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Achieving Sustainable Development through Transformative Pedagogies in Universities

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***Abstract*—**Developing a responsible personal worldview is central to sustainable development, but achieving quality education to promote transformative learning for sustainability is thus far, poorly understood. Most programs involving education for sustainable development rely on changing behavior, rather than attitudes. The emphasis is on the scientific and utilitarian aspect of sustainability with negligible importance on the intrinsic value of nature. Campus sustainability projects include building sustainable gardens and implementing energy-efficient upgrades, instead of focusing on educating for sustainable development through exploration of students' values and beliefs. Even though green technology adoption maybe the right thing to do, most schools are not targeting the root cause of the environmental crisis; they are just providing palliative measures. This study explores the under-examined factors that lead to pro-environmental behavior by investigating the environmental perceptions of both college business students and personnel of green organizations. A mixed research approach of qualitative, based on structured interviews, and quantitative instruments was developed including 30 college-level students' interviews and 40 green organization staff members involved in sustainable activities. The interviews were tape-recorded and transcribed for analysis. Categorization of the responses to the open-ended questions was conducted with the purpose of identifying the main types of factors influencing attitudes and correlating with behaviors. Overall the findings of this study indicated a lack of appreciation for nature, and inability to understand interconnectedness and apply critical thinking. The results of the survey conducted on undergraduate students indicated that the responses of business and liberal arts students by independent t-test were significantly different, with a p-value of 0.03. While liberal arts students showed an understanding of human interdependence with nature and its delicate balance, business students seemed to believe that humans were meant to rule over the rest of nature. This result was quite intriguing from the perspective that business students will be defining markets, influencing society, controlling and managing businesses that supposedly, in the face of climate change, shall implement sustainable activities. These alarming results led to the focus on green businesses in order to better understand their motivation to engage in sustainable activities. Additionally, a probit model revealed that childhood exposure to nature has a significantly positive impact in pro-environmental attitudes to most of the New Ecological Paradigm scales. Based on these findings, this paper discusses educators including Socrates, John Dewey and Paulo Freire in the implementation of eco-pedagogy and transformative learning following a curriculum with emphasis on critical and systems thinking, which are deemed to be key ingredients in quality education for sustainable development.

***Keywords*—**Eco-pedagogy, environmental behavior, quality education for sustainable development, transformative learning.

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I. Introduction

EDUCATORS and society in general, need to recognize that sustainable development depends critically on key competencies that are both physically and socially constrained, but most importantly need to be genuinely motivated, preserving nature for its intrinsic value. A worldview transformation is essential within the education realm. Unfortunately, efforts to design curricula that include environmental, economic and social aspects have overlooked content concerning a worldview that emphasizes the role of humans as a part of nature, in order to change attitudes. Besides exploring components of the physical domain, appropriate intention and intrinsic motivation have to be considered to avoid the waste of natural resources and destructive impacts on other living species. In this context, we should define the purpose of sustainable development as the optimization of human activities to maximize the utilization of resources within the domains of environmental, economic and social sustainability, without jeopardizing other kinds of life on the planet. Humans are behaving as invasive animals, spreading aggressively outside their native range, by modifying the environment to thrive at the cost of destroying other species' habitats. It seems reasonable to think that the definition of sustainability be within a context of non-human exemptionalism, in which nature's welfare, others than humans, is taken into consideration. To exert genuine respect for the natural world, it may be pertinent to investigate the perspective that divides anything social from the natural in search of a framework that re-establishes the complex intertwined relationship between humanity and nature.

The emphasis should not be on what will happen to future human generations, but on whether we are extinguishing other species and causing other forms of environmental damage in the process of expanding our species. Because human and non-living things are interconnected, sustainability is not limited to human survival; it has to include other living systems. The question is: How can we draw societal attention to change this mindset of human exemptionalism and develop genuine sustainable behaviors based on an inclusive urge to preserve all species in the natural world, not limited to humans? How can we avoid the propagation of human exemptionalism in a social system that is controlled by individualism and special interests? The answer has to be rooted in a transformative education for genuine sustainable development, in order to instill a different worldview. Education may be the only resort left to prevent human downfall.

This study found a lack of appreciation for nature, as well as predominant human exemptionalism. There was no understanding of the interconnectedness of all living and non-living things among undergraduate students and staff members of organizations involved with sustainability. Currently crucial analysis of the root-causes of harmful actions by society, such as climate change and extinction of other species, is not approached successfully in academia, especially in business schools, indicating the need for appropriate pedagogy to develop genuine sustainable development. Unfortunately, the emphasis is on profitability, although sometimes it coalesces with a recognition of the need for a façade of social responsibility, as among many strategies, for increasing marketability and competition.

