **VGKK:** -school website -local indigenous community's website -Mission statement -VGKK Annual Report -speeches by Former President, Dr. APJ Abdul Kalam where references to VGKK & Dr. Sudarshan

Table. 1: National and state standards documents and sources of school self-representations.

iv) Content Analysis: Environmental Definitions

Deciding which way to frame the environment, or not, reflects assumptions, values and models of thinking. My research is guided by the desire to let the data show where values lie in environmental education in the two different countries. The act of coding creates a systematic method of approaching material that lacks personal bias and lets the numbers point to where the bias is. My data sources on the national and state levels are all encompassing of the areas I have situated my research. The local level data collection is more unique depending on the

individual school but as schools are modern bureaucratic institutions, they have similar models of self representation through their web presence.

The content analysis of environmental education standards and representations empirically illuminate assumptions and values about the environment by illustrating how the word ”environment” is most commonly used. The purpose of coding the word environment is to systematically contextualize each actor’s use of the word. From there I am able to point out more refined categories, concepts and themes of the “environment”.[31]

The first stage of content analysis was to code for every usage of the word “environment” in these aforementioned standards documents and put them into five diverse categories according to Oxford English Dictionary’s definitions.[32] OED offered more than just five definitions but the others were unrelated to the topic of research entirely. “Environment” was not counted in the tables of frequency (shown in Results) if it was used in a title or the name of an organization because the context and how the word is used in a sentence is what is important when assessing values and assumptions.

Oxford English Dictionary | environment, *n.*				
a. The area surrounding a place or thing; the environs, surroundings, or physical context.	b) The physical surroundings or conditions in which a person or other organism lives, develops, etc., or in which a thing exists; the external conditions in general affecting the life, existence, or properties of an organism or object.	c) With modifying word: a particular set of surroundings or conditions which something or someone exists in or interacts with. (semi-desert environment)	d) Freq. with *the*. The natural world or physical surroundings in general, either as a whole or within a particular geographical area, esp. as affected by human activity.	e) The social, political, or cultural circumstances in which a person lives, esp. with respect to their effect on behaviour, attitudes, etc.; (with modifying word) a particular set of such circumstances.

Table 2. Oxford English Dictionary’s 5 definitions for the word “environment”.

[31]Geoff Payne and Judy Payne. "Coding Qualitative Data." (SAGE Research Methods, 2004).
[32]"Environment." Def. 2,4. OED The Definitive Record of the English Language. (Oxford UP, 2013)

v) Content Analysis: Uses of the Word Environment

The second stage of coding was to examine the uses of the word environment that fell under the category D) the natural world or physical surroundings in general, either as a whole or within a particular geographical area, esp. as affected by human activity. I chose to concentrate on this definition because its defining qualities most accurately reflecting topics taught in environmental education. I sorted all the uses of the word environment into thirteen categories of environmental studies topics. I drew on several sources including Young[33], Bernard[34], Mogey[35] and many other environmentally focused authors to help determine the thirteen categories and reflect a summation of pertinent educational environmental topics and issues.

Thirteen Uses of the Word Environment
1) Resource consciousness and perpetuating
2) Ecosystem Functionality/ Outdoors Focus (plants, streams, animals, air)
3) Human impact/ Degradation
4) Anti-Industrial
5) Bioregionalism/ Indigeneity
6) Hyper Localism
7) Self Sufficiency (food, water, energy)
8) Subsistence (small is beautiful, mom and pop)
9) Ethical obligations to non-humans
10) Social Concerns/ Need for economic development

[33]Gerald L. Young. "Environment: Term and Concept in the Social Sciences", *Social Science Information*. (SAGE Publications, 1986): 93.
[34] L.L Bernard. "A Classification of the Environments", *The American Journal of Sociology.*(1925): 313-332
[35] J. Mogey, "Environment", *Dictionary of the Social Sciences.* (New York, Free Press, 1964)

11) Environmental Justice/ Human Equity
12) Built environment as part of the environment
13) Technological innovation to solve environmental problems

Table 3: Summation of thirteen environmental topics.

The second stage of coding answers the deeper questions of what environmental topics are being suggested or taught at each level. About 8% of the occurrences of the word environment under the D category were uninterpretable. For example: at the US national level, "learners are able to design environmental investigations to answer particular questions". This use is too vague to reflect the values of the actor in that given sentence. For the remaining occurrences of the word environment, placing them into the thirteen predetermined categories shown in Table 3 provides a systematic basis to tease out conceptual models and values expressed at the national, state and school levels. The topics the actors omit are just as interesting as what the curricular standards includes.

