

Higher Education and the Promotion of Pro-Ecosystem Behaviour among Students

Stephen Ntim (PhD; M.Phil.; M. A B.Ed.)

Faculty of Education, Department of Social Science Education

Catholic University of Ghana

P.O. BOX 363, Fiapre-Sunyani, B/A, Ghana, W/Africa

E-mail: stephen.ntim@cug.edu.gh; stephenntim58@gmail.com; stephenntim58@yahoo.com

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Abstract

This study examined the synergy between higher education and the promotion of pro-ecosystem behaviour among students. Using descriptive research survey with purposive, stratified sampling of estimated two hundred (200) respondents to gauge perspectives on key questions on climate change, the following were the major findings: promoting pro-ecosystem behaviour requires a more integrative and multi-dimensional approach; an understanding of the social system and its gendered impact of how particular groups are at risk on climate change; developing ethical reasoning with critical thinking. Even though, Climate Change is of critical importance and education has been on-going in Ghanaian Higher Education, there are still gaps. Few developments of new climate courses or programs, lack of inter-unit team teaching across disciplines in Ghanaian universities, limited research capacities as well as little or no engagement of the universities with the communities on climate change. This suggests that more needs to be done.

Keywords: Higher Education, Climate Change Education, Attitudinal Change, pro-ecosystem behaviour

1. Introduction

Many species on the planet earth keep experiencing the effect of the climate change. Rising temperatures and its consequent ice loss, for example, make bears lose their habitat. This change of habitat has added bears on the list of animals on the verge of extinction in the wild (Pidcock, 2015). Humans also continue to face risks to their habitat as well as their survival as a result of climate change: the intensification of wild fires, heavy storms, droughts and food shortage, increasing temperatures leading to rising sea level. The irony here is this: climate change is human-induced due to massive and unrestrained interference by man on nature. While it could be said that, the global debate of conserving biological diversity is historically rooted in biological science, it is also recognized that the subject of environmental conservation, especially in the complexity of the modern world, requires an integrated and wider approach, if we want to maximize professional collaboration (Baerwald, 2010). There is no doubt, that the world is facing an unprecedented environmental crisis which continues to be a threat to the ecosystem of the planet earth. One of the defining challenges of the contemporary world has to do with the relentless biocide of our time and age, for which men and women of our era has been correctly described as '*homo petroleumus*' (Callicott, 1997). The global response to this unprecedented threat to the ecosystem goes beyond economics. Neither is it simply political nor technological, but that the response needs to be extended to ethical/moral, social and more important to religious and spiritual dimensions. We can only appreciate the enormity of this topic, if we relate it to the last five hundred years of a given cultural perspective that has dominated the worldview which extends from the period of the Enlightenment through to modern secular mentality.

Ecological education over the years has largely been concerned with how to mitigate environmental degradation through the mediation of knowledge change and individuals' behaviors. This approach has come to the fore due the saliency of the current levels of deforestation, the increasing wave of plastic waste into the oceans as well as the drastic consequences of climate change (RTL Today, 2021; The Guardian, 2020; Insurance Journal, 2021; The New York Times, 2021). This situation has also necessitated an increased need for ecological/environmental education to create the awareness of the criticality of the situation and awaken human drives and concerns for a change in habits and behaviors. This has precipitated global responses such as the implementation of cleaner production actions; environmental pollution prevention, migration to more energy-efficient technologies (Awan et al. 2020a; Awan et al., 2020b; Cheng et al., 2021). Management literature on corporate social responsibility continue to give evidence on managers belief and behaviour (Sharma, 2000; Lewis et al., 2014; Gröschl et al., 2017; Tang et al., 2018; Yang et al., 2019; Zhou et al., 2021).