II. The Case of Exemptionalism Consequences

There are those who insist on negating the evidence of other species extinction by either rationalizing it as an evolutionary paradigm that we are special and have priority to survive, or by saying that for survival the economy must keep growing as suggested in Julian Simon's book, *The Ultimate Resource* [1]. Simon claims that natural resources are actually becoming less scarce over time. He does not follow Malthusian reasoning about fixed resources and favors of an unlimited growth counting on human creativity to solve problems indefinitely. Population growth does not necessarily correlate with economic development. An example contradicting Simon's claims, is the case study of Uganda presented by Klasen [2], in which analysis suggests that there appears to be significant pay-offs to reducing fertility levels in Uganda. A reduction in population growth would improve education and health outcomes and lead to significantly higher economic growth. At the household level, a large number of children are associated with low human capital investment in each child. This is what Becker [3] called the quantity-quality trade-off. As a result, households with many children have fewer resources to send children to school, to afford health care, and to save or invest in productive activities. This also applies to the provision of public services. In a high population growth environment, it is extremely difficult to extend services to the rapidly rising population. This is particularly the case for education and health services for children. Besides overlooking many implications of population growth, Simon is discounting the displacement of other species in the natural world as we expand and destroy their habitats, and the uncertainty in his projections based on past data that depends on the faith of continuous technological progress, demonstrates human exemptionalism and a unilateral view of the world based on economics. Conversely, as reported by UN (2015) 5.2 million hectares of forest were lost in 2010 and consequently, habitat devastation, pollution and climate change are causing extinction of plants and animal species [4]. For example, overexploitation of marine fish is declining stocks to levels below the biological limits, from 90 % in 1974 to 71 % in 2011. Projections indicate that in 25 years 20 % of all plant and animal species will be extinct. Something needs to be done and has to come from individuals' wills and attitudes through a change of behavior and worldviews. Humans create habitat loss, as well as soil, water and air pollution with activities such as urbanization, intense farming (or industrial agriculture), logging and over-harvesting of plants and animals in order to comply with the demands of population growth.

History has shown that civilizations like the Mayans, and the people of the Easter Islands, have maintained their lifestyle and then vanished because they did not overcome their extractivism mindset. It seems that Simon did not consider the concept of an environmental carrying capacity for a population size of species that an environment can sustain without degradation. Gaston [5] presents good examples to illustrate biodiversity threats caused by humans, noting that lessons of the history of human activities indicate that widespread species are led to extinction even though they were not the target of exploitation. In addition, climate change suggests that many species, will under increased pressure, have their survival threatened.

GMO technology may be an example of human creativity to resolve the increasing demands for food due to population growth. Domesticated or genetically modified crops can potentially solve food and energy demands providing high productivity and allowing continuous human population growth. Even though, modification, either in a laboratory or by seed selection and hybridization, have been in some instances beneficial, there are modifications motivated by aesthetics or other reasons that have been harmful. An example of a harmful modification is domesticated rice. Lewinsohn [6] discusses the fact that during the process of rice domestication the incorporation of mutations with less pigment by selection led to a kind of rice with a low level of carotenoids, and consequently, is of less nutritional value. Another example of a harmful human interference with nature, motivated by aesthetics in disregard to other species, is the practice of double flowering, a genetic alteration of what are normally pollen-laden stamens into many small petals to improve the flower's appearance. However, the absence of stamens means no pollen, the food source for pollinating insects like bees or honey-birds [7].

Laboratory genetic modifications have more control and even might lead to some short term benefits; however, the long-term effects in human and environmental health are unknown. Furthermore, fossil fuels and fertilizers have been indiscriminately utilized with aggravated consequences on global warming, river and ocean pollution causing devastating hazardous to other species habitats, even though initially they were introduced offering promising benefits. The question is: What is the drawback of such implementation? It is extremely important that the educational model for sustainability bring to the classroom experiences, including the consideration of short- and long term consequences of actions.

III. Education for Sustainable Development and Worldview Transformation

The reality is that the progress towards a sustainable world has been too slow and not effective enough to handle over-

population and social transformations. The destruction of the environment has been faster than our awareness process, and has outpaced any actual steps towards progress in sustainability. Steffen [8] describes an approach to building a planetary boundary to regulate the Earth's system based on combining improved scientific understanding of that system. However, these are scientific considerations that must include human attitudes and behavior. If human lifestyle and socio-economic models continue in this trajectory, life could lead to a very different ecological state for the Earth, one that might be much less hospitable to the development of human species.

Geographer Erle Ellis [9] points out from the concept of planetary boundary that the history of human civilization could be described as a series of transgressions of natural limits where humans tame the environment by altering landscapes, oceans, and climate for their own preservation, and these transgressions will continue. In this perspective, humans have become an ecological force living and transitioning into a new geological epoch shaped by humans called Anthropocene. Ellis claims that human systems have been able to cope with ecological issues and have proven extraordinary resilience to social and environmental challenges to population growth, soil deterioration and climate change. As human systems dissociate from traditional ways of agriculture, wild forests and wild fish disappear, Ellis affirms that human systems are prepared to adapt and prosper with less biodiversity without any biophysical limits. This is an extreme anthropocentric view relying on technocentric worldviews and expectations that science would resolve all issues caused by human domination. However, failing to acknowledge the connection between nature and humankind, as well as rejecting interspecies equity, should be regarded with misgiving. As reported by the Ecological Society of America [10] some of the environmental challenges involve the role of ecological cycles essential for human survival including hypoxia, or low oxygen in aquatic systems is increasing, threatening fish and other marine species due to pollution and human activities. Another environmental issue is the change in the nitrogen cycle and its health effects on humans, causing air and water pollution leading to respiratory illnesses, cardiac diseases, cancers and allergies [11].