I did a content analysis for one-two official standards documents for both the US and India national level curriculum standards. At the state level, I coded one standards of excellence document for each of the six states. At the local level, I assessed the internet representation of each school. I also employ the use of the school's websites for content beyond the content analysis in order to aid my results. The different uses of the word environment reflect an interesting lack of consensus of what the word means. It is interesting what is considered "the environment" and what is not.

VI. Results

For the both the US and India national level curriculum standards each document contained mentions of the environment 18-30 times. At the state level, each document contained 10-25 mentions. At the local level, I assessed the Internet representation of each school and resulted in 25-32 mentions.

With the exception of Maryland and India's national level standards, every actor in Table 4. uses "environment" in the sense of definition D with the highest frequency. This means that the educational systems in US and India recognize the environment as it connects to human behavior.

Maryland and Vermont state standards have the highest % use of definition B which defines environment as the physical surrounding or conditions in which a person or other organism lives, develops, etc. B's definition indicates an environment without people interacting within it. An example would be "unicellular organisms (microorganisms), like multicellular organisms, need food, water, a way to dispose of waste, and an environment in which they can live.[36] The high number of mentions of this type of environment is due to the fact that the states in the US have their environmental curriculum embedded in their total science curriculum. Therefore when I coded for the word "environment", it came up in the context of pure biology education and "environmental education". It is interesting that the environment is taught within science curriculum in the United States. While the United States

[36]Mark Koker Ph D. "Lab-Aids Correlations for The 2009 Vermont State Science Standards Grades 6-8." *Lab Aids Experiencing Science. (*Science Education for Public Understanding Program, 2009)

claims that the environment is a topic including social science and ethics concerns, at the very core, it is taught alongside all other topics in the "science" category.

Interestingly enough, while Maryland and Vermont both heavily use definition B, no state level actor that I looked at in India uses it. This indicates that on a state level in India, the environment is a topic that is taught on its own, and not as a subsection within the science chapter of the student's curriculum. There is no such drastic comparisons at the local levels, two schools in India use B and C and one school in the US use them. The local levels are very diverse in their usages.

At the national level, India uses the definition E that environment is the social, political, or cultural circumstances in which a person lives, esp with respect to their effect on behavior, attitudes etc (with a modifying word). 50% of the mentions of environment in India's national standards are this use. In India, the states do not use any other definition of the environment that is not D save for one instance of Uttar Pradesh using E. Because the uses usually are describing things like "an inclusive school environment", I did not chose to analyze the use further in my research on environmental values and assumptions in education.[37] On a whole, of the definitions that are not D, the most common and interesting trend is that the US tends to use definition B much more than India, which is interesting because they proclaim to see the environment as a multidisciplinary issue.

Frequency of Usage of the Word Environment Under 5 OED Definitions

	Total: Usage	A)	B)	C)	D)	E)

[37] "Decade of Education for Sustainable Development Taking It Forward Together." *Inputs from the International Conference 'Education for a Sustainable Future*' (Centre for Environment Education, Ahmedabad, India 2005)

US National	**29**		**6.9%**		**93.1%**	
Maryland	14	21.4%	57.1%	7.1%	14.28%	
Crellin	16				100%	
Vermont	13		30.76%	7.69%	61.5%	
Lawrence	12				91.6%	8.3%
Oregon	3				100%	
Sunny	9	18.61%	10.83%	18.61%	51.94%	
India National	**10**		**10%**		**40%**	**50%**
Karnataka	1				100%	
VGKK	13		7.7%	7.7%	76.9%	7.7%
Jammun	8				100%	
DWLS	15	6.7%	6.7%	13.4%	60%	13.4%
Uttar P.	15				93.3%	6.6%
Nirman	7				100%	

Table 4. Frequency of Usage of the Word Environment Under 5 OED Definitions

Table 4. shows that the majority of actors use definition D of the word environment to mean, "the physical surroundings of organisms and are also affected by humans". This discovery led to more questions about what each individual actor chooses to teach within this historically and philosophically rich topic. The next component of my research concentrates on the context surrounding the word "environment" under the definition D. At this point, I was expanding my content analysis to read the entire paragraph surrounding the word instead of just the sentence. Contextualizing the word is necessary in order to judge what the standards and self-representations are implying. The analysis seeks to find exactly what environmental

topics each actor is teaching. Fig 3 shows all Indian actors and the frequency with which they use the 13 different environmental topics and Fig 4 shows all the US actors and the frequency with which they use the 13 different environmental topics.