In Ghana, the last three decades have witnessed successful story of economic growth, transitioning the country into a middle-income economy. But this also comes with a concern: how to protect and manage sustainably the natural resources that boosted this growth. Recent World Bank Ghana Country Environmental Analysis (CEA) provides both the economic effect as well as the warning that erosion of natural capital puts livelihoods and human health

at risk. For example, according to the CEA, environmental degradation costs \$6.3 billion annually or nearly 11% of Ghana's 2017 GDP. Non-renewable resources such as gold and oil cannot sustain growth as resources deplete while renewable resources like cocoa, timber, and other tree and food crops, depend on good environmental stewardship. There are clear signs and scientific evidence that the erosion of the natural capital may put at risk, growth, livelihoods, and human health. Air pollution, the leading environmental public health, costs roughly \$2 billion per year, plastic pollution, e-waste, land and forest degradation, climate change

etc. (<https://blogs.worldbank.org/africacan/ghana-balancing-economic-growth-and-depletion-resources>) are causing risks to sustainability in Ghana. Institutions of higher learning in Ghana can ill afford to remain unconcerned.

1.2 Statement of the Problem

Many studies have been conducted on ecological consciousness at the beginning of this 21st century with a focus on the interconnection of the subject with spiritual and moral factors. The need to develop ecocentric-ecological consciousness built into higher education pedagogy continues to become topical (E3S Web of Conferences 2021; Dmitriy et al., 2019; Panov, 2013) in order to reduce the risk of ecological/environmental catastrophe. The direction of current group of research is a re-profiling of the subject to denote psychological behaviors that are related to predispositions of individuals to be actively conscious to participate in pro-ecological behaviours (Schutz, 2014; Zelensky, 2015). While acknowledging that researchers are changing the narrative on the debate towards a multi-dimensional view, the same approach does not seem to include other behaviors and psychological constructs seen to be typically related to the ecological subject such as belief system, values, attitudes, knowledge, etc. It is this gap in the literature that this research seeks to fill. This is especially the case in the African/Ghanaian contexts in which dichotomy between cognition and affectivity is very rare. African/Ghanaian consciousness is an integral alignment of perception, cognition, attitude and action which together combine to form a disposition- what has been referred to as the African '*ontological sense of being and self*'- an African epistemology in which connections are made between knowledge and being (Khane & Ukpokolo, 2023).

Even though, contemporary researchers have underscored the causal relationship between affectivity and activity (pro-environmental behaviour) as mediated by behavioral and cognitive components (Sánchez & Lafuente, 2017; Borden, 2017, Senerpont & Teurlinx, 2019) from other geopolitical areas, not many of such studies with a multi-dimensional approach to the ecology debate have been conducted in Ghana, hence this research to contribute to the literature. Thirdly in Ghana, few studies have addressed and analyzed the seminal cause of the way of thinking (epistemology/cognition) and the particular technological embodiment that caused the problem *ab initio*. Fourth, even though in Ghana for about a decade now, some appreciable number of research has been conducted on climate change and its education in Ghanaian pre-tertiary institutions and universities (Boakye, 2015; Boateng & Boateng, 2015; Owusu, et al., 2013), many of these have focused on the

challenges such as limited existing levels of the knowledge and research on the subject (Owusu et al. 2013), ineffective teaching of the topic (Kofi Nyarko, 2014) with less focus on other behaviors and psychological constructs seen to be typically related to the climate change /ecological subject, such as belief system, values, attitudes, knowledge, etc. This study addresses this gap

1.3 Research Questions

The subsequent questions guided this research:

- 1) In what ways do the current threat to the ecosystem goes beyond economics and technology?
- 2) How is the current climate change education on the ecological crises making impact on people's s attitudinal change to the environment?
- 3) In what ways can Religion, Ethics and Ghanaian value system contribute to ensuring ecological consciousness in the Ecological /Environmental Debate?
- 4) How can Higher Education prepare future leaders towards respect for the ecosystem?