The issue is not whether science will resolve every environmental challenge imposed by human activities and to accommodate population growth fomented by the current socio-economic system, but if we have a moral right to destroy other living and non-living things. The question is whether humans recognize that they are part of nature. Once all other species are extinct who will be the next prey? Humans themselves? Based on the human predatory nature, the ecocentric perspective is not prevalent and the existing social and economic system translates the anthropocentric view leading to unachievable sustainability. Kopnina [12] points out that because the behavior of most humans does not display a pro-environmental concern, sustainable development is difficult. A worldview that supports genuine sustainability would imply a rejection of exemptionalism or equity between nature and humans, but first and foremost equity between humans themselves. Unfortunately, society has not even overcome the hurdle of stigmatization and dehumanization within themselves based on race, religion and economic status. An equalitarian perspective is a matter of self-consciousness and self-awareness as a product of an educational transformation. It seems that without a revamp of values and worldviews that can only be achieved by education, any attempt towards sustainability goals is doomed to fail. From a positive side, sustainability, as a necessity for human survival in the face of climate change and ecological downfall, might be the conciliatory vehicle for full human outburst.

The concept of Anthropocene, as named by Paul Crutzen [8] describes a new geological era where humans have control of ecology, is a utopian view where human environmental degradation may be vanquished by human superior intelligence. Nonetheless, despite major technological advances, observation of critical ecological elements, such as the CO_2 and N_2 cycle, are irrefutably being negatively affected as it concerns human health, indicating that the effectiveness of the so-called human ecological dominance remains uncertain. In response to the lack of appreciation for nature, an education strategy through rationalization to replace current values, to a worldview of interconnectedness and respect for other living and non-living things should be pursued by transformative learning experiences involving interdependencies of the web of life. The transition to a different mindset is necessary from an individual and collective perspective that can only be accomplished through the development of quality education for genuine sustainability, based on a transformative learning process to develop respect for nature.

IV. Pedagogical Approach

Mezirow [13] introduced the transformative learning theory as a process of change based on converting frames of reference or assumptions generated from our experiences. This is a very important perspective because the academic environment has the potential to selectively shape students' point of view and define expectations, perceptions and cognition. Behaviors and attitudes will be changed from a single event or a series of events building up to a changed perspective. His theory claims that we transform our frames of reference through critical analysis on the assumptions upon which our beliefs and point of views are based. In addition, this is a collaborative effort in which others are an integral part of reaching a common understanding until new evidence is presented. John Dewey [14] used the ordinary experience to approach the world and the scientific mode of inquiry applied to the evolution of the mind infused into a necessary educational process of continual organization and transformation. Dewey emphasized the importance to understanding the connection between what we do to things and what happens as a consequence of our actions. The opportunity to experience and exercise reflective thinking builds on the perception of relationships, giving the opportunity to learn about the world, ourselves and others.

Similarly, this educational perspective is also present in Paulo Freire's work, where the exposure of real world problems that face society should be brought to the classroom to instill social responsibility and citizenship for moral decision-making. Paulo Freire warns that the greatest danger that challenges education is the possibility of becoming a tool sustaining oppression, as the tendency is to harden any idea into a system, through a dominating bureaucracy that destroys creativity [15]. Sustainability faces similar dangers in respect of becoming a tool of power for organizations that have the potential to affect professional and educational objectives. According to Freire, critical pedagogy offers students the opportunity to develop a sense of responsibility to participate in governing and become critical agents in the relationship between theory and practice, use of critical analysis and common sense leading to social change. This is possible through engagement with citizens within an environment of questioning and dialectical thinking. By following Freire's belief that education and hope are necessary for social action to promote change within complex systemic issues, such as sustainability that are far beyond the reach of individual capacities alone to resolve, it is possible to develop sustainability by changing worldviews with transformative experiences.

Currently, our society is not sustainable. We live on a finite planet and population growth is exponentially increasing. Our lifestyle and demands for natural resources are rampant. We have taken for granted the natural environment and have allowed anthropocentric views to shape lifestyles within a cultural rationalization based on human greed. Human behavior is a product of social learning rooted in cultural values. Therefore, social transformation is required in order for sustainable development to be effective and genuinely implemented. The question of how to change attitudes as precursors of behavioral change of individuals towards the natural world, so genuine sustainable development practices are implemented, is pertinent and little understood. Even though poverty has been associated with the causes of an unsustainable crisis, economist Manfred Max-Neef says that poverty is not the root-cause of the environmental crisis [16]. He further elaborated that we do not understand poverty, and if we did, poverty would be eradicated. The belief that poverty leads to environmental crisis is a legacy of Brundtland's report in our Common Future [17], defining sustainable development, which besides not being precise and measurable, has laid the responsibility of environmental problems at the door step of developing countries. From the perspective of developing countries, environmental issues are really caused by developed countries that demand most of the natural resources.

Transformative learning, as a driver of pro-environmental concern, provides a unique attainment rooted in the way human beings communicate to fulfil significant transformative experiences. As such, students need to develop critical thinking skills and awareness of others with different perspectives. This is a social process of self-respect and empathetic ability to value purpose and the essential elements of life, creating ideal conditions of learning and worldview transformation. Information gathered from real world community engagement is incorporated by the student by developing an active process of thought, feelings, respect and disposition, to act after critically reflective thought. Education for sustainability is effective when modeled based on the problems of students own lives through consciousness raising, life histories, and finally, social action. Transformative learning focuses on a context of ideas and belief systems that shape the way we think, about our environment and the consequences of our actions by considering alternative perspectives. The learning environment encourages justice, civility, appreciation for diversity, sharing and responsibility for learning by becoming an autonomous thinker. The unveiling of students' new worldview is obtained when a student learns to critically reflect their own beliefs in a non-authoritative learning experience where students participate in the decision-making of the learning process of the course or emancipatory learning, raising both individual and collective consciousness.