India: Frequency of Usage of the Word Environment Under 13 Categories

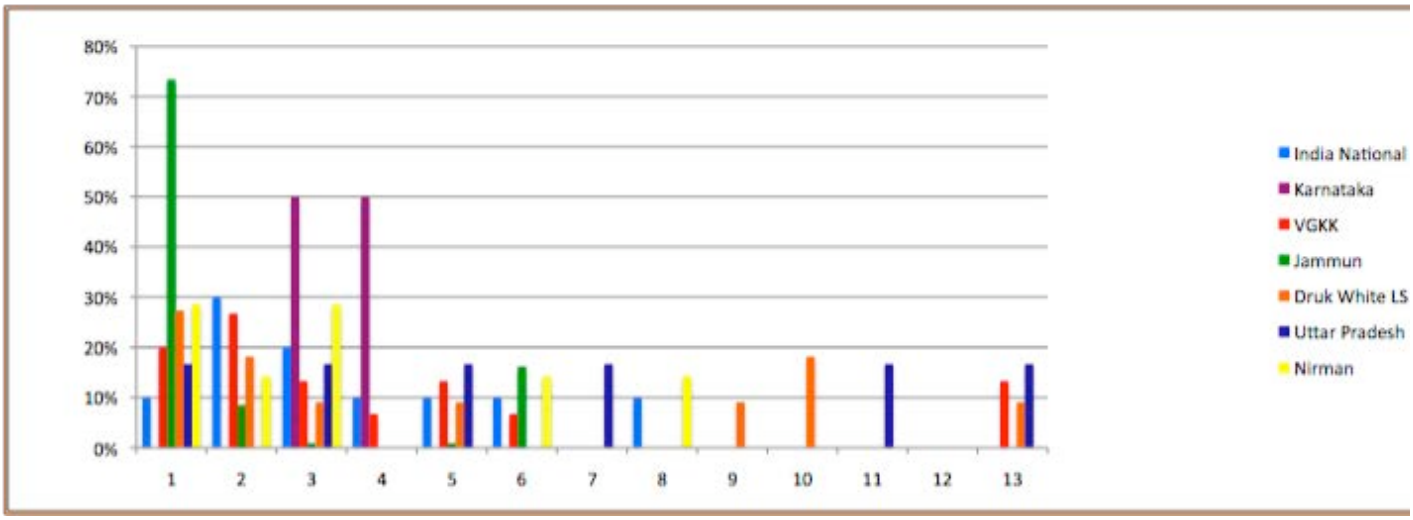

Fig 3. National, state and school level usage of the 13 topics of environmental education in India.

United States: Frequency of Usage of the Word Environment Under 13 Categories

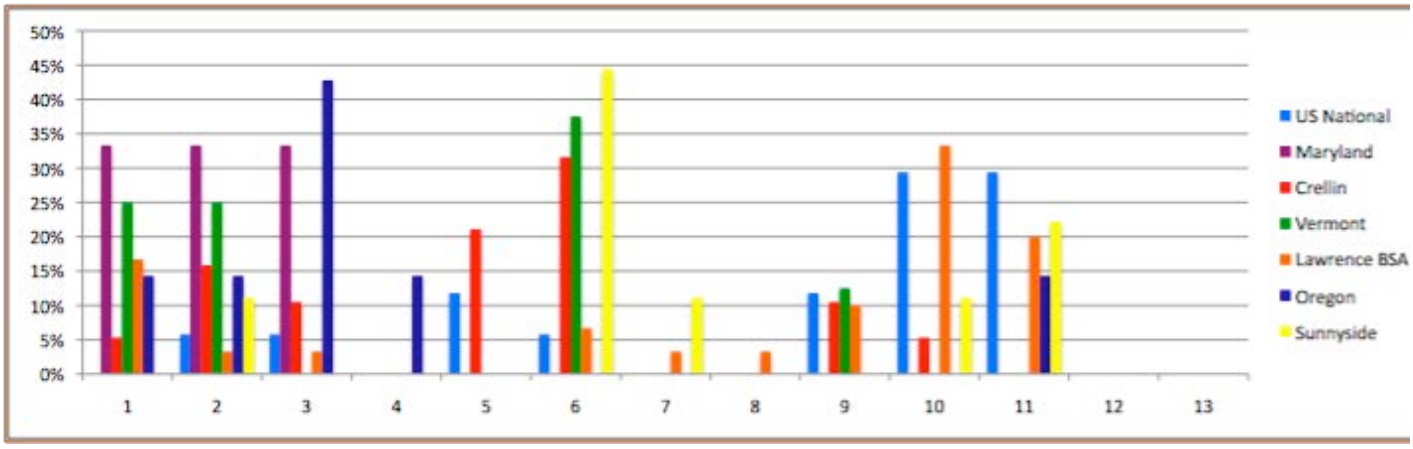

Fig 4. National, state and school level usage of the 13 topics of environmental education in the US.

i) India Hierarchical Analysis

National

On a national level, India's highest usages of the word environment fell into the categories of ecosystem functionality and human impact and degradation of the environment. A smaller, but still substantial, portion of their usages of the word environment then focus on resource consciousness, anti-industry, bioregionalism, hyper localism, and subsistence.