2. Literature/Theoretical framework

2.1 Climate Change and Education: The Paradox

Both humans and animals face enormous risks to their survival due to wildfire intensifications, storms, droughts, increasing sea levels, etc. in many parts of Ghana and Africa resulting from climate change. The three interrelated core mandates of institutions of higher learning, especially, the universities, teaching, research and community contribution are meant to help humanity to adapt and mitigate changing trends. This is especially compelling, since climate change after all, is largely the consequence of human-environment interventions (IPCC, 2018 p.53). Educational institutions therefore have the responsibility to do more, not simply to help humanity to understand the changes in our habitat, but more importantly, to educate how to slow down these changes, and how to adopt more sustainable practices. Universities therefore are not only to invent technologies to transform drivers of climate change, but to do more education to change human behaviors that continue to cause temperature above 1.0 °C degrees above pre-industrial levels (before the 1880s). In the estimates of the International Panel on Climate Change (IPCC), assuming a continue increase on the current trajectory, it is estimated that globally, warming will rise to 1.5 °C between 2030 and 2052 (IPCC, 2018; Reimers, 2022). Various technological inventions by universities to address climate changes has been undertaken. For example, Bill Gates stimulated novelty in designing next-generation toilets that could operate without sewer systems (Brueck 2019; D'Agostino 2018), because early toilets developed in the industrialized world were found to be resource-intensive and required expensive sewer systems to operate and could not be replicate in the developing world. Indeed, other significant technological breakthrough to change humanity's reliance on fossil fuels have led to the production of safer nuclear energy, efficient use of fossil fuels etc.

The above notwithstanding, it continues to be more glaring that technological advancement per se is not sufficient to reinvent a culture to promote effective ecology. Other equally critical variables need to be looked at. Typical examples among others, include structuring work in such a way that it allows working from home to reduce consumption of fuels. Ethical and spiritual imperatives that could significantly influence peoples' values and fundamental choices they make relative to respecting and protecting ecology cannot be left out in our educational agenda (Reimers, 2021). What this means in practice is that, enhancing sustainable ways requires not just knowledge in science and technological innovations. It also requires a more integrative and multi-dimensional approach, such as an understanding of social systems, developing ethical reasoning with critical thinking on the current debate of climate change, moral imagination as well as personal motivation. An understanding of the social system for example, will help us appreciate the gendered impact of climate change, how particular groups of women are at risk for their dependence on land and crops (Arora-Jonsson 2011; UNDP 2013; UN Women 2016). Such integrative, multi-dimensional approach provide students with a more profound understanding of the complexity of social action and the way "equity, sustainable development, and poverty eradication are best understood as mutually supportive and co-achievable within the context of climate action and are underpinned by various other international hard and soft law instruments" (IPCC 2018, p 54). While global concern on climate change has grown enormously (Mayherfeld & Askhood, 2015), it is also a fact that the challenges continue to be much greater. The question is not whether or not awareness and action has increased, but rather, whether the scale of the education/awareness matches the present challenges and the velocity of increase of the climate change challenges. This is the paradox of the climate education (Reimers, 2021).

2.2 Insufficiency of Knowledge/Cognitive approach in Climate Change Education

A survey conducted in 2017 of experts of sustainable development and people from the academia, business, NGO's and government indicated more than 50% of those surveyed were of the view that the current rate of progress was less sufficient to avert major damages to human, social and ecosystem health (Globescan, 2017). Additionally, belief in climate optimism declined in the last fifteen years. While nearly 20% of North American respondents believed the world was making progress in 2003, compared to 11% in 2017, the same optimism had declined from 11% in 2003 to 11% in 2017 (Globescan, 2017). The World Economic Forum, 2020 identified risks related to climate as the greatest threat facing humanity (World Economic Forum, 2020). Discernable climate changes affecting climate patterns is carbon emissions and other greenhouses gases into the atmosphere which traps the rays of the sun increasing temperature and the five warmest years from 1880 have all occurred since 2015 (NOAA 2020). This includes rising temperatures and salination causing flooding, extreme heat, storms, deforestation (Hass, 2020). If these data reported in these surveys are anything to go by, what it means is that to enhance ecological consciousness education, universities need to go beyond the cognitive level of giving people information, but also to equip people to understand the need for tradeoffs, to make fundamental value-based choices that are environmentally sustainable, how people are willing to give up

or change lifestyles they are used to in order to reduce for example their own carbon emission, governments to come up with ceiling and trades limiting emissions. All this imply an attitudinal change, collaboration with others to influence the complex system that undergird climate change.