V. Methodology

The present phenomenological study seeks to document some of the attitudes held by business students and green organization personnel involved in sustainability to determine factors that define genuine sustainable behavior to guide the design of a curriculum to change the mindset of future decision-makers. A mixed method, including the analysis of multiple interviews to open-ended questions and NEP surveys, pro-environmental concern and attitudes towards sustainability were collected from 32 students and 40 green organizations sustainability professionals. Once the instrument was developed to measure students' attitudes towards sustainability, subjects were selected randomly on campus to be interviewed. Convenience sampling was selected based on the non-probability method for this initial stage of the study because it would be easier and faster for students to collect the data considering the limited time of the course. Participants were asked to describe their feelings and reflections on their understanding of sustainability and life philosophy and how they contribute to sustainable activities. Students were randomly selected from different majors from Woodbury University campus. Sustainability professionals were selected within a diverse group of green organizations including for profit, nonprofit and government institutions. Interviewees were selected based on their employment, claims and accomplishments of sustainable development. Data collection spanned from 2014 to 2015 with open-ended responses recorded and transcribed. The coding of the data from the interview transcripts of the open-ended responses was conducted, as discussed by Creswell [18], and validated by two different Woodbury University faculty members from the psychology department. (Joye Swan &Robert Thornton)

The sample size of the survey followed the guideline principle of saturation, as suggested by Mason [19], indicating that the average sample size of PhD studies using qualitative approaches is often around 30 people to 50 people. A

combination of both qualitative and quantitative forms of data provides valuable information to aid the analysis of complex problems that cannot be answered solely by numbers or by words.

The in-depth interviews were preformed one-on-one, generating textual data, which required an analysis of the emerging themes, rather than statistical analysis [20]. Through such interviews, reasoning behind the thoughts and behaviors recorded by the survey, allowed one to explore deeply the possibility of a transformative learning process as a part of education for sustainable development.

VI. Results and Discussion

The character of this project was exploratory in nature and aimed at determining if attitudes towards sustainability were genuine. Appreciation of the natural world for its intrinsic value is a relatively new idea, seldom found in sustainability literature, and is rarely discussed in business schools. The findings of this study suggest that the current education system might be at fault in promoting a unilateral dialog subordinated by a process of dehumanization, where profit is the main objective and placing human society outside the natural limits. The corporatization of education defined by economic objectives needs to be rejected in favor of an education of citizenry, morality and practice for freedom; otherwise sustainability cannot be genuinely implemented. Consequently, an educational strategy of intervention towards sustainable development is necessary by underpinning a dialog of liberalization and reasoning. Interviewee responses seem to indicate a lack of appreciation for the natural world with 75 % of respondents leaning towards anthropocentric views in regards to sustainability based on actions to save the environment solely for the sake of preserving human life, as well as the belief that humans are not part of nature, as shown in Fig. 1.

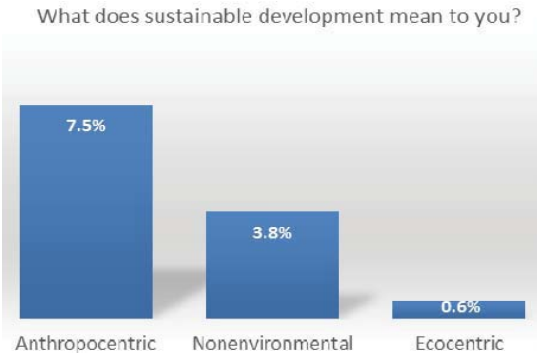

Fig. 1 Participant responses in reference to the meaning of sustainable development

The development of an education strategy to remediate exemptionism in favor of a more eco-centric worldview is the essence of this study, to define and acknowledge the need for genuine sustainability education. This resolve evolved as the categorization of open-ended responses indicated perceptions based on human exemptionalism, signaling a largely unrecognized contradiction within the sustainable development realm. By coding relevant information from open-ended questions, the typical and frequent elements of short names and themes were uncovered to represent the interviewees' views and understanding of sustainable development. While we as society would portray ourselves as non-exemptionalists, the predominant perception of the relationship between humans and the natural world resume solely for the purpose of human preservation and economic prioritization in disregard of the rest of nature. How can this anthropocentric view transition into an eco-centric mindset, or as expressed by Paulo Freire, be "unlearned" to re-create and liberate society from a tainted concept of sustainability promoted by the economic establishment in favor of a harmonious coalescence between the human and the natural world? Perhaps as described by the Dalai Lama (2014), "We are selfish. It's important for our survival. But because things are interdependent, it's in your own interest to take care of others. It should be *wise* selfish, not foolish selfish. If you take care of others, you get more benefit." [21]

Fig. 2 Participant responses on the importance of sustainability for business

Again in Fig. 2, it seems that in respect to business, most respondents believe that sustainable development is based on non-environmental reasoning abiding by management of natural resources for human use and exploitation, supporting consumerism and materialism, with very little indication of a sense of intrinsic value for nature.