State

With 72% usage of the word under the category of resource consciousness, Jammun focuses the most of the 3 states on this topic. Additionally, Jammun uses the word under the category ecosystem functionality and hyper localism. Karnataka's use of environment falls under human impact and degradation and anti-industry. Uttar Pradesh uses environment to mean resource use, human impact and degradation, bioregionalism, self-sufficiency, environmental justice and technological innovation. Compared to the other states Uttar Pradesh has the highest diversity of topics.

While Karnataka solely uses environment to mean human impact and degradation with anti-industry, Uttar Pradesh pairs the topic of human impact and degradation with bioregionalism, self sufficiency, environmental justice and technological innovation. It is interesting, not only that Karnataka matches impact degradation with anti-industry, but that those are the only topics they include in their standards.

Local

At the local level, VGKK uses environment to mean ecosystem functionality, resource consciousness, anti industry and technological innovation. DWLS uses environment to mean

resource consciousness, ecosystem functionality, ethical obligations to non-humans, social concerns/ need for economic development, and technological innovation. Nirman uses environment to mean resource consciousness, ecosystem functionality, human impact and degradation, hyper localism and subsistence.

Although all three schools use the word to mean ecosystem function and resource consciousness, they pair that grouping with different topics which frames them differently for each one. While VGKK teaches ecosystem function and resource consciousness along with anti-industry, DWLS uses environment to mean ecosystem function and resource consciousness with a concern for human economic growth, and lastly, Nirman pairs ecosystem function and resource consciousness with human impact/ degradation, need for economic growth, subsistence and hyper localism.

Comparisons

Actors like Karnataka, India as a nation, and VGKK use environment to mean human impact and degradation together with anti-industry. This pairing points to a theme connecting human activity and livelihood and degradation to the environment. Additionally, all Indian actors except Uttar Pradesh pair ecosystem functionality with resource consciousness and its perpetuation. There is a strong link here between humans' use of resources for both livelihood and personal consumption and the ecosystems they draw those from.

India as a nation, VGKK and Jammun all use environment to mean bioregionalism/indigeneity and hyper localism in tandem. This connection points to a link between indigenous focus and a concern for living locally. Interestingly VGKK and their state Karnataka both frame the environment around human impact and degradation and Nirman and

their state Uttar Pradesh both frame the environment as a combination of degradation issues, resource issues but also they both include self sufficiency and independently they add hyper localism and technological innovations. While Karnataka sets up a standard for negative human impact, which is echoed in VGKK, Uttar Pradesh sets up a standard for solutions that are echoed in Nirman. It appears here that the states have a strong influence on their local schools not only in what topics are taught, but also what themes are being passed down as well.

ii) United States Hierarchical Analysis

National

Nationally, the US uses environment to mean social concerns, need for economic growth, environmental justice, and human equity. Present, but to a much lesser extent, is the use of environment to mean ethical obligations to non-humans and bioregionalism and indigeneity.

State

Maryland uses the word to mean resource consciousness, ecosystem health and human impact/ degradation with no other additional focus. Vermont's standards use the word to mean hyper localism and also resource consciousness, ecosystem health, and ethical obligations to non-humans. Oregon's standards use environment to mean human impact and degradation resource consciousness, ecosystem health, anti-industrial and environmental justice.

Local

Crellin school's representative documents uses environment to mean resource consciousness, ecosystem functionality, human impact and degradation, bioregionalism and indigeneity, hyper localism, and ethical obligations to non-humans. According to their website,

Crellin kids learn about localism and local consumption based on indigenous land practices by re-vegetating their land with native grasses, shrubs, and trees. Lawrence Barnes Sustainability Academy uses environment to mean resource consciousness, ecosystem functionality, hyper localism, ethical obligations to non-humans, social concerns such as economic growth and environmental justice and human equity. Sunnyside uses environment to mean ecosystem functionality, hyper localism, self-sufficiency, social need for economic growth and environmental justice.