2.3 Limitations of Climate Change Education: Migration towards Systematic Multi-Dimensional Climate Change Education

Reimer (2020b) posits the need for a more comprehensive climate change education that is more multi-stakeholder based in approach. Such comprehensive coalition approach can produce collective leadership needed to address the debate. The strategy to be adapted needs to be attentive to the cultural, psychological, professional, institutional and political dimensions. Universities more than any other institutions are particularly positioned to develop and increase the necessary capacity to promote climate-change education. Besides, climate change education so far appears to stem from a narrow learning outcome focused on low level of cognition. There is the need to migrate into a didactic approach that involves much higher cognitive skills and/or intra personal and interpersonal skills of metacognition and interdisciplinary approach. As it is, most education by institutions of higher learning on climate change follow the implicit/explicit programmes of top-down model. The impact assumption under this multidimensional type of approach is that when intergovernmental bodies and universities embrace this, it will automatically transform instruction and learning of climate change. The fact that since 2015 carbon emission continues to rise globally, testifies that there is the need to reassess how climate change education has been organized. The first limitation has been the assumption that climate change is a more technical challenge that has a universal solution. If it were so the paradox of increased awareness vis-à-vis less optimism of the debate would have been solved. A strategic thinking for climate education needs to be situated with focus on who to be educated, how such education should be delivered, etc., because the impact of climate varies. Above all, focus on attitudes, values as indicated earlier needs to be given priority (Reiner, 2021).

2.4 Higher Education and Sustainability

Higher Education institutions have particular role to play to form future human resource and to implement requisite knowledge and ideas. As far back as the 1970's universities started to consider sustainability as core part of their responsibility. However, it was not until the 1990's, after the Tallories Declaration that universities started to adopted a high sustainability strategy. Other declarations such as the Halifax Declaration in Canada, the Copernicus Declaration of the Association of European Rectors, as well as the Kyoto Declaration of International Association of Universities, etc., were all instrumental in linking sustainability issues to the Universities (Corcoran et al., 2004). Notwithstanding the fact that most universities have linked sustainability to their academic programmes, it is also established in the literature that the implementation of sustainability principles are unequal across the globe and that some geopolitical areas are more advanced than others, for example Europe is on top than all other continent (Bizerril, et al., 2018). Regardless of the obvious continental gaps in

implementation, it is also on record that many education institutions continue to promote sustainability and are fully engaged in preparing students to appreciate and understand the global challenges so they could actively participate in its implementation. This is realized when institutions begin to reduce its environmental footprints, engaged more vigorously with communities, etc. (UNESCO, 2020). A recent body of knowledge has been accumulated on curricula design and their alignment to the subject of sustainability in higher education specifically on campus practices and outreach activities on sustainability (Weiss & Barth, 2019; Menon & Suresh, 2020). Other works particularly on pedagogy such as pedagogical barriers blocking sustainability implementation (Blanco-Portela et al., 2017), pedagogical strategy towards sustainability teaching in Higher Education (Seatter & Ceulemans, 2017), as well as the impact of Higher Education in sustainability (Hallinger & Chatpinyakoo, 2019) While all this constitute a key component to enhancing the image of higher institutions, especially the University in terms of their image and studies quality, it is also on record that globally only the high-ranking universities in western countries are incorporating ecosystem prosocial behaviors in their programs (Walter et al, 2021).

2.5 Ghana National Climate Change Policy (NCCP)

The National Climate Change Policy of Ghana (2013) consists of ten (10) programme areas addressing critical and fundamental issues of Ghana's climate change : a) Developing climate-resilient agriculture and food security systems; b) Building climate-resilient infrastructure; c) Increasing resilience of vulnerable communities to climate-related risks; d) Increasing carbon sinks; e) Improving management and resilience of terrestrial, aquatic and marine ecosystems; f) Addressing impacts of climate change on human health g) Minimizing impacts of climate change on access to water and sanitation; h) Addressing gender issues in climate change; i) Addressing climate change and migration and i) Minimizing greenhouse gas emissions. Five main areas are prioritized: (i) Agriculture and Food Security (ii) Disaster Preparedness and Response (iii) Natural Resource Management (iv) Equitable Social Development (v) Energy, Industrial and Infrastructural Development. Overall, these programmes are deemed to enhance food security, increase the resilience of infrastructure and communities, improve environmental management practices and ecosystems for greater biodiversity and carbon sequestration, optimize key socio-economic factors, and achieve more efficient systems for improved economic growth.