Environmental perspectives were evaluated by New Ecological Paradigm (NEP) statements. Survey implemented to University level students with different majors indicates a composition of 31.3 % of management (10 respondents), 40.6 % of architecture (13 respondents) and 28.1 % liberal arts (nine respondents). The number of students aware of sustainability campus related activities was significantly low (21.9 %) and even lower was the number of students participating in sustainable activities on campus (12.5 %). This indicates a lack of emphasis on a campus-wide effort towards sustainable activities and a lack of courses promoting sustainability.

Table I displays descriptive statistics of the NEP scale for corresponding scores of 32 Woodbury students, including the mean score of all 15 NEP statements. One third of the NEP statements (33 %) score a mean of four and above. The percentage distribution for responses to each of the 15 items

indicates that students have overall responded towards pro-ecological beliefs with most of statement means above score three (neutral). This was especially true for the following items with higher scores, such as NEP5 (Humans are seriously abusing the environment), NEP7 (Plants and animals have as much right as humans to exist), NEP8 (The balance of nature is strong enough to cope with the impacts of modern industrial nations, and NEP9 (Despite our special abilities, humans are still subject to the laws of nature), but much less true for items accepting the idea of limits to growth, such as with NEP 6 (The Earth has plenty of resources if we just learn how to develop them) having the lowest score.

TABLE I
COMPARING DESCRIPTIVE STATISTICS OF NEP SCALE FOR WOODBURY STUDENTS AND PERSONNEL OF GREEN ORGANIZATIONS TO EVALUATE PRO-ECOLOGICAL CONCERN

Descriptive Statistics Woodbury University			Descriptive Statistics Green organization		
	Mean	Std. Deviation		Mean	Std. Deviation
NEP6	2.50	0.984	**NEP6**	2.89	1.203
NEP4	3.00	1.047	**NEP4**	3.32	1.188
NEP2	3.06	1.076	**NEP2**	3.45	1.201
NEP1	3.09	1.329	**NEP14**	3.5	0.980
NEP14	3.25	0.950	**NEP1**	3.61	1.104
NEP3	3.53	0.803	**NEP11**	3.97	0.915
NEP10	3.59	1.043	**NEP3**	4.03	0.972
NEP12	3.72	0.772	**NEP15**	4.05	0.868
NEP13	3.84	1.081	**NEP8**	4.05	0.880
NEP15	3.84	1.081	**NEP13**	4.11	0.727
NEP11	3.94	1.014	**NEP12**	4.26	0.891
NEP5	4.13	0.942	**NEP5**	4.29	0.768
NEP8	4.13	0.907	**NEP10**	4.29	0.547
NEP9	4.31	0.693	**NEP7**	4.39	0.547
NEP7	4.38	0.751	**NEP9**	4.45	0.504

Various statements showed a high percentage of responses, above 26 %, selecting a neutral position, especially for items NEP1 (limits of growth) and NEP2 (Fragility of nature balance) and NEP14 (human exemptionalism). The first five lowest scores include NEP1 and NEP6 both referring to limits to growth, and NEP4 and NEP14 both referring to rejection of exemptionalism, which is based on the worldview that humans are exempt from constraints of nature. This result in which NEP 6 and NEP 4 are within the lowest four scores has been observed in other studies as Hofmeister [22], Erdogan [23] and Kaltenborn [24].

Similar results were observed for green organization personnel responses, as shown in Table I, possibly as a consequence of the fact that the concept of limits to growth have been relentlessly bashed down by the media as a doomsday fantasy. Still, it seems surprising that students that had studied natural sciences, and have some idea of calculus, would not be able to foresee the limits of growth by reasoning. Environmental fates due to limits of growth can be observed in the Mayan civilization and Easter Island societal collapses. Examples in nature of endless growth seem unreasonable. How can we explain the denial of limits of growth and resources in a finite planet, other than attribute this outcome to a deficient education for sustainable development? A transdisciplinary approach and systems thinking is necessary to bring a better understanding of our world process and living systems, as part of education for sustainability.

The low scores on NEP4 and NEP14 suggest the students' belief in humanities ingenuity and progress to solve our sustainability issues. However, there was strong support to items NEP7 anti-antropocentricism, followed by item NEP9 rejection of exemptionalism and NEP 8 fragility of nature's balance. Possibly a justification for this high pro-ecological response is the fact that in recent years, animal rights have been in the forefront of people's minds through the increasing media coverage of a large number of films and stories describing poor treatment of animals. NGO TV's advertisement to raise funds for abandoned animals is very visible and compelling. So, the percentage of people that are supportive of the idea of animals' rights is increasing, and consequently, it is possible that the responses were affected by social desirability bias, leading to the high score for the NEP 7 statement. The higher score for NEP9 (Despite our special abilities, humans are still subject to the laws of nature) might be based on a misinterpretation and religious influence, as some may believe that the laws of nature are a creation of God, as stated by Newton, rather than the understanding that humans are part of nature, not apart from nature. A second possible explanation might be due to social validation, determined by a particular social group. Furthermore, it seems that 84 % of respondents are not indifferent towards other species (NEP7), 88 % accept that humans are still subjected to the laws of nature (NEP9), 72 % disagree that the balance of nature is strong enough to cope with industrialization (NEP 8), while 81 % accept the disastrous outcome of human interference with nature (NEP 5).