Comparisons

Schools in the US all use the word to mean resource consciousness, ecosystem functionality and hyper localism and then add on other topics from there. Crellin is the only school not to use the word environment to mean social issues such as justice or the need for economic growth. None of the US States, I looked at, include social issues like the need for economic development as part of their definition of the environment. This omission is interesting because both the National level and all schools at the local level highly prioritize these social issues. Although Oregon is the only US actor to use environment to mean anti-industrial topics, they pair it with human-impact and degradation with indicates a connection between industry specifically, and the degradation caused to the US environment. Additionally, it is interesting how only one actor out of seven uses the word to mean anti-industry within environmental education.

India US Comparisons

Nationally, the US uses the word environment to mean social issues such as social concerns, need for economic development, environmental justice, human equity as well as

ethical obligations to non-humans. Nationally, India does not mention these social issues. Nationally, India standardized education uses environment to mean combination of ecosystem health, resources consciousness, human degradation, anti-industrial practices, bioregionalism, hyper localism and subsistence. Nationally, both India and the US agree to use the word to mean ecosystem consciousness, human impact and degradation, bioregionalism/indigeneity and hyper localism.

Save for Vermont, all states in both countries' standards use environment to mean resource consciousness, ecosystem health and human impact. These three topics are used together frequently. It is interesting that only one state actor in the US spends 15% of their standards for curriculum using environment to mean anti-industry while three actors in India spend a total of 58% of their standards using environment to mean anti-industry.

Because the uses of the word environment at India's local level are so diverse, the three schools agree only on the fact that environment means resource consciousness, ecosystem functionality and hyper localism. At the local level, US schools teach a combination of resource consciousness, ecosystem functionality and hyper localism. Interestingly enough, India's local level schools can agree that the environment means those same topics.

VII. Discussion and Implications

A study done by Kress et al., in 2001 used the data produced from students' written language and drawings to serve as signs for communicating the meaning they construct of the environment.[38] The data from these case studies contextualize and help point to greater repercussions of my data. While the case studies look at student's perceptions, I look at

[38]Jewitt Kress, J. Ogborn and C. Tsatsarelis, "Multimodal teaching and learning: The rhetorics of the science classroom". (London, UK: Continuum, 2001)

curriculum standards—both with the intent of seeing what is imbedded in education and how it may influence opportunities for effective action or open creative solutions to thinking about environment. Understanding each country's implications shows how the US and India could both benefit from cross-examination of the other's model.

Strictness and Looseness of Hierarchies

Comparing states like Karnataka and Uttar Pradesh provides insight into how India's states have a meaningful effect of the framing of local education. Karnataka solely uses environment to mean human impact and degradation with anti-industry. VGKK, under Karnataka's states standards, also uses environment to mean ecosystem function and resource consciousness along with anti-industry. Uttar Pradesh pairs the topic of human impact and degradation with bioregionalism, self-sufficiency, environmental justice and technological innovation. Under Uttar Pradesh's standards, Nirman pairs ecosystem function and resource consciousness with human impact/ degradation, need for economic growth, subsistence and hyper localism. It is clear that these state-local hierarchies are strict, compared to the US, where the State level standards are not reflected much in the local school's curriculum.

Nirman teaches the environment in the context of economic and social issues with conservation, subsistence and hyper localism, Nirman may be the most balanced and multidisciplinary in that they do not frame resource use solely an economic issue like DWLS nor do they frame humans as sources of degradation like VGKK. Teaching subsistence shows Nirman's attempt to provide solutions. Save for Uttar Pradesh, no state level standards from either country use the word environment in the context of the social sciences.

The Environment: Science or Social Science?

The local and state levels are not the only actors who struggle with framing environmental issues in a multidisciplinary manner. Even though environmental issues span much farther than just a scientific realm, India does not use the word environment in the context of social sciences. While teaching the scientific processes behind environmental problems is an important part of teaching the environment,

> Science has achieved success by dividing problems into parts and addressing them one at a time, but such a strategy is not possible when trying to understand the effect of environmental change on human societies: the problems affect, in multiple ways and at every stage of their perception, the subjects who are suppose to stay outside and solve them.[39]

Historically, science, and humans eagerness to utilize it, has been culpable for some the problems that we now aim to solve. ”Science is a building block in the Enlightenment tradition, which views society as a governable whole and sees nature as merely an external physical entity, controllable once the laws of nature are unveiled”[40]. An educational model lacking multidisciplinary education frames the environment in a way that contributes to short sighted behavior. The lack of differing academic perspectives contribute to decision making that is neither economically nor environmentally sound. David Orr famously said, “all education is environmental education”.[41] A prominent body of environmental education research suggests that the answer to more effective environmental education is an integrated curriculum that cuts across disciplines.[42]