3. Present Study

The literature above indicates four (4) fundamental convergences/commonalities: a) it is not that knowledge and awareness of the climate change is lacking globally; b) the more the awareness is created, the more the velocity of the challenge of climate change, raising high sea levels, increase in carbon emissions, drought, etc; c) this means that something might not have gone right in the global education; d) it appears to be unidirectional with focus on knowledge low-level cognition instead of higher metacognition as well as a focus on systematic multidimensional approach. With these commonalities and with the Ghana policy document as backdrop, this study surveyed stakeholders' perspectives in selected Ghanaian universities

along the following four questions: a) In what ways do the current threat to the ecosystem goes beyond economics and technology? b) How is the current climate change education on the ecological crises making impact on peoples attitudinal change to the environment?; c) In what ways can Religion, Ethics and Ghanaian value system contribute to ensuring ecological consciousness in the Ecological /Environmental Debate? d) How can Higher Education prepare future leaders towards respect for the ecosystem?

4. Methodology

4.1 Design and Sample

This paper used the descriptive research survey design and a random purposive sampling of estimated two hundred (200) respondents across the country. One hundred and eighty (180) respondents were sampled from the universities, which included one hundred and sixty students and twenty senior academics involved in the teaching of natural and social sciences; the remaining twenty were outside of the university from people working in related ministries and agencies, such as the Environmental Protection Agency (4 respondents), the Ministry of Lands and Mineral Resources (4 respondents), Ministry of Agriculture (4 respondents), Ministry of Health (4 respondents) and of course Ministry of Education (4 respondents) from three (3) of the sixteen (16) administrative regions of Ghana: Ashanti, Ahafo and Bono. These three regions were chosen for this study for strategic reasons: besides being among the most densely populated, most of the private universities are either located in these regions or almost all the public universities have satellite campuses in these regions. They are located in the middle belt of the country, making these regions a bit more cosmopolitan, people from North and South, East and West of Ghana converge on these regions, especially Kumasi, with its historical fame as a centre for cultural, commercial, economic and business activities, the most densely populated city of Ghana, next to the national capital Accra. Additionally, and perhaps more importantly, these regions are among the regions in Ghana that have suffered most of the negative impact of climate change in the areas of agriculture (especially faming drought, bush fires during the dry season) depletion of forests resources for gold mining, destruction of water bodies, carbon emission from old vehicles in traffic congestion etc.). This purposive choice of location allowed for easy sampling. When permissions were obtained after explaining the purpose of the survey that it was purely academic research, they were given a survey pack with consent form and a questionnaire.

4.2 Procedure and Measures

The questionnaires were in different sections. Each section sought to measure the different study variables as follows: a) *personal data of respondents*: Respondents were asked to report information on their age, level of academic qualification (PhD, M.Phil.; M.Sc., M.A), academic/administrative rank, years of engagement with university work, years of working in their area of work; b) *Personal vision on what universities could do to enhance effective climate change education*. Here the focus was on finding out respondents' attributes of what constitutes benchmarks for effective attitudinal change education to enhance pro-ecosystem behaviors in university in terms of their scale of preference. Hence, the instrument used to

assess this on the structured questionnaire was an adapted variant of the Attributes of the Intelligence Scale (Okagaki & Steinberg, 1993). There was a total of eight items in the measure using Likert's 5-point scale ranging from 1 (strongly disagree) to 5 (strongly agree); c) *Academic/Administrative/students' perception on the four research questions*. Four measures were assessed in the structured questionnaire: a) *on multidimensional approach to the climate change education*: In what ways do the current threat to the ecosystem goes beyond economics and technology? b) *on attitudinal change towards the environment*: How is the current climate change education on the ecological crises making impact on peoples' attitudinal change to the environment? c) *Axiological dimension to promote pro-ecological behaviors/consciousness in peoples psyche*: In what ways can Religion, Ethics and Ghanaian value system contribute to ensuring ecological consciousness in the Ecological /Environmental Debate? d) *Higher Education and human resource preparation with sensitivity to ecological concerns*: How can Higher Education prepare future leaders towards respect for the ecosystem?