An analysis of NEP sub-dimensions developed by Dunlap et al. [25] according to the following was performed: a) Pro-ecology all odds; b) The reality of Limits of Growth 1,6,11; c) Anti-anthropocentricism 2,7,12; d) Fragility of Nature's Balance 3,8,13; e) Rejection of Exemptionalism 4,9,14; f) Possibility of Eco-crisis 5,10,15. A one-way ANOVA of the NEP dimensions was investigated for different factors including enrollment year, citizen status, major, sustainable activity and awareness, but only the independent variable based on majors (liberal arts, architecture and management) and enrollment year (if freshman or senior) indicated any significance. It was observed that a student's major was a significant factor for all dimensions, with Liberal Arts students having significant higher scores than Architecture and Management students. Additionally, senior and freshman students were significantly different for both NEP anti-anthropocentrism and rejection of exemptionalism dimensions. This is an interesting result as it indicates that students improve their attitudes related to anthropocentrism and rejection of exemptionalism towards the end of their undergraduate studies. On the contrary, no significant difference was observed for the dimensions related to pro-ecology, limits of growth, fragility of nature's balance and possibility of eco-crisis had little change. Among the four

dimensions, limits of growth was the one that scored the lowest and might require extra attention as far as a curriculum development plan. One-way ANOVA for comparing means of total NEP score between different majors indicate a significant difference with p-value < 0.001 and liberal arts students displaying higher scores than architecture and management students.

NEP individual statements were also compared for different majors and indicated similar results with liberal arts students scoring much higher, as shown in Table II. Most of the statements showed significant difference except for the following two items, NEP6 representing the lowest score in the scale (Limits of growth: The Earth has plenty of natural resources if we just learn how to develop them) and NEP9 with a higher score (Rejection of exemptionalism: Despite our special abilities, humans are still subject to the laws of nature). All other statements indicated significant difference with liberal arts scoring higher than architecture and management, meaning that liberal arts major students present higher pro-ecological beliefs than other majors. It seems that students believe that eventually humans will manage natural resources possibly through human ingenuity or technology because humans are exempt from dieback, but they still believe that humans are subject to natural laws, possibly a religious influence has played an important role in the responses for this item.

TABLE II
COMPARING MEAN INDIVIDUAL NEP SCORES BETWEEN DIFFERENT MAJORS

Major	NEP1	NEP2	NEP3	NEP4	NEP5	NEP6	NEP7	NEP8	NEP9	NEP10	NEP11	NEP12	NEP13	NEP14	NEP15
Management	2.90	3.00	3.10	3.10	3.30	2.20	3.70	3.30	4.10	3.00	2.80	3.50	3.10	2.50	2.80
Architecture	2.39	2.54	3.39	2.46	4.23	2.54	4.54	4.39	4.23	3.31	4.23	3.46	3.92	3.23	4.39
Liberal Arts	4.33	3.89	4.22	3.67	4.89	2.78	4.89	4.67	4.67	4.67	4.78	4.33	4.56	4.11	4.22
Mean	3.09	3.06	3.53	3.00	4.13	2.50	4.38	4.13	4.31	3.59	3.94	3.72	3.84	3.25	3.84
p-value	0.00	0.01	0.00	0.02	0.00	0.45	0.00	0.00	0.18	0.00	0.00	0.01	0.01	0.00	0.00

TABLE III
COMPARING MEAN INDIVIDUAL NEP SCORES BETWEEN DIFFERENT YEARS OF ENROLMENT

YEAR	*NEP1*	*NEP2*	*NEP3*	*NEP4*	*NEP5*	*NEP6*	*NEP7*	*NEP8*	*NEP9*	*NEP10*	*NEP11*	*NEP12*	*NEP13*	*NEP14*	*NEP15*
Freshman	2.69	2.15	3.23	2.46	4.00	2.62	4.31	4.08	4.08	3.08	4.00	3.54	3.92	3.08	4.31
Senior	3.50	3.78	3.78	3.39	4.33	2.39	4.50	4.22	4.50	3.94	3.94	3.83	3.83	3.44	3.67
Mean	3.16	3.10	3.55	3.00	4.19	2.48	4.42	4.16	4.32	3.58	3.97	3.71	3.87	3.29	3.94
p-value	0.09	0.00	0.06	0.01	0.30	0.54	0.47	0.66	0.10	0.02	0.88	0.31	0.83	0.29	0.07

Comparing freshman and senior year students from all majors, it was observed that there was a marginally significant difference with seniors having a higher score for the total NEP scale indicating a higher order pro-ecological behavior with p-value 0.067. This is promising because education seems to be a factor of behavior change towards pro-ecological issues. The following items were significantly different as compared individually with NEP1 (0.086) NEP2 (p<0.001), NEP3 (p =0.062), NEP4 (P=0.014), NEP10 (p=0.021) and NEP15 (0.067) indicating significant difference with seniors scoring higher than freshman, except for NEP15. This might indicate that schooling has a positive effect on appreciation for pro-ecological behavior. However, even though the difference was significant, most of the means for NEP1, NEP2, NEP3, NEP4, NEP10 and NEP15 were still low and indicated a neutral tendency. Other statements (40 %), such as NEP5, NEP8, NEP11, NEP12, NEP13 and NEP14 were not significantly different and indicated slightly higher scores.