Humans as Part of the Environment

Across both India and the US, at all levels, the built environment, the physical manifestation of human presence, is not considered part of the environment. This has

[39] Yrjö Haila, **“**Ecology: A New Discipline for Disciplining?,” *Social Text* 42 (1995): 153-171
[40]Haila, **“**Ecology: A New Discipline for Disciplining?,”
[41]David Orr.“Earth in Mind: On Education, Environment, and the Human Prospect.”(Washington, DC: Island, 1994)
[42]A. Stables, “Who Drew The Sky? Conflicting Assumptions in Environmental Education” *Educational Philosophy and Theory* (2001): 245-256

implications that humans are not considered part of the environment. Claiming our homes are not part of the environment reifies the belief that humans and nature are separate. This belief is common in students according to a multitude of studies done all over the world. An American study done in 1994 found that when asked what the environment was, secondary students from inner-city Detroit conceptualized the environment as pristine nature consisting of animals and plants.[43] A study conducted in 2004 in the UK found that students associated the environment as a "place where animals live".[44] Studies that explored students' conceptions of urban environments found that students were not able to conceptualize living organisms inhabiting built up area and they did not consider urban areas to have wildlife.[45] A Swedish study from 2000 found that secondary students think about the environment in aesthetic terms: as a pristine and pure place that is not impacted by humans. The students could only speak about the environment in terms of how they used it for their benefit.[46]As US study done in 2010 sought to understand "young people's" perceptions of the environment. Their results show that young people leave out humans in their identification of environment.[47]

According to The Environmental Protection Agency, the environment does not only consist of nature or natural places but is also defined as the built environment as well as the natural environment and all natural resources including air, land, and water.[48] The belief that the natural environment is outside of human contact is problematic. If human contact with the

[43]A.E. Wals, "Nobody planted it, it just grew! Young adolescents' perceptions and experiences of nature in the context of urban environmental education." (Children's Environments, 1994): 177–193.
[44]M. Littledyke, "Primary children's views on science and environmental issues: examples of environmental cognitive and moral development", (Environmental Education Research, 2004): 217–235.
[45] D.A. Simmons, "Urban children's preferences for nature: lessons for environmental education. *Children's Environments* (1994): 194–203.
[46]Eva Alerby, "Some Reflections On Time as A Phenomenon Within School" (Sweden: Luleå University of Technology Department of Educational Sciences, 2004)
[47]Tony Loughland , Anna Reid & Peter Petocz. "Young People's Conceptions of Environment: A phenomenographic analysis" E*nvironmental Education Research*. (2010): 187-197
[48] EPA. "Our Built and Natural Environments." *Development, Community, and Environmental Division* (Washington DC, 2001)

environment results in it being “artificial”, "human beings then cannot have any means of getting into contact with a "natural environment.”[49]

These case studies show how common it is that students perceive themselves to be somehow outside the environment. Jim Proctor, a professor at Lewis and Clark College speaks to this phenomenon:

> Somehow our notion of environment got wrapped up in our notion of nature, and with it came a whole host of conceptual binaries that effectively drive a wedge through any lasting resolution of environmental problems.[50]

Teaching the perception that the environment is nature only, especially pristine nature that is untouched by humans excludes all people, especially those in inner city populations. A dangerous effect of this trend is that students will grow to feel isolated from the environment and never recognize or try to understand how their actions impact the environment. If one starts to define “nature” as one place but not a park, for example, it creates a series of binaries that lead to further separation of humans and their environment.

At the national level, America includes social justice, the importance of economic growth and social science issues in their definition of the environment. The US on all levels projects rhetoric of the ethical obligations towards non-humans and VGKK is the only actor in India to mention it. The United States makes a priority the ethical considerations for animals. This concern may exclude concerns for humans because humans are not seen as part of nature. Concerns with development, the need to generate wealth and jobs are crucial in the US. It is important that the United States consider economic concerns part of our environmental concerns. The health of our economy is part of the health of our environment in that our

[49] Yrjö Haila, **“**Ecology: A New Discipline for Disciplining?,” *Social Text* 42 (1995): 153-171
[50] Jim Proctor, "Environment After Nature: Time for a New Vision.” *Envisioning Nature, Science and Religion* (Templeton Foundation Press, 2009): 293-311.

country's concern for jobs is very high and it would be neglectful not to engage social, economic and environmental together in solving our countries economic problems.