5. Findings

5.1 Research Question 1: Multidimensional approach to Climate Change Education

In what ways do the current threat to the ecosystem go beyond economics and technology?

This section of the survey was meant to gauge respondents' perception whether or not they see the challenge to the ecosystem, specifically climate change as essentially a scientific and economic issue that should be left to the natural and social sciences to resolve. Responding to the sub-question, *Do you perceive climate change as more a technical challenge that has a universal solution and should be left to those is in science and technology?* Eight percent (80%) of respondents (160) rejected the notion that the current climate change challenges in Ghana and globally should be left to scientists. When asked further to explain the basis for their position that the challenge should go beyond science and economics in the sub-question: *If your answer is that the solution should go beyond science and technology and economics, what is the basis for this answer?* Majority of respondents, three out of every five (60%), especially the academics were of the view that with growing empirical evidence since 2015 that carbon emissions globally continues to rise astronomically, despite the consistent climate education, there is the justification that science and technology is needed of course, but they are not sufficient. The consistent rising temperatures as well as increase in high levels of salination which precipitate flooding, deforestation, storms, extreme heat are glaring indications of why there is the need for a systematic multi-dimensional approach, especially the need for the behavioral sciences for behavior modification, attitudinal change and ethical values since climate change after all, is essentially anthropogenic in nature. The remaining 40% offered similar answers, but with more local/domestic instances of drought, bushfires, etc., which affect crop farming and therefore the economic livelihood of the rural poor, especially women who depended on land for their economic survival.

5.2 Research Question 2: How is the current climate change education on the ecological crises making impact on people's attitudinal change to the environment?

This part of the survey was equally critical. It sought to measure the relationship between awareness creation of the challenge of the climate change, and the impact it has made on pro-ecosystem behaviour. The first sub-question under this section was to find out the awareness level of respondents of the 2013 Ghana Government's Policy document on climate change. Responding to a Likert-form question of ranking from 1-6, 1 'being most fully aware' to 6 'being not at all aware', the question asked was: *Are you aware of the 2013, Ghana Government Policy document on climate change?* More than 50% (55%, 110 respondents) humbly admitted, not at all aware of this document especially the student respondents. While a few of the academics (45%) did acknowledge the existence of this 2013 policy document, very few (20%) had read it. It was the respondents from governmental agencies, such as Environmental Protection Agency and from the Ministry of Land and Natural Resources who scored high on this measure. On the substantive question, *whether or not climate change has made appreciable impact on people's attitude to the environment*, the following were some of the scores: overall, 70 % (140 respondents) were of the view that there was a mismatch between awareness creation of the ecological crisis, and impact on peoples' behavior. This means that given a sample of ten (10) respondents to this question, seven (7) out of the ten (10) believed that climate change education has not made significant change in people attitude to the environment. The remaining 30% (60 respondents) were not too sure of their response to this question. Pressed further to substantiate their answers, why climate change education in their view has not made any significant impact, respondents were quick to cite indiscriminate disposal of trash in the cities, especially in Accra and Kumasi which get choked in gutters causing perennial flooding as well as poor waste management systems in our cities.

5.3 Research Question 3: In what ways can Religion, Ethics and Ghanaian value system contribute to ensuring ecological consciousness in the Ecological /Environmental Debate?

Africans in general and Ghanaians in particular are known for how they put premium on religion and values in their behavior towards one another and to how they treat mother nature. It is on record that in many tribes in Ghana, indigenous Ghanaian farmers for example, used to follow the 'fallow system/shifting cultivation farming'. The intention was not to put pressure on nature, but to allow nature to regenerate itself. This section of the survey sought to examine the extent to which Ghanaians bring these values, ethnical norms to bear on this debate on the climate change. Responding to the question 85 % of respondents (that is 170/200 respondents) concurred that yes indeed religious and ethical values can contribute positively to the debate. Explaining the *how* of the contribution of ethics and values the following were some of the responses: a) the climate change challenge is not by nature; b) It is caused by humans. Humans need to understand that it does not have automatic right over nature. Humans are only custodians; c) Therefore, the responsibility lies on humans to ensure we bequeath a healthy ecosystem to our future generations, just as our forebears did to u; d) All these have to do with the ethical question of responsibility and conscience more than

economic/profit maximization.