VII. GREEN ORGANIZATIONS PERSONNEL ATTITUDES TOWARDS SUSTAINABILITY

A total of 40 green organization personnel were interviewed using a homogeneous sampling method in order to target individuals that are involved with sustainability in the workplace. Descriptive statistics indicate that most of the respondents are males (77.5 %), and above 40 years of age (80 %). Respondents that are working for less than 10 years make up 53.8 %. In terms of a major/degree, 63 % are non-technical, meaning they are entrepreneurial, and 52 % are involved in a for profit organization versus 29 % non-profit and 18 % governmental.

The New Ecological paradigm scale with the corresponding mean scores for green organization personnel responses for each statement is shown in Table I. Green organization personnel presented most of the statement with a score of four and above average scores (66 %) in comparison to Woodbury students (46 %). The percentage distribution of responses to each of the 15 items indicates a tendency of green organization personnel towards pro-ecological beliefs with most of the statements above score three (neutral), similarly to Woodbury students.

In Fig. 3, a comparative bar chart between Woodbury University students and green organization personnel scores is displayed. The four highest NEP scores observed for both green organization personnel and Woodbury Students responses are: NEP5 (humans are seriously abusing the environment), NEP7 (Plants and animals have as many rights as humans to exist), and NEP9 (Despite our special abilities, humans are still subject to the laws of nature). The five lowest scores include both NEP1 and NEP6 referring to limits to growth, and both NEP4 and NEP14 referring to rejection of exemptionalism, which is based on the worldview that humans are exempt from constraints of nature. Remarkably, a comparison between the lowest scores for Woodbury students

and green organization personnel indicates that the first five lower statements coincide. This result implies a consistency in terms of pro-ecological behavior in the academic and professional environment.

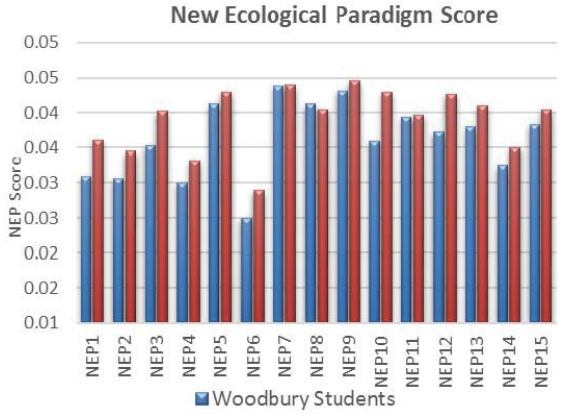

Fig. 3 NEP statements mean of Green Organization personnel responses versus Woodbury students

Green organization shows higher NEP average score (3.910) in comparison to Woodbury students (3.508). This is an expected result considering that green organization professionals would have a better understanding of environmental issues or maybe would know the expected answers (dominant social paradigm) with 80 % of the statements towards pro-ecological behavior versus 66 % for Woodbury Students. The correlation between both is 0.679. Scores are low, trending towards neutrality with values for both Woodbury students and Green organization indicating that quality education for sustainable development should be further studied in order to intervene and develop a transformative learning strategy to provide higher pro-ecological concern.

Independent t-test indicated that green organization respondents' majors/degree if technical or not seems to be a significant factor specifically for statement NEP4 (p=0.034), NEP9 (p=0.051 marginally significant), NEP12 (p=0.058) and NEP15 (p=0.055) where non-technical displayed higher scores on pro-ecological behavior, Table IV. The NEP4 statement refers to human's talent to be able to circumvent the damage that humans have caused to the planet so the human species will be preserved. The fact that technical personnel scored lower implies that they believe humans will in the end use their ingenuity to remediate the environmental damage, as expected considering that these have an engineering background. Independent t-test of the Total NEP scores indicates a significant difference between technical and non-technical, with a p-value of 0.046 at the last line in Table IV. The following items showed no significant difference *NEP1*, NEP2, **NEP3**, NEP5, *NEP6*, NEP7, **NEP8**, NEP10, *NEP11*, and **NEP13**. This includes all items related to limits of growth, and the fragility of the balance of nature. (*Italics* indicating limits to growth and **bold** fragility of nature's balance)

Other factor, such as gender, age, years of working experience in the environmental field for less than and greater than 10 years, as well as for type of organization, indicated no significant difference when tested for the NEP statements.

TABLE IV
INDEPENDENT T-TEST FOR TECHNICAL AND NON-TECHNICAL DEGREE FOR NEP DIMENSIONS

MAJOR	NEP1	NEP2	NEP3	NEP4	NEP5	NEP6	NEP7	NEP8	NEP9	NEP10	NEP11	NEP12	NEP13	NEP14	NEP15	Total
Technical	3.45	3.36	4.00	2.64	4.00	2.82	4.55	3.73	4.27	4.27	4.00	3.91	4.00	3.00	3.73	3.72
Non-technical	3.73	3.68	4.09	3.55	4.45	2.95	4.36	4.19	4.64	4.41	4.09	4.50	4.23	3.73	4.27	4.06
Mean	3.64	3.58	4.06	3.24	4.30	2.91	4.42	4.03	4.52	4.36	4.06	4.30	4.15	3.48	4.09	3.93
p-value	0.53	0.48	0.81	0.03	0.17	0.77	0.39	0.19	0.05	0.61	0.79	0.06	0.42	0.06	0.06	0.05