It is important that the US defines the environment as social issues. According to the principles of "ecological sustainable development" espoused in Agenda 21 in 1993, a student must see that environmental issues and social issues are highly interrelated in order to have a well-developed relational view of the environment. This also supports the initiative written by the United Nations Earth Summit in 1992, that environmental improvement involves environmental, social and economic sustainability.[51]

Trajectories of India and the United State

The different trajectories of India and the US put them in different positions to start or continue environmental awareness and action. India's rapid industrialization has caused environmental degradation "as [an] unavoidable consequences of livelihood extraction... This phenomenon is not included [in] the EE India imparts in schools. There are certain situations to which we just cannot say "no", [despite] the fact that... we know the potential harmful effect of the activity".[52] Limiting student's environmental education to lessons of ecosystems and human degradation cannot provide students with the full economic and social background necessary to begin to think about the problems India faces in meaningful ways. According to Sonowol, India is in need of a new educational paradigm of the interaction with environment and development.

In 2000, Pandey wrote a critical assessment of NCERT books. He cited several examples of the presence of incoherence like how the curriculum only taught about the negative impacts

[51]United Nations, "*National Implementation of Agenda 21"*. (Johannesburg Summit Commission on Sustainable Development, 2002)
[52]C.J Sonowal. "Environmental Education in Schools: The India Scenario". (Tata Institute of Social Sciences, 2009): 15-36

of pollution without giving any other explanation or context. Pandey says that the lacking model would benefit from a "holistic view of EE teaching". [53] According to Agenda 21: The Earth Summit Strategy to Save Our Plane, a more effective method of teaching environmental topics involves giving students a skill set involving investigation, evaluation, and resolution. A more specific title used for this approach is the "define-practice-apply" approach.[54]

Siddhartha Shome writes about conservation in a way that relates to Sonowol's discussion of the disconnect between India's needs as a rapidly developing country and the anti-degradation rhetoric espoused in their environmental educational model. In the early 20th century, the Prime Minister, Indira Gandhi and international NGOs followed the suggestions of Mahatma Gandhi who "advocated an idealized vision of a traditional village-based society with limited needs, limited ambitions, and small-scale subsistence production" and enacted a slew of conservation laws in the Himalayan forests.[55] While the highly consumptive, elite members of society cheered at the success of the conservation laws, the poor members of the community suffered greatly as they were unable to collect wood to build houses or heat food. Shome argues that the local communities were better at managing the forests than the federal government, and enlists Ambedkar's argument that

> "embracing technological transformation and modernization would be good for all of India, not just the green elite and upper class. Rapid modernization and urbanization bring their own problems and challenges, but they present far greater opportunities for the poor than traditional technologies and the traditional village-based socioeconomic order-along with the potential for greatly reduced ecological impacts ".[56]

While it is unclear exactly what Shome means by his concluding statement, it is a point that has been developed and supported by many economists using the Kuznets curve.

[53]K. P. Pandey, "Educational and Vocational Guidance in India, Varanasi: VishwaVidyalaya Prakashan"(2000)
[54]D. Sitarz. "Agenda 21: The Earth Summit Strategy to Save Our Planet." (Boulder, 1993)
[55]Siddhartha Shome, "The New India Versus the Global Brahmins". (Breakthrough Institute, 2012)
[56]Shome,"The New India Versus the Global Brahmins".

Shome suggests that there would be positive impacts of industrializing India at every socioeconomic level. Not only does he argue that this shift would free Indian's from the current economic dependence on the caste system, but that the increased industrialization would eventually reduce ecological impacts. The Kuznets curve is an economic model based on the environmental impacts of a country and its industrialization trajectory. The curve reflects multiple studies that support the hypothesis that "the environmental quality deteriorates at the early stages of economic development/growth and subsequently improves at the later stages".[57] In the case of rapidly developing India, "the progress of economic development [moves] from clean agrarian economy to polluting industrial economy to clean service economy...[and the] tendency of people with higher income [is to] have [a] higher preference for environmental quality".[58]