5.4 Research Question 4: How can Higher Education prepare future leaders towards respect for the ecosystem?

The above generic question was broken up into the following four sub-questions: a) How is your university fully engaged in preparing students to appreciate and understand global challenges on climate change so they could actively participate in its implementation?; b) In what ways are Ghanaian universities reducing their environmental footprints to engage more vigorously with communities on the climate change challenges?; c) What are the pedagogical barriers blocking sustainability/climate change implementation in Ghanaian universities?; d) What pedagogical strategies do Ghanaian universities have in place towards sustainability/climate change teaching? On a Likert's scale of 4-1 with 4 being the highest and 1 the lowest: *fully engaged, partially engaged, least engaged and not engaged at all*, many respondents (140 that is 70%) on the average gravitated *between partially engaged and least engaged*. The remaining 30% (60) respondents, 20% were of the view that Ghanaian universities were fully engaged in climate change education while the remaining 10% were not too sure. Regarding Universities efforts to reduce their environmental footprints while engaging community outreach, while 65% admitted that many Ghanaian universities are becoming more sensitive to climate change issues and ensuring effective waste management and disposal on campuses, such as for example, migrating from paper memoranda to staff and focusing more on electronic messages to reduce paper consumption, the same 65% respondents were doubtful whether community engagements on climate change education by the universities were being undertaken. Responding to pedagogical challenges, all the university respondents in the natural and social sciences concurred that while the natural sciences are making efforts to relate programmes and courses to the climate change topics, it appears that apart from Geography and economics, the other social sciences are yet to get on board. The major pedagogical challenges are: a) development of new climate courses especially from other mainstream social sciences besides Geography and economics; b) majority of respondents both senior members academic, students and other respondents (75 %) constituting 150 respondents, expressed the view of the lack of inter-unit team teaching as well as climate research collaboration among university units continue to be a major hindrance on climate change education.

6. Discussion

The findings above seem to suggest that notwithstanding significant science-technology breakthroughs towards inventions that help humanity to change the narrative of for example, reliance on fossil fuels to safer nuclear energy, efficient fossil fuels, etc., there is still the need for ethical/spiritual imperatives to drive the climate change debate. Science and Technology, critical though they are, are still not sufficient. This finding supports the position of Reimer (2021) that enhancing a more sustainable climate change education requires not just science and technology, but also a systematic multidimensional approach that will require an understanding of varied contexts of the impact of the climate change on other

peoples' social system. It is the social systems that will indicate how particular groups become more vulnerable to the impact of climate change. While 60% of respondents focused on the global effect of the climate change as reported above, 40% of respondents not from the universities, but working on day-today basis, such as those from the Environmental Protection Agency and the Ministry of Lands and Mineral resources focused their answers on the impact of climate change on the social systems. These 40% reported on the local/domestic instances of drought, bushfires, etc., affecting crop farming and the economic livelihood especially of women. This corroborates the first of the five prioritized main areas of major concern of the Ghana Government, which is climate change impact on agriculture and food security, especially on the most vulnerable in Ghana whose livelihood is centred on farming. Climate change is directly related to human development especially in areas South of the Sahara. People live in poverty. Their lives are dependent directly on agriculture for survival. Climate changes affect the production of food staples linked directly to drought and rainfall variation (<https://library.fes.de/pdf-files/bueros/ghan>). Thus, the need for critical understanding of the social and economic dimension of climate change and its impact on the most vulnerable gives more justification to the ethical/moral component of the debate. Developing ethical reasoning with critical thinking, moral imagination as well as personal motivation, cannot be underestimated. The ethical/moral perspective will help us appreciate the gendered impact of climate change, how particular groups of women are at risk for their dependence on land and crops (Arora-Jonsson 2011; UNDP 2013; UN Women 2016).