TABLE V
EXPOSURE TO NATURE (PLAYTIME) DURING CHILDHOOD (ABOVE 50 % OF THE TIME HAS CONSISTENTLY HIGHER SCORE)

PLAYTIME	NEP1	NEP2	NEP3	NEP4	NEP5	NEP6	NEP7	NEP8	NEP9	NEP10	NEP11	NEP12	NEP13	NEP14	NEP15	Total
Above 50%	4.06	3.75	4.44	3.75	4.56	3.13	4.56	4.40	4.44	4.50	4.19	4.56	4.38	3.81	4.44	4.19
Below 50%	3.35	3.35	3.75	3.00	4.05	2.75	4.25	4.00	4.40	4.20	3.90	4.05	3.90	3.20	3.85	3.73
Mean	3.67	3.53	4.06	3.33	4.28	2.92	4.39	4.17	4.42	4.33	4.03	4.28	4.11	3.47	4.11	3.92
p-value	0.05	0.32	0.04	0.06	0.07	0.35	0.09	0.12	0.83	0.19	0.34	0.08	0.06	0.07	0.03	0.00

TABLE VI
ANOVA NEP SUB-DIMENSIONS FOR CHILDHOOD EXPOSURE TO NATURE

	Mean Square	*F*	*P-value*
Pro-ecology	1.86	11.87	0.001
Limits of Growth	1.70	3.95	0.540
Anti-anthropocentrism	1.47	3.40	0.073
Fragility of Nature's Balance	2.34	8.03	0.008
Rejection of Exemptionalism	2.03	5.24	0.028
Possibility of Eco-crisis	2.02	6.74	0.014

In Table V, independent t-test seems to indicate that the variable (playtime) representing exposure to nature during childhood seems to be an important factor and has shown to be significant for eight of the individual NEP statements. The following dimensions had two items that were significantly different: Nature' fragility (NEP3 & NEP13), rejection of exemptionalism (NEP4 & NEP14 – marginally significant), and possibility of eco-crisis (NEP5 & NEP15). Composite total NEP was significant different for playtime with p-value of 0.02. NEP dimensions also indicated significance for independent variable playtime. Five out of the six NEP dimensions indicated significant difference while anti-anthropocentric was marginally significant, with p-value 0.073

with above 50 % exposure, showing higher scores. This is an important result as it emphasizes that exposure to nature in early age is determinant for pro-ecological concern.

VIII. Conclusion and Recommendations

Enough opportunities were given for the respondent to disclaim their position towards sustainability. Fragments of some of the responses presented involve topics such as the economic system, natural resources issues, climate change, perceptions of the natural world and business activities. My concern was to try to measure if they were genuinely involved in sustainability from the perspective of preserving nature for its intrinsic value, and if they would position themselves as part of the natural world. In general, it was understood that the climate change threat is a reality, and that it will lead to disastrous consequences for the Earth and all living systems if not addressed. Respondents agreed that there is a need to protect natural resources and that climate change is imminent and requires action. However, some believe that things will be resolved either by itself or by human ingenuity, but most did not display any interest in protecting nature because of its intrinsic value. Their motivation was mostly based on selfishness and self-preservation. The main concern was about themselves, immediate family and perpetuation of human race.

Most business professionals interviewed declared commitment and motivation to be involved in sustainability; however, most did not present any genuine and effective implementation strategies or transformations in the core of their business or attitudes. Some claimed that money and high cost were barriers to sustainable implementation of activities. Regarding realistic solutions most proposed government financial support and changes in lifestyle with focuses on energy expenditure. Education was never mentioned and neither was the need for a transformative worldview, in respect to an appreciation of nature and other species. The emphasis was always in terms of the management of resources as the solution to the climate change crisis.

An assiduously educational program strategy is essential. The main findings of this study seem to indicate that behavior and attitudes can be changed based on learning experiences such as childhood exposure to nature, effects of schooling from freshman-to-senior years, as well as curricula emphasis according to different majors. In this context, transformative learning experiences may be effective following John Dewey's learning from real life in the classroom and Paulo Freire eco-pedagogy educational framework. The fact that liberal arts students presented significantly higher pro-environmental concern may indicate that some of the curricular aspects may provide essential educational experience and should be conjoined with business studies exploring interdisciplinary perspectives. Education has to be viewed as a resort of liberation from the shadows of reality. Education for sustainable development has the potential to develop a society with the capacity to see that every being is intertwined and interconnected, under which the natural and human world can co-exist in harmony.

Transformative learning promoted by a scientific mode of inquiry and reflective thinking feeds the mind and allows for an approach to the world from a sustainable development perspective. Education has to allow for a continuous reorganization in order to be transformative. Learning from the world and by experiencing the connection between actions and their consequences in an environment of continuous learning opportunities within a dialog with local communities is the driver of engagement and self-awareness. Education for sustainability cannot be passive when students receive pre-packaged information because it will not instill change to provide genuine attitudes toward sustainability.

In order to reduce the gap between the academic environment and real world problems, the curricula has to encompass community activities and civic engagement following Paulo Freire's eco-pedagogy. This will allow for a number of people to work together in a common spirit and common aims developing interchanges of thought, critical thinking and evolving empathetic feelings that are fundamental for sustainable development. It is however through communication that different people and groups are led to interact freely and fruitfully with each other by sharing goals, interests, and values by recognizing their common humanity by cooperation toward nature and fellow men.

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