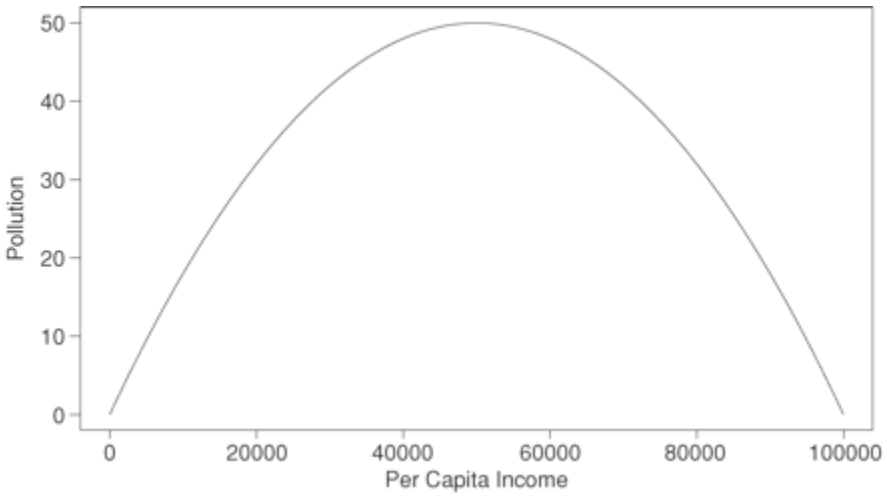

Figure 3. Stylized environmental Kuznets curve.[59]

[57] Richard T. Carson, "The Environmental Kuznets Curve: Seeking Empirical Regularity and Theoretical Structure". (Rev Environmental Economic Policy, 2010): 3-23

[58] Richard T. Carson, "The Environmental Kuznets Curve: Seeking Empirical Regularity and Theoretical Structure". (Rev Environmental Economic Policy, 2010): 3-23

[59] Carson, "The Environmental Kuznets Curve: Seeking Empirical Regularity and Theoretical Structure"

The Kuznets Curve ties to Shome's work in that it dismantles the environmental argument that mitigating environmental problems means putting an emphasis on anti-industry. According to Shome, not only does the current economic and environmental model of conservation and aestheticism negatively impact the poor, but like the Kuznets curve shows, increasing industrial practices does not mean giving up on environmental stewardship. The Kuznets curve shows to the extreme that human technological advancement is not inherently un-environmental.

Due to India's recent industrial growth, the fact that they define the environment in the context of the negative effects of industry is pertinent. US industry is also culpable for many environmental issues. It is interesting that environmental education in the US remains mostly silent about industry. This omission may be due to the fact that US is more dependent on industrial practices because they are much more embedded in the country's infrastructure; environmental educators may be omitting the topic in order to focus on areas where they feel there is more room for negotiations or change.

At the local level, US schools consistently define the word environment as a combination of resource consciousness, ecosystem functionality and hyper localism. This pairing may point to a trend that environmentalism in the US is returning to localism as a means to consume resources consciously. It is still to be seen whether the US is fitting nicely into the Kuznets Curve or not. Instead of using the word environment in the context of technological innovations to solve environmental problems, the US environmental schools are turning back to subsistence and local practices.

The Kuznets Curve above all else acts as an indicator that drastic conservationist approaches may approach mitigating environmental issues through a limited framework. Authors Shellenberger and Nordhaus argue that while elites in the west, similar to Shome's notion of the "green elite" insist that technological development is the cause of ecological problems but not their solution and human history has shown that solutions are borne from our use of technology. They argue that it is technology that has made us human so we should not fear it or treat it as the problem.

Bruno Latour calls on Mary Shelley's piece *Frankenstein* to address the controversy over technological innovation for environmental problems. Frankenstein

> is not a cautionary tale against hubris, but rather a cautionary tale against irrational fears of imperfection. Dr. Frankenstein is an antihero not because he created life, but rather because he fled in horror when he mistook his creation for a monster—a self-fulfilling prophecy. The moral of the story, where saving the planet is concerned, is that we should treat our technological creations as we would treat our children, with care and love, lest our abandonment of them turn them into monsters.[60]

Shellenberger, Nordaus and Latour argue that technology is the way in which we came to be where we are today and instead of abandoning our technological trajectory, we must continue trying to understand and improve upon it and ourselves.

Solving the world's environmental problems will never have an easy answer. However, concrete steps we can take to improving our chances of effectively addressing environmental problems would be to globally cross-examine our mental models to gain fresh perspectives how we can and do see "the environment". When schools and nations like Nirman, VGKK and Crellin and India are not using the environment to mean social issues like environmental justice and economic needs, it is made clear that self-reflection and horizontal communication across all actors is necessary. Simply focusing on

[60] Ted Shellenberger and ted Nordhaus, "*The Monsters of Bruno Latour*". (Breakthrough Institute, 2012)

ecosystem health and human degradation of the environment cannot supply a learner with the background or the tools to approach the complex environmental issues humans are facing today. While some claim technology or increased industrialization will be the key to mitigating environmental issues, and others strongly lean towards subsistence and mom and pop business models, it is evidence how important reflection and comparison are for learning more multifaceted approached to environmental education and for further mitigation of environmental problems.

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