Various technological inventions by universities to address climate changes and its social and economic impact on the world's poorest people has been undertaken (Brueck 2019; D'Agostino 2018). This includes technological breakthrough to change humanity's reliance on fossil fuels which have led to the production of safer nuclear energy, efficient use of fossil fuels etc. This notwithstanding, it continues to be more glaring that technological advancement per se is not sufficient to reinvent a culture to promote effective ecology. Other equally critical variables need to be looked at. Typical examples among others include structuring work in such a way that it allows working from home to reduce consumption of fuels. Ethical and spiritual imperatives that could significantly influence peoples' values and fundamental choices they make relative to respecting and protecting ecology cannot be left out in our educational agenda (Reimers, 2021). What this means in practice is that enhancing sustainable ways requires not just knowledge in science and technological innovations. It also requires a more integrative and multi-dimensional approach, such as an understanding of social systems, developing ethical reasoning with critical thinking on the current debate of climate change, moral imagination as well as personal motivation. An understanding of the social system for example, will help us appreciate the gendered impact of climate change, how particular groups of women are at risk for their dependence on land and crops (Arora-Jonsson 2011; UNDP 2013; UN Women 2016).

With respect to attitudinal change, popular beliefs, values and moral imperatives on the debate of the climate change, the findings confirm the position of many researchers especially at the beginning of the 21st century. Developing an eco-centric ecological consciousness

especially among future leaders will imply that students and younger people are able to identify the value meanings of the life of modern society, such that they are able to indicate the consequences of the reckless use of natural resources on the ecosystem (Bazaily, 2021). The need to emphasize attitudes, values, beliefs besides the multidimensional approach to environmental consciousness will ensure the needed psychological predisposition in which the student/learner is able to combine the alignment of cognitive, attitudes (dispositional) as well as pro-ecological behavior (the active/implementation aspect).

Besides, popular beliefs, attitudes and behaviour in relation to environmental problems are deemed to be critical factors for a sustainable development. Sustainability to a large extent is contingent upon the degree to which environmental concerns are taken into consideration in the choices made by ordinary citizens. In addition, their behaviour as voters and consumers affect the decisions made by more influential actors, such as political and business leaders (Hellevik, 2002). Contemporary researchers are of this view of the relationship between the affective domain and the active domain which is mediated by the components of behavior and cognition (Sanchez & Lafuente, 2017). The overwhelming majority of respondents whose view was that climate change goes beyond technology and economics support the thesis that a person with pro-ecological behaviour is one who engages in varied pro-ecological behaviours that adhere to values and attitudes (Schultz, 2014; Zelezny, 2015). Many authors in the latter part of the 20th century and the beginning of the 21st century see the value systems of religions as powerful source for mobilizing global sensibility to preserve the ecosystem (Tucker & Grim 1999; Gardner, 2006; Foltz, 2006). It promotes a paradigmatic shift away from a purely anthropocentric view of nature towards a more bio-centric one, in which the interdependence as well as the mutually-beneficial gains between humanity and nature are safeguarded. Yet religion and its moral/ethical values hardly feature in the on-going debate.

7. Conclusion

Universities across the globe are gradually recognizing the need to educate future global leadership and society to consciously contribute to the mitigation of, as well as adaptation to climate change. Universities play dual role in this context. They are adopting and promoting neutrality in carbon emissions as institutions and they are educating students and by implication society on the imperatives of climate change mitigation and neutrality in carbon emissions. Climate Change education has been going on in many Ghanaian universities with some scientific publication on the topic. Highlighted in the survey results above, respondents in general reported that climate change is indeed a matter of genuine concern to all in Ghana, acknowledging growing demand for professionals with training in this area in Higher Education. Nevertheless, consistently in many Ghanaian Higher Education, there are gaps such as few developments of new climate courses or programs in the universities, lack of inter-unit team teaching across disciplines within and outside of Ghanaian universities, limited research capacities, little or no emphasis of the climate change debate with the belief systems, ethical values, attitudes which are so fundamental to Ghanaian philosophical work view. Besides, there is little engagement of the universities with the

communities and the need to shift the debate on climate change from anthropocentric towards a more biocentric approach. All this points to the fact that as far as climate change pedagogy is concerned, more needs to be done in Ghanaian Higher Education.

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